Improving Eyewitness Identification Accuracy with a Modified Lineup Procedure

by

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Abstract

The purpose of the current program of research was to examine whether a modified lineup procedure would increase identification accuracy. Study 1 (*N* = 241) examined several lineup procedures including the simultaneous, sequential, and elimination lineup along with a new procedure known as the elimination-plus. The elimination-plus lineup had participants provide a confidence measure following their first decision. In target-present lineups, the elimination-plus procedure was the only procedure to significantly predict accuracy. Judgment one confidence significantly predicted identification accuracy; once a witness was 75% or more confident in his or her decision, making a correct decision rose above chance level. Similar results were found for judgment two such that once a witness was 75% or more confident, making a correct decision rose above chance level. Given that there are two confidence ratings in the elimination-plus procedure, the two ratings were averaged to determine whether it was predictive of accuracy. Similar to the confidence obtained at judgment one and judgment two, once a witness had an average of 75% confidence, making a correct decision rose above chance level. Study 2 (*N* = 120) examined whether modifications to the existing elimination lineup procedure instructions would increase the rate of correct identification in target-present lineups. No significant differences were found; however, participants' decision criteria became more conservative such that both the rate of correct identification in target-present lineups and the rate of false positive identifications in target-absent lineups increased. Study 3 (*N* = 240) examined whether adding a salient rejection option to judgment two of the elimination lineup procedure would increase identification accuracy. Contrary to prediction, the salient rejection option was detrimental to identification

accuracy in target-present lineups with no benefit to target-absent decisions. Overall, results suggest that adding in confidence following judgment one of the elimination lineup procedure is a beneficial modification as it provides another piece of evidence as to the guilt of the suspect. Given that confidence has been recognized by the Supreme Court of the United States in *Neil v. Biggers* (1972), these results shed light on a novel way of examining identification accuracy.

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Improving Eyewitness Identification Accuracy with a Modified Lineup Procedure

In criminal trials eyewitness testimony is often the only form of evidence presented, especially in cases where physical evidence may be lacking, and research has established that the presence of eyewitness testimony is highly persuasive to jurors (e.g., Cutler & Penrod, 1995). Because of this, it is imperative to examine underlying factors that may influence the accuracy of an eyewitness' identification, and subsequently, his or her testimony in court. To date, there have been over 300 wrongly convicted defendants who have been exonerated in the United States (Innocent Project, 2016a). Most important, a majority (72%) of these wrongfully accused people were convicted based on faulty eyewitness identification in some part. With the high rate of faulty misidentification sending innocent people to jail, many researchers have examined the underlying reasons why these misidentifications occur. Certain factors, such as identification procedure, have been shown to influence the accuracy of an eyewitness' identification. Even more so, eyewitness identification accuracy also has been shown to be affected by various factors, which are broken down into system and estimator variables (Wells, 1978; Wells & Olson, 2003). System variables are controlled by the legal system and include, for example, the type of lineup used, how many people are in the lineup, and instructions given at the time of the lineup. Estimator variables are out of the legal system's control and include, for example, sex, age, and race of the eyewitness. The purpose of this program of research was to examine system variables, and more specifically how modifications to a current lineup procedure influenced identification accuracy and the probative value of lineup identifications.

Structure of Lineups

A primary purpose of using a lineup is to help establish the identity of a perpetrator; lineups usually include 6-12 photographs (Wells, 1993). There are two types of lineups that are constructed for research purposes that vary the presence of the target. The first is known as a target-present lineup which includes a photograph of the guilty suspect among foils (i.e., individuals known to be innocent for the crime in question). In a real world scenario, this would be when the police have apprehended the guilty suspect. When using a target-present lineup one of three responses can occur. The first is that the eyewitness accurately chooses the perpetrator out of the lineup, known as a correct identification. The second response is that the eyewitness chooses one of the foils, known as a foil identification. Lastly, eyewitnesses can reject the lineup whereby the eyewitness does not select anyone, believing that the perpetrator is not in the lineup; this is known as a false rejection (Wells, 1993). A target-present lineup is thought to be more of a memory task (e.g., a cognitive task) as opposed to a social task because the perpetrator is there and the witness need only match their memory of the perpetrator to the photographs (Pozzulo & Lindsay, 1998).

The second lineup is known as the target-absent lineup. A target-absent lineup does not include a guilty suspect, rather, a known to be innocent suspect is presented among the other lineup photographs. In a real world scenario, this would be when the police have apprehended an innocent suspect. Three responses also can occur with a target-absent lineup (i.e., the suspect is innocent). The first is an incorrect identification of the innocent suspect, known as a false identification. The second is that the eyewitness can again choose one of the foils, known as a foil identification (as in target-present lineups). Lastly, eyewitnesses can correctly reject the lineup stating that the

perpetrator is not present, known as a correct rejection. A target-absent lineup is thought to be a combined mechanism of both cognitive and social mechanisms such that if there is no match to the witness' memory, social demands of the tasks (i.e., to select someone) may take over. This is also being done under the social demand of trying to please the officer by making the correct choice (Pozzulo & Lindsay, 1998).

It is important for both theory and practice to examine target-present and target-absent lineups. While certain techniques may not improve the rate of correct identification in target-present lineups, they may result in an increase in the rate of correct rejection in target-absent lineups or vice versa. In real world cases, eyewitnesses may be presented with a lineup that does not include the perpetrator (i.e., the suspect is innocent); therefore, it is important to determine which procedure can improve an eyewitness' ability to correctly reject a lineup when presented with a target-absent lineup and, conversely, correctly identify the perpetrator in a target-present lineup. Manipulating target presence also allows researchers to calculate the rate of correct identification (i.e., the rate at which the suspect is identified in target-present lineups), the rate of false identification (i.e., the rate at which an innocent suspect is identified in a target-absent lineup), and the rate of correct rejection (i.e., the rate at which the witness correctly rejects the lineup stating that the perpetrator is not present). It is important to determine whether modifications to existing lineups will be beneficial.

Lineup Presentation

There are three primary lineup procedures that have been developed: simultaneous, sequential, and elimination. Each lineup has its own advantages and

disadvantages; even more so, each lineup may work better for different populations (i.e., children or adults; Fitzgerald & Price, 2015).

Simultaneous lineup. The simultaneous lineup was one of the first procedures employed and is one in which all photographs are displayed to the eyewitness at once. The witness is then asked whether the perpetrator is present. When a witness is presented with a simultaneous lineup, he or she is assumed to make a relative judgment and selects the lineup member who most closely resembles their memory for the perpetrator relative to the others (Wells, 1993). This approach may be ideal when the suspect is guilty because the suspect is likely to resemble the witness' memory more so than the other lineup members; however, if the witness is presented with a target-absent lineup, he or she may still choose the person who most resembles their memory of the perpetrator, thus resulting in a false identification of an innocent person (Lindsay, Pozzulo, Craig, Lee, & Corber, 1997).

Wells (1993) examined the "removal without replacement" technique to help provide evidence that eyewitnesses use a relative judgment strategy when presented with a simultaneous lineup. Participants viewed a staged crime and were then presented with either a target-present or target-absent lineup. In the target-absent lineup, the target was removed but not replaced with an innocent suspect. More than half of the participants who viewed the target-present lineup accurately chose the perpetrator; however, in the target-absent lineup, 38% chose a foil. These findings suggest that when presented with a target-absent simultaneous lineup witnesses are likely to choose the lineup member that most resembles their memory for the perpetrator relative to the other lineup members, even if the actual perpetrator is not present, thus identifying an innocent person.

Wells and colleagues (1998) reported on the first 40 DNA exonerations by the National Institute of Justice. Ninety-percent of the false conviction cases involved faulty eyewitness identification which led researchers to examine what the underlying cause of these misidentifications might be. Some suggested these misidentifications may be due to the bias influenced by decision making strategies (i.e., relative or absolute). The simultaneous lineup was the most commonly employed procedure at that time which may encourage witnesses to use a relative judgment. Early research examining the efficacy of the simultaneous lineup and the relative judgment process suggests that the relative judgment process yields a response bias to choose someone from the lineup. There appears to be an inherent bias to choose when eyewitnesses use a relative judgment process; Wells (1984) discussed that this bias may occur because it would almost always be the case that someone in the lineup would be more similar to the perpetrator than the other lineup members. In target-absent lineups, the person most closely resembling the perpetrator will not be the correct choice; therefore, a new lineup was created to help combat the detrimental effects of the relative decision making strategy in target-absent lineups, known as the sequential lineup.

Sequential lineup. Lindsay and Wells (1985) devised a new lineup procedure, the sequential procedure, to help combat witness' reliance on relative judgments. In the sequential lineup procedure, lineup members are presented to the witness one at a time and the witness has to make a choice of whether the photo is or is not the perpetrator before moving on to the next photo. This discourages witnesses from basing their decision on who looks most like the perpetrator (Lindsay & Wells, 1985). Instead, witnesses may be encouraged to use an absolute judgment whereby the memory of the

perpetrator is compared to each photograph, one at a time, rather than comparing all of the photographs together; therefore, a relative judgment strategy cannot be employed.

To test the sequential procedure, Lindsay and Wells (1985) had participants view a mock crime and then presented them with either a simultaneous or sequential lineup. Participants presented with a sequential lineup had a lower rate of false identification than those in the simultaneous condition. Furthermore, the rate of correct identification was not influenced by using the sequential lineup procedure. This was the first study to suggest that a procedure that encourages witnesses to use an absolute judgment is effective in reducing the rate of false identification without compromising the rate of correct identification.

Steblay, Dysart, and Wells (2011) recently conducted a meta-analysis including 72 tests of eyewitness identification performance between simultaneous and sequential lineup procedures. Results provided support of a sequential superiority effect: that is, the sequential lineup resulted in fewer false identifications in comparison to the simultaneous lineup. However, when examining the rate of correct identification, the simultaneous lineup procedure elicited a higher rate compared to the sequential lineup. These results support the findings of a previous meta-analysis conducted a decade prior (e.g., Steblay, Dysart, Fulero, & Lindsay, 2001). Although Steblay and colleagues (2001) found that there was a lower rate of correct identification with the sequential lineup procedure, they concluded that this difference disappeared under more realistic conditions where moderator variables, such as cautionary instructions, were included. When these moderating variables were taken into account the sequential lineup procedure was superior to the simultaneous lineup procedure under almost all conditions.

McQuiston-Surrett, Malpass, and Tredoux (2006) further examined the sequential lineup procedure to obtain a better understanding of the simultaneous-sequential debate, extending the work of Steblay and colleagues (2001). A moderator analysis was conducted to examine whether the sequential superiority effect was present in some conditions but not others. Results of the moderator analysis indicated that the sequential superiority effect may vary as a function of study methodology (McQuiston-Surrett et al., 2006). One factor found to influence the difference between the simultaneous and sequential lineup was the use of counterbalancing the lineup photographs across participants; those studies that did counterbalance the photographs failed to find a sequential advantage. A second factor found to influence the sequential superiority effect was whether the lineup procedure stopped after an identification was made. No overall effect for the sequential lineup procedure was found when the lineup was stopped after an identification. The findings from McQuiston-Surrett and colleagues (2006) suggest that the sequential superiority effect may vary as a function of the study methodology as opposed to the procedure itself.

More recently, Wells, Steblay, and Dysart (2015) examined the sequential versus simultaneous lineup debate in actual eyewitness cases. Across four U.S. cities 494 lineups from actual eyewitnesses attempting to identify someone out of a lineup were examined. Witnesses were presented with a double-blind (i.e., a lineup in which the witness and the lineup administrator do not know whether the suspect is present) sequential or simultaneous lineup. Wells and colleagues found that choosing rates were significantly lower in the sequential lineup compared to the simultaneous lineup. When examining lineup choices, both the rate of correct identification and filler identification

were slightly lower in the sequential compared to the simultaneous lineup. They concluded that the real-world patterns of eyewitness identification are similar to what is found in lab studies: witnesses are less likely to misidentify someone when presented with a sequential lineup; however, witnesses are also less likely to make a correct identification when presented with a sequential lineup (Wells et al., 2015).

Regardless of past research showing the sequential lineup to be superior over the simultaneous procedure, there are many researchers who are still skeptical of the sequential superiority effect. For example, Carlson, Gronlund, and Clark (2008) examined the robustness of the sequential superiority effect over the simultaneous lineup and sought to replicate the findings of Lindsay and Wells (1985). The first study examined foil similarity to the suspect. Participants viewed a staged theft and were later presented with either a simultaneous or sequential lineup procedure. Experiment 1 did not replicate the findings of Lindsay and Wells (1985) who found that the innocent suspect in the target-absent lineup was chosen at a higher rate in the simultaneous lineup compared to the sequential lineup; Carlson and colleagues (2008) found that there was no difference in choosing rates between the simultaneous and sequential lineups.

Carlson and colleagues (2008) conducted a second study and manipulated lineup fairness, i.e., whether the foils selected match the description of the perpetrator and resemble the suspect (i.e., a fair lineup) or one in which the foils do not match the suspect and he or she stands out (i.e., unfair lineup). Participants viewed a video mock theft and were presented with either the simultaneous or sequential lineup. The simultaneous lineup was 1.6 times more likely to result in a correct identification compared to the sequential lineup. A simultaneous advantage was found for biased lineups (e.g., when

the suspect stood out relative to the other lineup members); however, the correct identification rate was comparable between the two procedures when lineups were both fair and intermediately biased (e.g., the lineup contained three bad foils and two good foils). These results are contradictory to previous research and suggest that the sequential lineup presentation may not be the better choice when choosing between the two procedures, especially if the lineup is biased.

To further examine the accuracy rates between the sequential and simultaneous procedures, Mickes, Flowe, and Wixted (2012) examined the accuracy rates of the two procedures using Receiver Operating Characteristic (ROC). A confidence based ROC analysis was used which utilizes confidence judgments to assess diagnosticity of guilt. Mickes and colleagues suggest that confidence can be used as a proxy for the diagnosticity of the suspect's guilt (e.g., as confidence increases so does accuracy). An ROC curve is generated by plotting the correct identifications against the false identifications at each level of confidence. Lower ends of the curve represent more conservative decisions and upper ends of the curve contain the most diagnostic information about the guilt of the suspect. It is further assessed by calculating the area under the curve for each lineup procedure; the procedure with the most area underneath the curve is deemed the better procedure.

Mickes and colleagues first examined whether the sequential lineup procedure was superior to the simultaneous procedure when the lineup contained only six photographs with unbiased foil similarity (i.e., a fair lineup). Participants viewed a video of a mock theft and were later presented with either a simultaneous or sequential lineup. Results of Experiment 1 indicated that identification accuracy was superior in the

simultaneous lineup compared to the sequential lineup. Mickes and colleagues conducted a second study to examine whether the sequential procedure would be superior in an unfair, target-absent lineup when examining accuracy with the ROC analysis. Prior research has suggested the sequential procedure may be particularly useful under these conditions; thus, Experiment 2 sought to examine whether a sequential superiority effect would be present for the unfair lineup (e.g., high foil similarity to the suspect). Compared to Experiment 1, overall performance was greatly reduced; however, there was still no sequential superiority effect observed. Taken together, these two studies were among the first to suggest that there may not be a sequential superiority effect when examining identification accuracy with the ROC analysis; the sequential lineup procedure was inferior to the simultaneous procedure when examining the rate of identification accuracy.

Gronlund, Carlson, Dailey, and Goodsell (2009) also examined the simultaneous-sequential debate using ROC analysis with 24 comparisons of the sequential lineup versus the simultaneous lineup across 2,529 participants. The different comparisons included good or bad view of the criminal in the video, target-present or target-absent lineup, suspect position (i.e., 2nd or 5th), and whether the lineup was a fair, medium or biased lineup. Each of these factors were presented in a simultaneous or sequential lineup, thus allowing for 24 different comparisons. Participants were shown a video of a mock crime and then participated in a lineup task. Only five significant differences between the simultaneous and sequential lineup procedures emerged. Out of these five, only two provided support for the sequential advantage: quality of lineup photograph (i.e., good quality) and the position of the suspect (i.e., fifth). The remaining differences

that enhanced identification in the simultaneous lineup were when the picture was of poor quality and in the second position. The results of this study extend the findings that the sequential lineup may not be as superior as previously suggested; having a good quality image and placing the suspect in the fifth position of the lineup are the only two factors that were shown to produce the sequential superiority effect. Gronlund and colleagues speculate one reason that suspect position may play a role is because witnesses may be fine-tuning their decision criterion to make the best possible decision as the lineup goes on.

Gronlund and colleagues (2012) examined differences in accuracy rates on participants' performance on show-ups (i.e., only one photograph shown to the witness, usually the suspect in the case) and lineups (e.g., the simultaneous and sequential procedures) using ROC analysis. Participants viewed a video mock crime and were then presented with either a show-up, simultaneous lineup, or sequential lineup. The majority of cases resulted in the simultaneous lineup yielding more accurate identification evidence than the show up. When comparing the simultaneous and sequential lineup, overall performance was not significantly different between the two lineup procedures; thus contradicting the sequential superiority effect. Simultaneous lineups were diagnostically superior compared to the sequential procedure if the suspect was placed early in the sequential lineup; even more so, when the suspect was placed later in the sequential lineup, performance on the sequential lineup was only increased to that of the simultaneous lineup. These findings extend the conclusions from Gronlund and colleagues (2009) and Mickes and colleagues (2012) who also concluded that the sequential lineup procedure may not be as superior as previously suggested.

While there are a group of researchers that believe examining identification abilities is best analyzed through the use of ROC, there is another group of researchers who argue it does not capture the entire picture of eyewitness identification accuracy. Wells, Smalarz, and Smith (2015) argue that the use of ROC to examine eyewitness identification data is flawed because it does not capture all three witness responses. Witnesses can make a positive identification of the suspect, a positive identification of a filler, or a rejection. By using ROC analyses to examine identification accuracy across different lineup procedures, we may be missing vital information that comes from a witness' identification response. For example, Wells and colleagues argue that the use of ROC focuses only on identifications of suspects and rejections while treating filler identifications as rejections.

Malpass, Tredoux, and McQuiston-Surrett (2009) examined the existent literature on the sequential lineup and examined whether there was enough research to support the notion that a policy change to using the sequential lineup presentation is justified. Malpass and colleagues discuss that there are both strong and weak forms of the sequential superiority effect. For example, a strong claim is that the sequential presentation itself is the necessary component for the superiority. A weak claim is that the superiority of the sequential lineup comes as a "package" whereby a combination of procedures must be present when administering the sequential lineup for it to be superior. The factors in this weak package include presenting the photographs one at a time to the witness (but not telling him or her how many photographs will be viewed), participants must say yes or no for each photograph, and witnesses cannot view each photograph more than once (Malpass et al., 2009). There is no clear evidence that the sequential

presentation in and of itself is necessary for the identification advantage reported for the sequential lineup procedure (Malpass et al., 2009). Malpass and colleagues (2009) further argue that the fact that researchers do not know which part of the sequential lineup procedure is responsible for the decrease in false identifications it is premature to conclude that the sequential lineup is indeed superior to the simultaneous lineup.

There have already been many policy changes that are encouraging the use of sequential lineup compared to the simultaneous lineup. For example, in Canada, the sequential lineup is the most commonly used procedure (Beaudry & Lindsay, 2006). In the United States, some states such as New Jersey and North Carolina, have already implemented the change from simultaneous to sequential lineup presentation (Wells & Olson, 2003). Those who are skeptical of the sequential superiority effect argue whether this change is warranted. Malpass and colleagues (2009) concluded that the research on the sequential lineup does not satisfy the requirements for policy change. More research needs to be conducted to examine what exactly it is that leads to the decline in false identifications when witnesses are presented with a sequential lineup, if in fact the decline occurs.

It is evident from the research examining the simultaneous and sequential debate that a sequential lineup results in a more conservative decision criterion as witnesses are less likely to select a lineup member in a target-absent lineup, which, in turn, reduces the rate of false identification; however, witnesses are also less likely to choose from a target-present sequential lineup, thus reducing the rate of correct identification (Palmer & Brewer, 2012). Although the sequential lineup has been shown in some instances to produce more accurate results than the simultaneous lineup procedure when examined;

this is not true when the two procedures are compared using child eyewitnesses. The reduction in accuracy by child eyewitnesses does not only happen with the sequential lineup procedure; it also happens with the simultaneous lineup procedure comparing children and adults (Fitzgerald & Price, 2015; Pozzulo & Lindsay, 1998). Because there are differences found between adult and child eyewitnesses when using the simultaneous and sequential lineup procedures, researchers examined ways in which to improve lineup procedures to help with child eyewitnesses (i.e., the elimination lineup).

Elimination lineup. The elimination lineup was created by Pozzulo and Lindsay (1999) originally to help with children's eyewitness identification. The elimination lineup begins with a simultaneous lineup that is partitioned into two steps that correspond with the Two-Judgment Identification Theory (Pozzulo & Lindsay, 1999). The two judgment identification theory suggests that a simultaneous lineup can be viewed as involving two judgments (Pozzulo & Lindsay, 1999). The first judgment is the relative judgment in which the eyewitness determines which lineup member is most similar looking to the perpetrator. This is more of a memory task that is asking the eyewitness which photograph most resembles his or her memory for the perpetrator. During the second judgment all remaining photographs are taken away, and the eyewitness then determines whether the most similar looking lineup member is indeed the perpetrator, thus encouraging an absolute judgment. This second judgment is especially important in target-absent lineups because the person most resembling the perpetrator in judgment one will not be the perpetrator in judgment two; it allows the eyewitness to compare that specific photograph with his or her memory to decide whether the photograph he or she selected is or is not the perpetrator.

Another advantage to the elimination lineup procedure is that it gives information on the survival status of the suspect which is the rate at which the suspect survives the first judgment, that is, the rate at which the suspect is chosen as most resembling the perpetrator (Pozzulo & Lindsay, 1999). Survival status is not available in the simultaneous or sequential lineups as the survival status of the suspect is similar to the rate of correct identification. For example, if the rate at which the suspect survives the first judgment is high, the likelihood that the suspect is indeed the perpetrator increases. Furthermore, if the suspect does not survive the first judgment, the likelihood the suspect is innocent increases. Keep in mind, if the suspect is indeed guilty, it is more likely that he or she will look most like the perpetrator relative to the other lineup members. Additionally, as Wells (1993) pointed out, when presented with a lineup, if an eyewitness selects a photograph it is suggestive that the lineup member chosen most resembles the eyewitness' memory of the perpetrator.

The use of the elimination lineup in children has been successful at reducing false identifications without compromising the rate of correct identification (Pozzulo & Lindsay, 1999). Pozzulo and Lindsay (1999) also examined the elimination procedure with adults, compared to the simultaneous lineup. The elimination lineup resulted in a lower correct identification rate compared to the simultaneous lineup. Pozzulo and Lindsay (1999) suggest that this may be due to the fact that the two judgment process may have violated adults' expectations for how a lineup is conducted; furthermore, with the high rate of correct rejection in the simultaneous condition it was difficult to determine whether the elimination lineup produces comparable rates of correct rejection. It is important to note that the survival status of the perpetrator in judgment one, for both

children and adults, was significantly higher than the correct identification rate in judgment two. This could have been due to the fact that they participated in a second judgment which may have violated their preconceived notions of how a lineup is administered. The second judgment could have caused the participants to believe that their first choice in judgment one was wrong because they were asked a second question regarding the photograph they chose.

Pozzulo and colleagues (2008) were the first to compare the simultaneous, sequential, and elimination lineup procedures with adults. Participants viewed a videotaped mock crime and were later asked to make an identification decision. The rate of correct identification was comparable across all three lineups, with the lowest rate of foil identifications and highest false rejection rates in the sequential lineup. In target-absent lineups, both the sequential and elimination lineups resulted in significantly higher correct rejection rates than the simultaneous lineup, thus supporting previous research that encouraging witnesses to use an absolute judgment is beneficial in target-absent lineups. When examining the survival status of the first judgment, the rate at which the suspect survived was .56, this number represents the rate at which the suspect was selected during the first judgment. The survival status of the suspect was higher than any other lineup member. However, there was a decrease from the suspect's survival status (.56) to correct identification rate (.32), the rate at which the suspect was accurately identified as the perpetrator. Again, asking the witness to make a second decision may have caused participants to question their initial selection. Pozzulo and colleagues' (2008) findings suggest that the elimination lineup may prove to be a useful procedure when adult witnesses are presented with a target-absent lineup compared to the traditional

simultaneous lineup, but of course police do not know whether they are dealing with a guilty or innocent suspect.

Pozzulo, Dempsey, and Pettalia (2013) further examined lineup identification procedures comparing the simultaneous, sequential, and elimination procedures with both adolescents and adults. Participants viewed a videotape of a staged theft and after a brief delay engaged in a lineup identification task. Correct identification rates were higher in the simultaneous procedure compared to the elimination procedure. As previous researchers have suggested (e.g., Pozzulo & Lindsay, 1999) this could be due to the fact that the two judgment process involved in the elimination procedure leads witnesses to question their initial decisions. Survival rate of the suspect for judgment one in the adolescent population was .72 compared to a correct identification rate of .44. In the adult population, the survival rate of the suspect in judgment one was .78 compared to a correct identification rate of .47, thus supporting previous research (e.g., Pozzulo & Lindsay, 1999; Pozzulo et al., 2008). The elimination procedure resulted in significantly higher correct rejection rates compared to the simultaneous procedure and moderately higher correct rejection rates compared to the sequential procedure (Pozzulo et al., 2013). This study extends the findings of Pozzulo and colleagues (2008) such that the elimination lineup procedure proves to be superior compared to the simultaneous procedure in both an adolescent and adult population for increasing the rate of correct rejection; however, unlike Pozzulo and colleagues (2008), but similar to Pozzulo and Lindsay (1999), the simultaneous lineup yielded higher rates of correct identification in target-present lineups.

Humphries, Holliday, and Flowe (2012) examined identification accuracy in simultaneous, sequential, and elimination lineup procedures using video lineups with children (aged 5- to 6-years-old and 9- to 10-years-old) and adults (aged 18- to 49-years-old). Participants viewed a videotaped mock theft and were later asked to make an identification from one of the video lineups. Adults in the target-present conditions produced an identification rate that was comparable between the elimination, simultaneous, and sequential lineups; however, the sequential lineup resulted in a reduction of correct identifications for children. Adults in the target-absent condition had a higher correct rejection rate in the elimination lineup condition compared to the simultaneous and sequential lineup conditions. The survival rate for the suspect at judgment one of the elimination lineup for the adults was .93 compared to the correct identification rate of .63. Humphries and colleagues (2012) believe that this may be due to the strict rules of the second judgment. In the second judgment, once a positive identification has been made, the lineup is over whereas in the first judgment, the lineup was not over after a choice was made. The fact that the lineup ends after a choice has been made in judgment two could weaken the eyewitness' confidence of their choice from judgment one, thus leading them to change their decision. In addition to providing further support for the elimination lineup, the results from this study also suggest that the elimination lineup is also beneficial to use when eyewitnesses are presented with both a static photograph lineup as well as a video lineup.

More recently, Pozzulo, Reed, Pettalia, and Dempsey (2015) examined identification accuracy across the simultaneous, sequential, elimination, and wildcard procedures. The wildcard procedure is one in which the photographs are presented

simultaneously to the eyewitness with an additional photograph, the wildcard (i.e., a blackened silhouette with a question mark superimposed on it; Zajac & Karageorge, 2009). Participants viewed a theft on a university campus and were later presented with the identification task. The rate of correct identification was comparable across all four lineup types; however, the correct rejection rate in target-absent lineups was significantly higher using the elimination lineup compared to both the wildcard and simultaneous lineups. Similar to previous studies that have examined the elimination procedure, the guilty suspect survived judgment one at a higher rate (.80) compared to the rate of correct identification of the guilty suspect (.46). These results also support previous research that has found the elimination lineup procedure to be superior to the simultaneous when presented with a target-absent lineup (e.g., Humphries et al., 2012; Pozzulo et al., 2013).

Pozzulo, Dempsey, and Clarke (2010) examined the boundary conditions of the elimination lineup and examined its robustness when the lineup is biased (i.e., the suspect stands out from the other lineup members). The elimination and sequential lineups were compared as past research has found that the sequential lineup reduces the negative effects of biased lineups (e.g., Lindsay, Lea, & Fulford, 1991). Participants viewed a videotaped mock crime and were later presented with a sequential or elimination target-absent lineup. The lineup was either biased such that the innocent suspect wore the same sweatshirt as the perpetrator (thus making him stand out) or a neutral lineup such that all lineup members were similar. Overall, the elimination lineup procedure resulted in a significantly higher rate of correct rejection than the sequential lineup. When examining clothing bias, the elimination procedure was found to be more resistant; bias did not negatively influence correct rejections. The sequential lineup procedure produced a trend

for bias to negatively affect correct rejection rates (Pozzulo et al., 2010). These results suggest that when a lineup is biased, the sequential lineup may not be as robust as once thought and that the elimination procedure may be helpful at eliciting higher rates of accuracy.

The elimination lineup procedure has also been shown to be superior to the simultaneous lineup when witnesses view a multiple perpetrator crime. Dempsey and Pozzulo (2008) had participants view a videotaped theft at a store and later asked participants to identify both the thief and the accomplice from a simultaneous or elimination lineup. The rate of correct identification for both the thief and accomplice did not vary as a function of lineup procedure. However, differences were found when examining the rate of correct rejection in target-absent lineups. Participants were more likely to correctly reject the thief lineup when presented with an elimination lineup compared to a simultaneous lineup; similar results were found for the accomplice such that participants were more likely to correctly reject an elimination lineup compared to the simultaneous. Similar to previous research (e.g., Pozzulo et al., 2008, 2015), the survival status of both the thief and accomplice was higher than any other lineup member. The elimination lineup appears to be beneficial when there is a multiple perpetrator crime beyond that of the traditional simultaneous lineup, thus extending the boundary conditions of the elimination procedure.

The elimination lineup is a promising procedure with one downfall similar to the sequential lineup; once eyewitnesses are encouraged to make an absolute judgment, the rate of correct identification in the second judgment is much lower than the survival status from judgment one in target-present lineups (Humphries et al., 2012; Pozzulo et

al., 2013; Pozzulo & Lindsay, 1999). There has been some speculation as to why the high survival status of the perpetrator in judgment one does not transfer over to high correct identification rates in judgment two.

As previously mentioned, some researchers have argued that after making a decision in judgment one, the eyewitness may feel as though a wrong choice was made when asked to make the second judgment (e.g., Pozzulo & Lindsay, 1999; Pozzulo et al., 2013). Other researchers have suggested that the second judgment has a strict rule (e.g., Humphries et al., 2012). After the second judgment, the identification task is over whereas after judgment one there is still a second judgment (i.e., the identification task is not finished). This may place heavy demands on the eyewitness because he or she is being forced to make an absolute decision as to whether the person is the perpetrator of the crime in question. In judgment one, the eyewitness is free of any social expectations because he or she is not forced with making the dichotomous choice of "yes this is the perpetrator" or "no this is not the perpetrator". Once the eyewitness is presented with judgment two of the elimination lineup, those social expectations are in place because the witness is asked to make the dichotomous choice. The current studies aimed to transfer the high survival status of judgment one into a higher rate of correct identification in judgment two through a series of modifications to the traditional elimination lineup procedure without compromising the rate of correct rejection.

Postdictors of Accuracy

A postdictor is a factor that occurs after the identification (i.e., asking witness for his or her confidence), but before trial and is used to assess identification accuracy. Confidence has been examined to determine if it is a reliable postdictor of accuracy as to

whether an eyewitness is correct in his or her identification decision. Brewer and Wells (2011) state that witnesses who are highly confident in their decisions are more likely to be accurate compared to those witnesses who have little confidence in their decisions. Confidence is also highly influential in jurors' decision making processes (Sauer & Brewer, 2015). In *Neil v. Biggers* (1972) the Supreme Court of the United States endorsed confidence to be considered when assessing identification accuracy; therefore, it is important to understand the confidence-accuracy relationship and whether it is a reliable postdictor of accuracy.

Confidence. Confidence refers to an index of how sure the participant is that he or she has made the correct choice in the lineup identification. It can also be conceptualized as the degree of a match between the eyewitness' memory for the perpetrator and the photograph chosen. Sauer and Brewer (2015) state that when the degree of match between the witness' memory and the photograph chosen is high, confidence and accuracy are also likely to be high. Confidence, when measured directly after an identification has been made, has been identified as one of the indicators of eyewitness accuracy (Cutler & Penrod, 1995) and is one of the most widely researched postdictors of eyewitness identification accuracy (Sporer, Penrod, Read, & Cutler, 1995). Early research concerning the confidence-accuracy relationship found very small relationships. For example, Leippe, Wells, and Ostrom (1978) had witnesses view a staged crime with a subsequent lineup identification task. Participants were asked to rate their confidence in their identification decision. Only 31% of participants made a correct identification, and there was no confidence-accuracy relationship observed. These results

sparked researchers to examine under what, if any, conditions the confidence-accuracy relationship could be a reliable predictor of an eyewitness' accuracy.

There are two common ways of measuring one's confidence in their identification decision. The first is the prospective rating (also known as pre-identification confidence) which is obtained at the time a stimulus is studied about how the person feels that he or she will correctly identify the stimulus; in eyewitness identification studies, this confidence would be taken directly after viewing the crime (Busey, Tunnicliff, Loftus, & Loftus, 2000). A retrospective confidence rating (also known as post-identification confidence) is obtained at the time of the identification and concerns how the person feels that he or she made the correct decision (Busey et al., 2000).

Given that confidence can be taken at various stages of the identification process (e.g., before the lineup and after the lineup), Cutler and Penrod (1989) took a meta-analytic approach to examine if the time confidence is taken moderates the confidence-accuracy relationship. Both pre-identification confidence and post-identification confidence were examined in relation to accuracy across nine studies. Across five of the studies, there was a significant difference in the confidence-accuracy relationship between pre- and post-identification confidence: post-identification confidence was significantly better in predicting accuracy compared to pre-identification confidence suggesting that confidence is more reliable when taken after the identification decision compared to before the identification decision (Cutler & Penrod, 1989).

Brewer and Wells (2011) discuss two different approaches to measuring the relationship between confidence and accuracy that can extend into other variables used to examine accuracy. The first is the correlation approach. Researchers use a point-biserial

correlation due to one of the variables being dichotomous (e.g., correct vs. incorrect identification decision). The point-biserial correlation allows the relationship between the confidence and the binary identification outcome of correct/incorrect. Correlations are easily calculated. Busey and colleagues (2000) discuss three different types of correlations that are used in research; these correlations are discussed in terms of confidence. A within-subjects correlation reflects the degree to which a participant is more accurate on trials when greater confidence is given. A between-subjects correlation reflects the degree to which participants who are more confident also tend to be more accurate. The last correlation is an over-condition correlation which reflects the degree to which confidence and accuracy are influenced in equivalent ways by the manipulation of experimental variables (Busey et al., 2000).

Most research that utilizes the correlation approach uses either the within- or between-subjects designs. However, it has been suggested that these correlations may not give an accurate picture of the true relationship (Brewer & Wells, 2011). Instead, researchers can use the calibration approach which is charting the proportion of accurate responses at each confidence level (Brewer & Wells, 2011). The identification decision confidence is plotted against the proportion of correct identifications recorded for each confidence category (e.g., a category of 90%). The calibration statistic can range from 0 (perfect calibration) to 1 (Brewer & Wells, 2006). Numbers closer to 0 indicate calibration which is what researchers strive for; as the calibration statistic approaches 1, little to no calibration is observed. This approach has been shown to provide a meaningful guide for adults when taken immediately after an identification task. The

calibration approach also allows researchers to examine the reliability of identifications made with different levels of confidence whereas the correlation approach cannot.

Fleet, Brigham, and Bothwell (1987) examined the confidence-accuracy relationship between choosers (i.e., someone who chose someone out of the lineup) and non-choosers (i.e., someone who did not choose someone out of the lineup). Participants were witness to a staged theft and later interviewed by a confederate; participants then took part in a lineup procedure. Confidence was taken either before the lineup, after the lineup, or both before and after the lineup. There was a significant confidence-accuracy relationship such that the higher the participant's confidence, the more accurate he or she was in his or her identification accuracy. Differences between choosers and non-choosers revealed that choosers were more confident when they correctly chose the perpetrator out of the lineup compared to those who did not make a selection. No significant differences were found in the confidence-accuracy relationship for target-present or target-absent lineups.

Sporer and colleagues (1995) took a meta-analytic approach to examine the confidence-accuracy relationship and its ability to predict eyewitness accuracy. Thirty staged event studies were examined that included data for both target-present and target-absent lineups. When analyzing the data together, a small, significant positive relationship was found ($r = .29$). Sporer and colleagues (1995) took the data one step further and examined the data for choosers only and found a moderate, significant positive relationship ($r = .41$). When a choice is made in a lineup, the higher the witness' confidence, the more likely he or she is correct in his or her choice; however, if a witness does not choose from the lineup, his or her confidence is not a reliable predictor of

accuracy. The findings from this meta-analysis suggest that the confidence-accuracy relationship is strongest for choosers; thus, when an identification is made and the higher the witness' confidence, the more likely he or she is correct in his or her decision.

Sauerland and Sporer (2009) examined the predictive utility of confidence using live interactions in a field setting. Participants were approached by a confederate who asked for directions; this interaction lasted roughly 15-60 seconds. Thirty seconds later, the interviewer approached the participant and explained the true purpose of the interaction. Participants were asked to rate their pre-identification confidence prior to the lineup and their post-identification confidence after they participated in the lineup procedure. This study utilized both the correlation and calibration approach to measure the confidence-accuracy relationship. Overall, accurate participants were more confident than inaccurate participants. Post-identification confidence was significantly related to accuracy rates for those who chose one of the photographs from the lineup. When examining the results while using the calibration approach, Sauerland and Sporer (2009) found that there was a boundary for correct identifications; those who reported a 90% or higher confidence rating were most likely to be accurate in their choice with a mean proportion of correct identifications of 77.5%. The results of this study suggest that when a confidence rating between 90-100% is given, the witness is more likely to be accurate in his or her choice compared to a lower confidence value.

Recently, Palmer, Brewer, Weber, and Nagesh (2013) examined the confidence-accuracy relationship for eyewitness identification decisions and tested the boundary conditions under which it proves to be a reliable postdictor of accuracy. In their first study, participants were approached on university campuses and city streets by a

confederate. Once the participant agreed to participate, the confederate signaled to the hidden target to move into view. The participant was then instructed to focus his or her attention on the target. This study examined whether exposure time or retention interval influenced confidence and its relationship to accuracy. Their second study examined whether attention affected confidence. Participants viewed a stimulus video and those in the divided attention group also took part in an auditory task while watching the stimulus film. Across both studies, Palmer and colleagues (2013) found that in all conditions accuracy increased with confidence when positive identifications were made.

Confidence may appear to be a good postdictor of eyewitness accuracy; however, confidence can be influenced if improper procedures are used. For example, an eyewitness' confidence may be inflated or deflated if the person administering the lineup gives any post-identification feedback (Paiva, Berman, Cutler, Platania, & Weipert, 2011). Furthermore, confidence is found to be more useful when an eyewitness makes an identification compared to a rejection (Sporer et al., 1995). These idiosyncrasies of the usefulness of the confidence-accuracy relationship have led researchers to use confidence ratings in other parts of the identification process.

Study 1 in the current program of research examines confidence ratings; however, not only in the traditionally used format. Study 1 utilizes confidence ratings after the first judgment of the elimination procedure prior to asking for a yes/no binary decision as to whether the lineup member is the perpetrator. It is important to know whether the confidence-accuracy relationship can be extended to other parts of the lineup procedure compared to confidence being taken directly after a lineup choice is made. In Study 1, participants were presented with an elimination lineup; however, a confidence rating was

added following the first judgment. Participants were asked how confident they were that the person they selected was indeed the perpetrator.

Alternative use of confidence ratings. Confidence has been shown to be a reliable postdictor of accuracy (e.g., Sporer et al., 1995); however, this postdictive ability has only been examined with a confidence rating after the identification decision. There has been a shift from the traditional yes/no recognition paradigm that asks for confidence after an identification has been made to using confidence ratings to help diagnose the guilt of a suspect. Participants view a mock crime and are later shown a lineup; however, instead of choosing someone out of the lineup, participants are asked to rate their confidence for each photograph as to whether he or she is the perpetrator. Asking for confidence ratings compared to the standard yes/no decision may alleviate some of the pressure an eyewitness feels when deciding whether the perpetrator is among the photographs. Witnesses who feel pressured to make a choice as to whether someone is or is not the perpetrator may set an inappropriate decision criterion that can reduce the extent to which their identification decision reflects the match between their memory for the perpetrator and the lineup photographs (Sauer, Weber, & Brewer, 2012). The use of confidence ratings may take some of that pressure off the eyewitness given they are not making a definitive yes/no decision as to whether the suspect is indeed the perpetrator; rather, the witness is rating each photograph based on his or her confidence.

Confidence ratings are used to reflect the extent to which confidence discriminates correct from incorrect decisions. The use of confidence ratings in determining accuracy depends on identifying a criterion to determine when a pattern of confidence ratings can be taken to indicate a positive classification, known as a maximum

value (Sauer, Brewer, & Weber, 2008; Sauer et al., 2012). The maximum value represents a criterion that produces a proportion of positive identifications that deviated the least from the actual proportion of target-present trials (Weber & Varga, 2012). This value maximizes the combined proportion of correct identifications in target-present lineups and correct rejections in target-absent lineups and is known as a fit-ratio (Sauer et al., 2008). When the suspect is given the maximum value, the probability of his or her guilt is high (i.e., an identification), and if no max value is present for the suspect, the probability of his or her guilt is low (i.e., a rejection). At the time of this research there are only a few studies that measure lineup identification accuracy using this alternative procedure.

Sauer and colleagues (2008) were the first to examine eyewitness identification accuracy utilizing confidence ratings to measure identification accuracy. Experiment 1 consisted of a facial recognition task. Participants studied a series of faces ($N = 20$) and were later asked to identify them as previously seen faces or new faces. One group of participants were asked to make the typical yes/no decision and rate their confidence in their choice. The other group of participants were asked to rate their confidence as to whether each face was previously seen. The study phase consisted of both target-present and target-absent trials ($N = 20$) presented sequentially to the participant. The confidence ratings were found to be superior for target-absent accuracy; however, the standard yes/no response was superior in the target-present trials (Sauer et al., 2008).

A second experiment was done with two changes from the first experiment. The four faces in the test phase were presented simultaneously and participants could alter their confidence estimates as many times as they wanted. Faces presented in the study

phase were presented with a cue (either a name or occupation); this cue was used to help in the study phase so participants knew they were looking for a specific face. Instead of asking participants if the face was previously seen in the study phase, participants were asked if there was a face in the study phase that had been paired with the relevant cue they were asked to look for. Results were similar to Experiment 1 such that the confidence estimates were superior for the target-absent trials but not target-present.

Sauer and colleagues (2008) conducted two more experiments using the eyewitness identification paradigm to see if their findings could extend to lineups. Participants viewed a video mock crime and later viewed a simultaneous eight-member lineup. Across both studies, Sauer and colleagues found the confidence ratings extended to the eyewitness paradigm such that accuracy was improved. In Experiment 3, there were no differences in accuracy rates for target-present lineups when comparing the use of confidence ratings and the binary yes/no responses. When examining target-absent lineups, Sauer and colleagues found those who reported their confidence as an identification decision had higher correct rejection rates compared to those who reported the binary yes/no decision.

Sauer and colleagues' (2008) fourth experiment examined the robustness of the confidence ratings. Participants watched a video mock crime with two targets (one male and one female). A simultaneous eight-member lineup was presented to the participants and varied in foil similarity to the target (i.e., high similarity vs. low similarity). Experiment 4 resulted in similar findings, those who utilized confidence ratings had a higher correct rejection rate in target-absent lineups compared to those in the binary yes/no condition; however, accuracy rates in the target-present conditions were slightly

higher when participants reported a binary yes/no response. No significant findings were found when examining accuracy rates between the confidence ratings and the binary decision when foil similarity was either high or low; however, when comparing Experiments 3 and 4, the results demonstrate consistent patterns of results across stimulus sets that produced identification tasks of different levels of difficulty (Sauer et al., 2008). Together, these four studies provide support for the use of an alternative procedure for examining accuracy with the largest advantage found for the target-absent lineups.

In order to extend the findings of Sauer and colleagues (2008), Weber and Varga (2012) examined accuracy rates using a facial recognition, mini-lineup task comparing the standard simultaneous procedure and a modified procedure using confidence ratings. The modified lineup procedure in this study was designed to elicit confidence ratings about a single face and assess the "oldness" of the stimulus. Participants viewed a series of faces (*N*= 20); each face had either a name or occupation above them used as a cue for the faces in the lineup phase. Twenty mini sequential lineups were used (half target-present and half target-absent) with cues to the participant that he or she is looking for a specific face. Only one face was chosen from the previously seen 20 to be considered as the target face which was presented among foils in the test phase. The modified lineup consisted of asking participants which lineup member best matched the faces they studied. Once they chose a face, the remaining faces disappeared and they were then asked to retrospectively indicate their confidence that the face they had chosen was previously seen. Lastly, they were asked the traditional yes/no recognition question. Confidence ratings were a strong predictor of whether the face was previously studied or not; even more so, the modified procedure produced more accurate responses than the

standard simultaneous procedure suggesting that confidence ratings provided stronger evidence of guilt than the binary yes/no decision (Weber & Varga, 2012).

Brewer, Weber, Wootton, and Lindsay (2012) examined how the alternative method of using confidence ratings worked when participants were given a deadline to respond. Instead of picking the suspect out of the lineup or rejecting the lineup, participants made confidence ratings under a short deadline of pressure where witnesses had only three seconds to make a decision about whether each lineup member was the suspect. In Experiment 1, participants viewed a video depicting a non-violent theft. In experiments two and three, participants were shown a video involving different people with no crime; however, participants were told after viewing the video that the people they saw in the video were now suspects to a crime. Following a 5-minute delay (Experiments 1 and 2) or a one-week delay (Experiment 3), participants were shown a 12-person sequential lineup. A control group was given the standard instructions of choosing yes/no as to whether the photograph was the suspect. The experimental groups were given three seconds to make a confidence rating on each picture as to how confident he or she was that the photograph was the suspect. An 11-point Likert scale was used ranging from "absolutely certain this is not the culprit" to "absolutely certain this is the culprit." Across all three experiments, confidence ratings were more informative than a yes/no lineup decision about the likelihood that the witness recognized that the culprit was in the lineup (Brewer et al., 2012).

The elimination lineup has not been examined with the use of confidence ratings. The fact that there is a high survival status of the suspect in judgment one (e.g., Humphries et al., 2012; Pozzulo et al., 2008, 2013, 2015) opens the door for the

possibility to improve the rate of correct identification in judgment two. The current study utilized confidence ratings after the first judgment of the elimination lineup. Once the participant made the choice of who most looks like the criminal, he or she was then asked to rate his or her confidence that the person selected was indeed the perpetrator. For the second judgment, participants answered "yes, this is the perpetrator" or "no, this is not the perpetrator" and then rated his or her confidence in the identification to determine if confidence ratings are superior to the traditional yes/no decision when using the elimination lineup procedure.

Study One

The objective of this study was to examine whether a modification to the traditional elimination lineup procedure, hereafter referred to as the elimination-plus procedure, would be effective in increasing the rate of identification accuracy. The elimination-plus procedure utilized confidence ratings both at the end of judgment one and in addition to the binary yes/no decision at judgment two. At the time of this study, there is no research examining the use of confidence ratings to examine accuracy when using the elimination lineup. The elimination procedure has been shown to be effective with adults (e.g., Pozzulo et al., 2008, 2013), with the exception of one limitation, the rate of correct identification in judgment two is lower than the survival status of the guilty suspect in judgment one. Given the elimination lineup procedure is a two judgment procedure, it gives the opportunity to improve accuracy at either one or both judgments. If a reliable technique can be found to improve accuracy rates and diagnosing the guilt of the suspect, the elimination procedure can overcome its downfall.

Hypotheses

1. There will be a higher rate of correct rejection when using confidence ratings to assess guilt compared to the yes/no decision.
2. Confidence taking directly after judgment one in the elimination-plus procedure will predict identification accuracy.
3. The suspect will survive the first judgment in the elimination and elimination-plus procedures at a higher rate than any other lineup member.

   a. The use of confidence ratings to diagnose guilt at the end of judgment one in the elimination-plus procedure will produce a survival rate of the suspect (e.g., the rate at which the suspect is chosen as most resembling the perpetrator) that is comparable to the correct identification rate.

Method

Participants. Undergraduate psychology students (N = 241) were recruited from Carleton University via an online participation pool (i.e., SONA; see Appendix A). Participants' ages ranged from 18- to 49-years-old (M = 21.13; SD = 4.32); there were 164 females and 81 males. The majority of participants (37.8%) identified themselves as White/Caucasian, with smaller numbers of Asians (29.9%), Latino/Latinas (3.3%), Black/African-Canadians (16.6%), Aboriginals (2.9%) and those who identified themselves as either mixed or "other" (9.5%)[1]. A total of 245 participants were included in this study; however, study checks were used to ensure that the participants were not aware that they would be participating in a lineup task; the data of those participants who

[1] There were no significant differences in the number of males and females in each lineup condition, $\chi^2(3, N = 241) = 2.31$, $p < .05$, $\varphi = .10$. There also were no significant differences in ethnic make-up (White vs. non-White), $\chi^2(3, N = 241) = 4.30$, $p < .05$, $\varphi = .13$.

did not pass the study checks (i.e., were aware that they would be participating in a lineup task) were not included in the analyses ($N = 1$). Similarly, data were excluded from any participants who selected more than one lineup member in the sequential lineup procedure ($N = 3$). Participants received course credit for their participation.

Design. A 2 (lineup: TP vs. TA) x 4 (lineup procedure: simultaneous vs. sequential vs. elimination vs. elimination-plus) between-subjects design was used. There were eight conditions with roughly 30 participants per condition resulting in $N = 241$.

Materials.

Video. All participants were shown a silent video, approximately 53 seconds in length, depicting a staged, non-violent theft occurring on the university campus. The video commenced with a confederate (i.e., a 21-year-old, White, male) sitting on a couch. The lens focused on this man for approximately four seconds, panned in for a closer look for 10 seconds, and then backed out. As the screen panned out the man was suspiciously looking at the purse sitting next to him. The man got up from the couch, took the purse, and left the scene.

Demographics. After viewing the video, participants filled out a demographic form, which asked for their age, sex, and ethnicity (see Appendix B).

Description form. Participants were asked to complete an event description form (Appendix C), asking them to describe everything they remembered about the video and everything they remembered about the perpetrator in the video. This form was used both as a filler task and to mimic real life scenarios such that witnesses are asked to give a description of the events that transpired as well as the perpetrator after witnessing a crime.

Computer game. As an unrelated filler task, participants played "Bejeweled," a Tetris-like computer game, where they coordinated colour-matching jewels in sets of three or more in order to move from one level to the next. This was used to simulate a delay that occurs in real life scenarios between witnessing a crime and participating in the identification task. This task was also used to overcome any potential effects of verbal overshadowing (e.g., Memon & Bartlett, 2002). Verbal overshadowing refers to the fact that a verbal description prior to an identification task, without some sort of unrelated activity serving as a delay, is harmful to identification accuracy

Photographic Lineup. Six 4 x 6 inch photographs were taken of volunteers resembling the target. Five of these 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. A 4 x 6-inch photograph of the target was taken for the target-present lineups. All photographs were colour, head and upper body shots taken against a white background. Persons photographed adopted a neutral facial expression so that consistency was maintained across the photographs.

Twenty-five photographs were taken of volunteers resembling the target to construct a six-person lineup. Lineup foils were chosen by having three independent raters rank order the photographs based on similarity to the target. The rankings were totaled across the judges and six photographs (in addition to the target) were chosen based on the lowest total rank indicating higher similarity.

Sixteen mock witnesses' then viewed the mock crime and were asked to give a description of the perpetrator. These descriptions then were used to ensure sufficient similarity/dissimilarity as per the suggestion by Luus and Wells (1991). Common

descriptions were then combined to create one description of the perpetrator. More specifically, after the lineup was constructed (the six foils and the target), an additional group of mock-witnesses (*N* = 23) were given the common description of the perpetrator and asked to identify the perpetrator based on that description. The description was: "*brown, short hair/brown eyes/ tall, thin/between 18- and 25-years-old/thin nose*". Results indicated a fair lineup with each lineup member receiving a proportional number of identifications, proportion (*binomial probability*): lineup member 1 = .17 (*.19*); member 2 = .13 (*.24*); member 3 = .13 (*.24*); member 4 = .13 (*.24*); member 5 = .13 (*.24*); member 6 (target) = .17 (*.19*); member 7 = .13 (*.24*). Five photographs along with the target's photo were used in the target-present lineup. The same five photographs from the target-present lineup and a similar looking photo substituted for the target were used to create the target-absent lineup.

A test for lineup bias was also calculated per the guidelines of Malpass (2015). The test for lineup bias tells us whether witnesses are biased to choose one lineup member over the other. An excel spreadsheet created by Malpass (2015) was used to calculate lineup bias. In order to calculate bias, I entered the total number of mock witnesses who participated in the lineup fairness task, those that identified the suspect, and the total number of members in the lineup. The spreadsheet then gives two pieces of information: (1) the proportion expected to identify the suspect on chance alone, and (2) the proportion of mock witnesses actually identifying the suspect (Malpass, 2015). Bias at the .05 alpha level would reveal a critical ratio (difference from chance) above 1.96, and bias at the .01 alpha level would reveal a critical ratio above 2.58. In the current study, the critical ratio was .09, thus suggesting an unbiased lineup.

Tredoux's *E* was also calculated; this value estimates the number of persons in the lineup who are realistic choices (Tredoux, 1998). Similar to the calculation of lineup fairness, an excel spreadsheet created by Malpass (2015) was used to calculate Tredoux's *E*. In order to calculate Tredoux's *E*, I entered the number of mock witnesses who were shown the lineup, the number of lineup members, and the number of mock witnesses who identified each member of the lineup. The spreadsheet then estimates the number of persons in the lineup who are realistic choices given the common descriptors the mock witnesses were given (Malpass, 2015). In the current study, Tredoux's *E* was equal to 6.87, 95% CI [6.15, 7.77].

Depending on assigned condition, approximately twenty minutes following exposure, participants were presented with one of four lineups: a simultaneous lineup, a sequential lineup, an elimination lineup, or an elimination-plus lineup. Participants were presented with either a target-present or target-absent lineup. Instructions given varied depending on the lineup condition.

Simultaneous lineup procedure. The lineup photographs were presented simultaneously in two rows, each of which had three photographs. The location of the target or replacement photograph was randomly determined. The other lineup members were always displayed in the same order relative to each other. 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's picture, please put a check mark in the*

box marked not here. Now let's look at the photos". At this point, participants were given a simultaneous lineups response form (see Appendix D). Participants were then asked to rate their confidence in their decision on a scale of 0 (*not at all confident*) to 100% (*very confident*).

Sequential lineup procedure. The lineup photographs were presented serially (i.e., one at a time) to participants. The location of the target or replacement photograph was randomly determined. The other lineup members were always displayed in the same order relative to each other. 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 each picture. The criminal's picture may or may not be here. You will only be allowed to look at each photo once. Please look at each photo and decide if it is or is not a picture of the criminal. If the picture is of the criminal, please place a check mark in the box labelled 'yes.' If it is not a picture of the criminal, please place a check mark in the box labelled 'no.' Please note that you will NOT be able to re-examine any pictures. Also, you will NOT be allowed to move forward until you make a decision about the picture you are looking at. After each decision, please rate your confidence in your decision on a 0 (not at all confident) to 100 (very confident) scale.*" At this point, participants were given a sequential lineup response form (see Appendix E) which asked participants to indicate whether each photo is or is not the criminal and to rate their confidence in their decision on a scale of 0 (*not at all confident*) to 100% (*very confident*) for each photograph.

Elimination lineup procedure. The lineup photographs were presented simultaneously in two rows, each of which had three photographs. The location of the

target or replacement photograph was randomly determined. The other lineup members were always displayed in the same order relative to each other. 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. At this point, participants were given an elimination lineup response form and presented with the following instructions: "*Think back to the video. Think back to what the criminal looks like. 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.'*" The elimination lineup response form provided to participants included a choice of two corresponding lines upon which to place a checkmark. Participants placed a checkmark on the appropriate line at this time (see Appendix F). Participants were then asked to rate their confidence in their decision on a scale of 0 (*not at all confident*) to 100% (*very confident*).

Elimination-plus lineup procedure. The lineup photographs were presented simultaneously in two rows, each of which had three photographs. The location of the target or replacement photograph was randomly determined. The other lineup members were always displayed in the same order relative to each other. 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.*" At this point, participants were given the first page of the elimination-plus lineup response form. Participants then chose a photograph and were asked to rate their confidence that the person they selected was the criminal on a scale of 0 (*not at all confident*) to 100% (*very confident*). At this point, participants were given a second elimination lineup response form. "*Think back to the video. Think back to what the criminal looks like. 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.'*" Participants were then asked to rate their confidence on their binary decision on a scale of 0 (*not at all confident*) to 100% (*very confident*) (see Appendix G).

Study checks. Upon completion of the identification task, participants answered four questions to ensure they did not know they would be participating in a lineup task as well as to ensure they did not know anyone from the photographic lineup (see Appendix H).

Procedure. After ethical approval was obtained from Carleton University, students were recruited via the SONA student recruitment tool (see Appendix A for SONA recruitment notice). Via SONA, participants scheduled an appointment with the primary researcher to attend to the Laboratory for Child Forensic Psychology to complete the study. Random assignment of conditions was conducted per person. Upon entering the

lab, participants were asked to complete a deceptive informed consent form (Appendix I). They were told that they will watch a short video and answer questions related to that video. Following the viewing of the video, participants were given the true consent form (Appendix J) detailing the true purpose of the study, and if they agreed to participate, were asked to complete the demographic and description forms and asked to play Bejeweled once the forms were completed. Once this was completed they were invited to participate in the second part of the study, the memory activity (i.e., the lineup task) and answer the study check questions. Lastly, participants were asked to read over a debriefing form (Appendix K), and they were given the opportunity to ask questions and thanked for their time.

Results

Preliminary Analyses

Data screening. Prior to analyzing the data, the data were screened for any potential outliers, skewness, or kurtosis in the confidence data; the identification data were categorical, as such, no outliers were observed. Univariate outliers were examined for participants' confidence ratings in their identification decisions as well as their confidence that the person selected was the criminal at the end of judgment one in the elimination-plus lineup. In order to examine outliers, participants' confidence ratings were transformed into their respective z-scores. Given the large sample size ($N = 241$), any participant with a z-score higher than 3.29 or lower than -3.29 was considered an outlier (Cohen, Cohen, West, & Aiken, 2003). Three outliers were identified when examining confidence at the end of judgment one of the elimination-plus lineup; however, upon further inspection of the data, this was due to the fact that these

participants reported 0% confidence that the person they selected was the criminal. When examining the identification decision confidence, two participants had z-scores above 3.29; however, similar to the elimination-plus judgment one confidence, it was revealed that this was due to low confidence in their identification decisions (both participants reported being 8% confident in their identification decisions). These five outliers were kept in because confidence was a primary variable of interest and it is important to understand how confidence plays a role in the confidence-accuracy relationship whether the participant is 0% confident or 100% confident.

Skewness and kurtosis were then examined for both confidence ratings. A descriptive analysis was run with SPSS to obtain the values of skewness (-1.18, *SE* = .31) and kurtosis (.91, *SE* = .60) for the elimination-plus judgment one confidence and the skewness (-.40, *SE* = .31) and kurtosis (-.28, *SE* = .60) for identification decisions. These tests indicated there was not a substantial departure from normality (West, Finch, & Curran, 1995).

Assumptions. Assumptions for each statistical analysis were then checked. The two primary statistical analyses used to analyze the data of the current study were a Pearson chi-square test and a logistic regression. Assumptions for a chi-square analysis include (1) independence of errors and (2) the expected frequencies should be greater than five (Field, 2009). Independence can be assumed as each participant completed the task individually and at only one-time period. Few cells had expected frequencies less than five; however, Field (2009) also points out that in larger contingency tables, no cells should have an expected frequency less than one. The current study met all of these assumptions.

Assumptions for a logistic regression include (1) the outcome variable and predictor variable(s) must have a linear relationship, (2) there should be no multicollinearity among the predictors, and (3) independence of errors (Field, 2009). Linearity was tested first; since the outcome variable is categorical (i.e., correct, not correct), the assumption of linearity in a logistic regression assumes a linear relationship between a continuous predictor and the outcome variable. In order to examine this, Field (2009) suggests creating an interaction term with the log of the original variable and the original variable itself, in this case, confidence at the end of judgment one in the elimination-plus lineup. If the interaction term is not significant, one can conclude the assumption of linearity is not violated. This assumption was not violated. A similar test was examined for the identification decision confidence across all four lineups; the assumption was not violated. Multicollinearity also was not violated as there was only one predictor. The assumption of independence also was not violated as each participant completed the tasks on their own and at different points in time from one another (Field, 2009).

Study Results

Identification data were first examined to determine if one lineup elicited higher rates of accuracy over the other, collapsed across target presence. There was no influence of lineup type on overall accuracy, $\chi^2(3, N = 241) = 4.33$, $p > .05$, Cramer's $\nu = .13$.

Identification data were then separated between target-present and target-absent lineups as combining the correct identifications with the correct rejections may obscure the advantages and/or disadvantages associated with each procedure. Moreover, response accuracy differs between target-present and target-absent lineups such that one requires

making a selection and the other requires rejecting the lineup (Pozzulo & Lindsay, 1998). Because of this, it is thought that cognitive factors underlie the process of making a correct identification more so than social factors because the target is present and the participant need only match a photograph to his or her memory. In target-absent lineups, social factors are thought to underlie the process of making a correct rejection more so than cognitive factors because none of the photographs will match the eyewitness' memory, but he or she may feel a social pressure to make a decision (e.g., Pozzulo, Dempsey, Bruer, & Sheahan, 2012).

Target-present lineups. In order to examine whether identification accuracy differed between the four lineup procedures, a chi-square was calculated. Results indicated there was a significant difference in accuracy rates between the lineups, $\chi^2(6, N = 121) = 12.65$, $p = .05$, Cramer's $\nu = .32$. Follow-up tests indicated that the simultaneous lineup elicited higher rates of correct identification (.80) compared to the elimination lineup (.40), $\chi^2(2, N = 60) = 12.00$, $p = .002$, Cramer's $\nu = .45$, and the elimination-plus lineup (.55), $\chi^2(2, N = 61) = 6.78$, $p = .03$, Cramer's $\nu = .33$. Furthermore, the simultaneous lineup elicited fewer false rejections (.10) compared to both the elimination lineup (.50) and elimination-plus lineup (.39). The simultaneous lineup and sequential lineup elicited comparable rates of correct identification, as did the elimination lineup and sequential lineup and the elimination-plus lineup and sequential lineup (see Table 1 for identification rates as a function of lineup).

Target-absent lineups. In order to examine differences in identification accuracy between the four lineup procedures, a chi-square was calculated. Results indicated there was no significant difference in accuracy rates between the lineups, $\chi^2(3, N = 120) = 3.66$,

$p = .30$. Each lineup procedure produced comparable rates of correct rejection (see Table 1 for identification rates as a function of lineup).

Table 1

Identification Accuracy as a Function of Lineup Procedure in Study 1.

	Simultaneous	Elimination	Elim-plus	Sequential
Target-present				
Correct ID	0.80 (24)	0.40 (12)	0.55 (17)	.63 (19)
False ID	0.10 (3)	0.10 (3)	0.06 (2)	.07 (2)
False rejection	0.10 (3)	0.50 (15)	0.39 (12)	.30 (9)
Target-absent				
Correct rejection	0.53 (16)	0.67 (20)	0.63 (19)	.77 (23)
False Positive ID	0.47 (14)	0.33 (10)	0.37 (11)	.23 (7)

Note. The false identification rate is the sum of all foil members combined.

Survival status. The survival status is the rate at which each lineup member is selected (i.e., survives) during the first judgment in the elimination and elimination-plus procedures (Pozzulo & Lindsay, 1999). This information is only possible in these procedures as the survival status for both the simultaneous and sequential lineups is equivalent to their identification rate. In the target-present elimination lineup, a binomial test indicated that the suspect survived judgment one at a significantly higher rate than any other lineup member combined, $p < .001$. In the target-present elimination-plus lineup, a binomial test indicated that the suspect survived judgment one at a significantly higher rate than any other lineup member combined, $p < .001$ (see Table 2 for survival rates and identification rates as a function of lineup type and lineup member).

Table 2

Survival Rates (*and Identification Rates*) *as a Function of Lineup Member and Lineup Procedure.*

	Lineup Member					
	1	2	3	4	5	6
Target-Present						
Simultaneous	.07	.00	.00	.03	.00	.80*
Elimination	.20 (.07)	.00	.00	.07 (.03)	.00	.73 (.40)*
Elimination-Plus	.03 (.00)	.00	.00	.13 (.06)	.00	.84 (.55)*
Sequential	.07	.00	.00	.00	.00	.63*
Target-Absent						
Simultaneous	.30	.00	.00	.13	.00	.03
Elimination	.33 (.10)	.03 (.00)	.07 (.00)	.27 (.10)	.07 (.00)	.23 (.13)
Elimination-Plus	.43 (.20)	.07 (.00)	.17 (.00)	.17 (.10)	.07 (.00)	.10 (.07)
Sequential	.10	.10	.00	.00	.00	.03

Note. The survival rate is equivalent to the identification rate in the simultaneous and sequential procedures.
* denotes target

To examine whether the rate of correct identification in the simultaneous and sequential lineups was comparable to that of the survival status in the elimination and elimination-plus procedures, a series of chi-square analyses were run. The survival status of the suspect in the elimination lineup (.73) was comparable to the rate of correct identification in the simultaneous lineup (.80), $\chi^2(3, N = 60) = 5.42$, $p = .14$. Similarly, the survival status of the suspect in the elimination-plus lineup (.84) was comparable to the rate of correct identification in the simultaneous lineup (.80), $\chi^2(3, N = 61) = 5.20$, $p = .16$. The survival status of the suspect in the elimination lineup (.73) was comparable to

the rate of correct identification in the sequential lineup (.63), $\chi^2(1, N = 60) = .69$, $p = .41$. Similarly, the survival status of the suspect in the elimination-plus lineup (.84) was comparable to the rate of correct identification in the simultaneous lineup (.63), $\chi^2(1, N = 61) = 3.32$, $p = .07$.

Diagnosticity. While most eyewitness literature specifically examines the diagnosticity ratios, the current studies calculated the relative risk ratio which is conceptually similar to the diagnosticity ratio and represents the ratio of two risks (Fitzgerald & Price, 2015; Tredoux, 1998). The benefits of using the relative risk ratio is that it has known sampling distributions and established methods of calculating confidence intervals around the ratio (Fitzgerald & Price, 2015). The relative risk ratio was calculated similar to how the diagnosticity ratio is calculated whereby the rate of correct identification would be conceptualized as the target-present risk and the rate of false identification in target-absent lineups would be conceptualized as the target-absent risk.

Wells, Smith, and Smalarz (2015) discuss three different ratios for all three witness decisions (i.e., suspect identification, filler identification, and rejections); therefore, all three were calculated in the current study. The ratio of a suspect identification indicates the likelihood of selecting a guilty suspect compared to selecting an innocent suspect (Clark, Howell, & Davey, 2008). A higher ratio indicates that one lineup procedure may be better at providing information concerning the guilt or innocence of a suspect. Suspect ratios in the current study were calculated similar to that of Pozzulo and colleagues (2015); dividing the number of correct identifications in target-present lineups by the number of false identifications of in target-absent lineups

(CorrectID/FalseID); since there was no designated innocent suspect, the false identification rate was calculated by dividing the total number of false identifications in target-absent lineups by the number of lineup members (i.e., 6). The simultaneous lineup elicited a relative risk ratio of a suspect identification of 10.30, 95% CI [2.96, 35.81], the elimination elicited 7.19, 95% CI [1.54, 33.44], the elimination-plus elicited 8.99, 95% CI [2.13, 37.94], and the sequential elicited 16.24, 95% CI [2.69, 97.96]. All lineup procedures elicited a relative risk suspect identification ratio that was significantly different from zero; however, none of the ratios were significantly different from each other.

The ratio of a filler identification is calculated by dividing the rate of false identification in target-absent lineups by the rate of false identification in target-present lineups (Wells et al., 2015). A higher filler identification ratio suggests that the suspect in the lineup is innocent whereas a lower filler identification ratio suggests that the suspect in the lineup is guilty. The simultaneous lineup elicited a relative risk ratio of filler identification of 4.67, 95% CI [1.49, 14.59], the elimination elicited 3.33, 95% CI [1.02, 10.92], the elimination-plus elicited 5.68, 95% CI [1.37, 23.53], and the sequential elicited 3.83, 95% CI [.77, 14.96]. All filler identification relative risk ratios were significantly different from zero, except the sequential lineup procedure; moreover, none of the ratios were significantly different from each other.

Lastly, the relative risk ratio of a rejection was calculated by dividing the rate of correct rejection in target-absent lineups by the rate of false rejection in target-present lineups (Wells et al., 2015). A higher ratio suggests that the suspect in the lineup is innocent. The simultaneous lineup elicited a risk ratio of a rejection of 5.33, 95% CI

[1.73, 16.42], the elimination elicited 1.33, 95% CI [.86, 2.07], the elimination-plus elicited 1.64, 95% CI [.97, 2.75], and the sequential elicited 2.56, 95% CI [1.43, 4.57]. Only the simultaneous and sequential procedures elicited a relative risk ratio significantly different from zero. Interestingly, the simultaneous lineup procedure elicited a significantly higher relative risk ratio than the elimination lineup procedure, *RRR* = 4.01, 95% CI [1.20, 13.41].

The diagnosticity ratio for survival status in the elimination and elimination-plus procedures was also calculated. Per Pozzulo and colleagues (2015), the survival status diagnosticity ratio was calculated by dividing the rate at which the guilty suspect survived judgment one by the rate of an innocent suspect surviving judgment one. Again, since there was no designated innocent suspect, the rate of an innocent suspect surviving was divided by the total number of lineup members (i.e., 6). The elimination lineup procedure produced a survival status of 4.29, and the elimination-plus procedure produced a diagnosticity ratio of 5.25. These results suggest that when an eyewitness selects a person from judgment one of the elimination lineup, the guilty suspect is 4.3 times more likely to be selected than an innocent suspect. Similarly, in the elimination-plus lineup, the guilty suspect is 5.3 times more likely to be selected than an innocent suspect.

Confidence

Confidence-accuracy relationship. In order to examine whether there was a confidence-accuracy relationship, a point-biserial correlation was used as the sample size was not large enough to compute calibration curves (Weber & Brewer, 2004). When examining the confidence-accuracy relationship with the identification decision

confidence of the simultaneous, elimination, and sequential procedures and the judgment one confidence of the elimination-plus procedure, a significant relationship emerged, $r(209) = .14$, $p = .04$; similarly, when examining the identification decision confidence of all lineup procedures, a significant relationship emerged, $r(209) = .19$, $p = .006$. Data were then split by lineup procedure, there was only a significant confidence-accuracy relationship within the elimination lineup procedure, $r(60) = .28$, $p = .03$. When examining the confidence-accuracy relationship between target-present and target-absent data, a significant confidence-accuracy relationship emerged only for target-present data, $r(82) = .30$, $p = .006$.

Predictive utility of confidence. A series of logistic regressions were then run to examine whether confidence predicted overall accuracy across all four lineups (see Table 3). Confidence taken after the identification decision did not significantly predict overall accuracy in the simultaneous lineup, B = -.01, $SE = .02$, $p > .05$, the sequential lineup, B = .04, $SE = .02$, $p > .05$, or the elimination-plus lineup, B = -.02, $SE = .01$, $p > .05$. However, confidence did significantly predict overall accuracy after the identification task in the elimination lineup, B = .04, $SE = .02$, $p = .04$[2]. In order to examine at which level of confidence it becomes predictive of accuracy, the probability of making a correct identification at each level of confidence, in five point increments, was calculated. Once a witness reached 75% confidence, the probability of making a correct decision rose above chance level (see Figure 1). Confidence taken after the first judgment in the

[2] When the outliers were removed, the elimination lineup became only marginally significant in predicting overall identification accuracy, B = .04, $SE = .02$, $p = .07$; no other changes were observed.

elimination-plus lineup did not predict overall accuracy, B = .01, *SE* = .01, $p > .05$. Given that there are two separate confidence ratings available in the elimination-plus lineup, I examined whether averaging the two ratings would be predictive of overall accuracy in the elimination-plus lineup. This combined confidence was entered into a logistic regression with overall accuracy as the dependent variable. Overall accuracy was not significantly predicted by the combined confidence ratings, B = .02, *SE* = .02, $p > .05$.

Target-present lineups. Given that identification data were separated by target presence, the same was done for the predictive utility of confidence. A further series of logistic analyses were run to examine whether confidence predicted accuracy in target-present lineups. Confidence did not predict accuracy in target-present simultaneous lineups, B = .01, *SE* = .02, $p > .05$, sequential lineups, B = -.03, *SE* = .07, $p > .05$, or elimination lineups, B = .04, *SE* = .03, $p > .05$. However, confidence taken after the identification decision in the elimination-plus lineup did significantly predict accuracy in target-present lineups, B = .06, *SE* = .03, $p = .04$. Once a participant was 75% confident, the probability of making a correct identification rose above chance level (see Figure 2). A logistic regression also was run to examine whether participants' confidence at judgment one of the elimination-plus procedure was predictive of accuracy in target-present lineups.

Confidence after judgment one also was found to be a significant predictor of accuracy, B = .11, *SE* = .04, $p = .01$. The probability of making a correct identification did not reach chance level until a participant was 70% confident in his or her decision that the person looking most like the criminal was indeed the criminal; once a participant was 75% confident in his or her decision, the probability that they would make a correct

identification rose above chance level (see Figure 3). Similar to overall accuracy, the confidence at judgment one and judgment two were averaged to determine whether the combined confidence predicted accuracy in target-present lineups; combined accuracy significantly predicted accuracy, B = .12, *SE* = .05, *p* = .01. The average of combined confidence ratings ranged between 50% and 97.5%, once participants reach an average combined confidence of 75%, the rate of identification accuracy rose above chance level (see Figure 4).

Figure 1

Probability of Making an Overall Correct Decision in the Elimination Lineup with Identification Confidence.

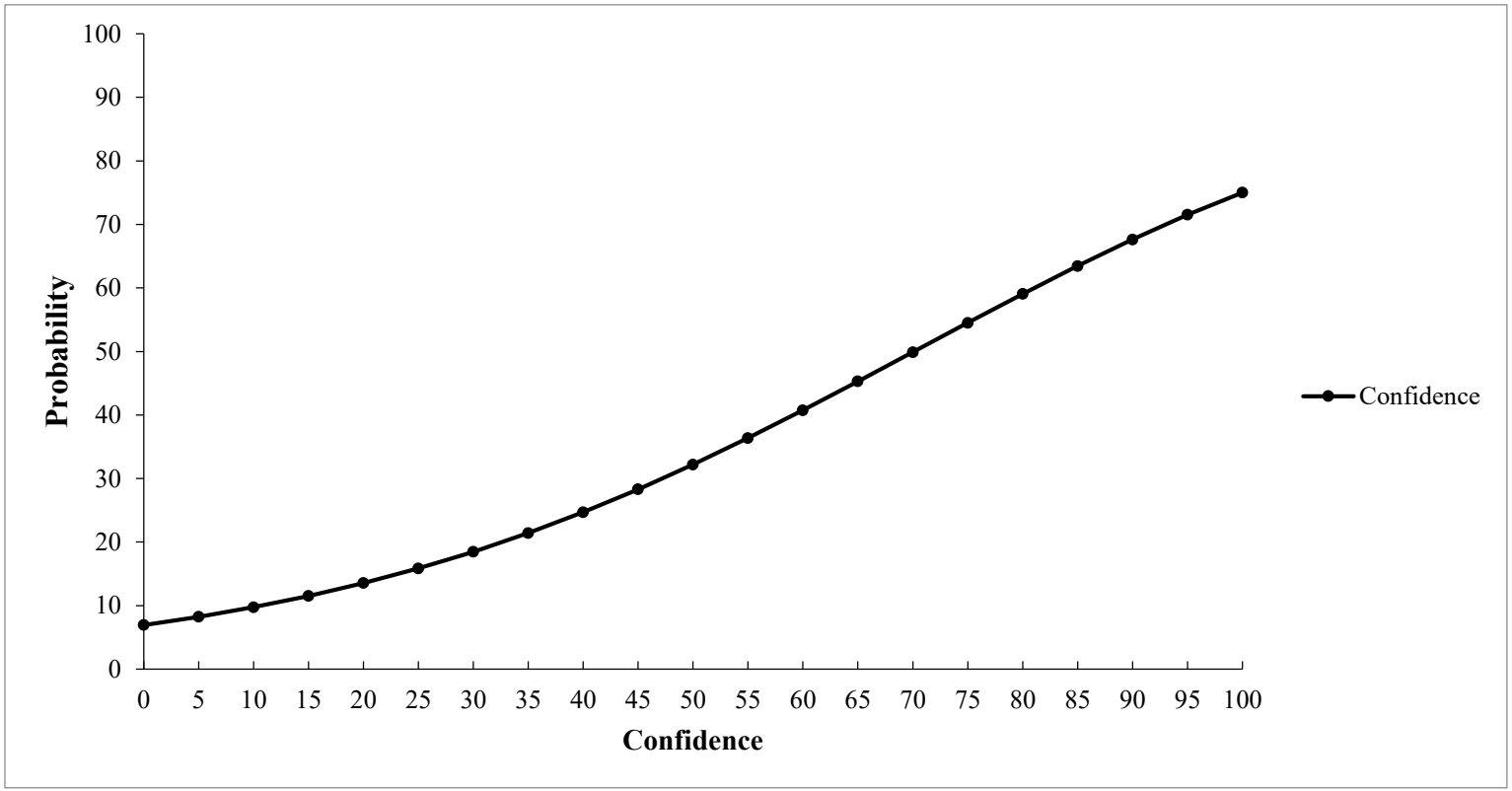


Figure 2

Probability of Making a Correct Decision in the Target-Present Elimination-plus Lineup using Judgment 2 Confidence.

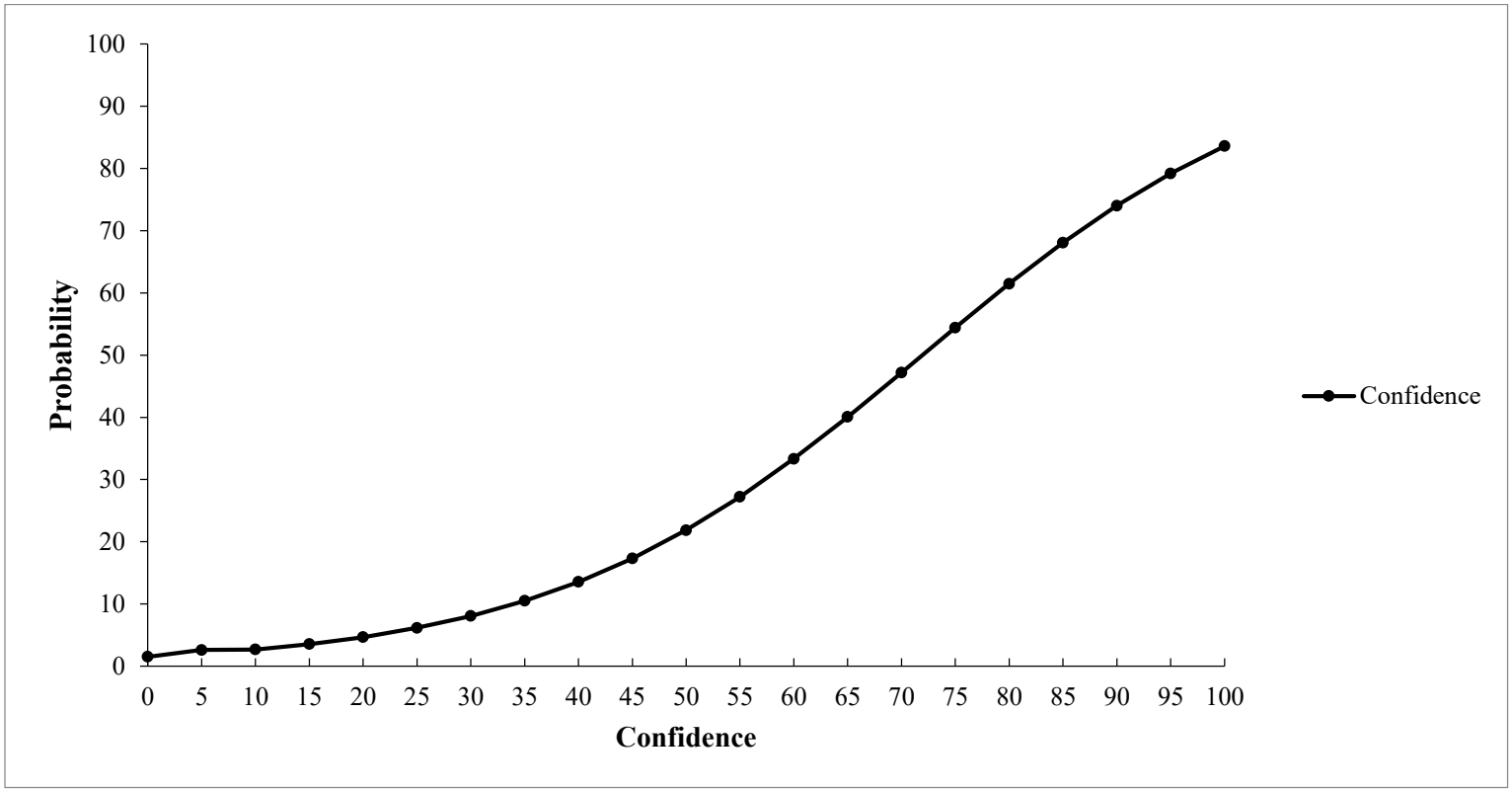


Figure 3

Probability of Making a Correct Decision in the Target-Present Elimination-plus Lineup using Judgment 1 Confidence.

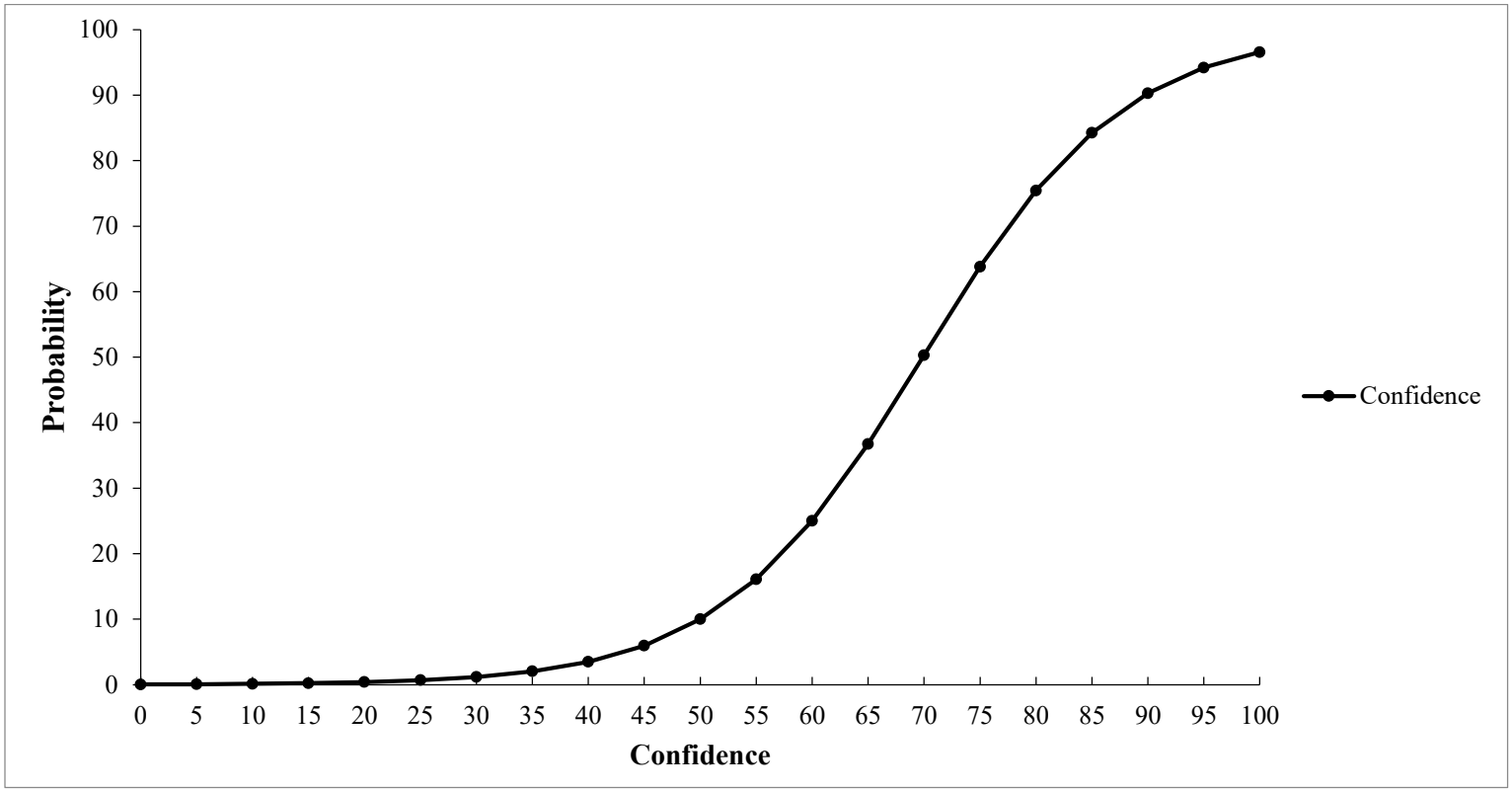
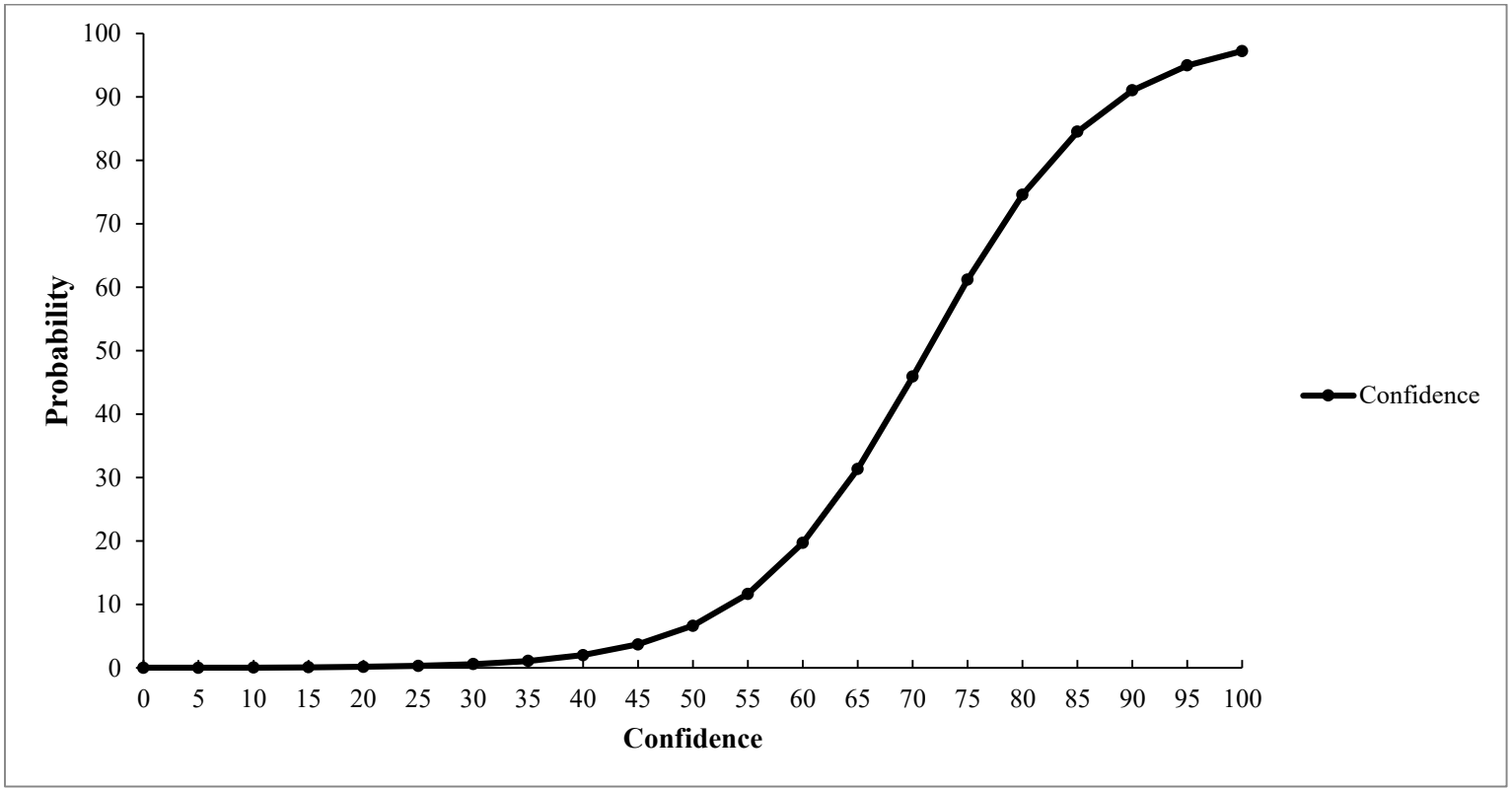


Figure 4

Probability of Making a Correct Decision in the Target-Present Elimination-plus Lineup using Combined Confidence.



Target-absent lineups. An additional series of logistic regressions were run to examine whether confidence predicted accuracy in target-absent lineups. Confidence was not found to be a significant predictor of accuracy in the target-absent simultaneous lineup, B = -.02, *SE* = .03, $p > .05$, elimination lineup, B = .01, *SE* = .02, $p > .05$, or elimination-plus lineup, B = -.01, *SE* = .02, $p > .05$. Additionally, confidence after judgment one of the elimination-plus lineup was not predictive of accuracy, B = -.01, *SE* = .02, $p > .05$, nor was the combined confidence average, B = -.003, *SE* = .02, $p > .05$ (see Table 3).

Table 3

Logistic Regression Coefficients for Confidence in Study 1.

							95% CI for Exp(B)	
	B	S.E.	Wald	df	Sig	Exp(B)	Lower	Upper
Overall Confidence								
Simultaneous	-.01	.02	.10	.1	.75	1.00	.96	.103
Elimination	.04	.02	4.12	1	.04	1.04	1.00	1.08
Elimination-Plus Judgment One	.01	.01	.41	1	.52	1.01	.99	1.03
Elimination-Plus Judgment Two	.02	.01	2.61	1	.11	1.02	1.00	1.05
Elimination-Plus Combined	.02	.02	1.91	1	.17	1.02	1.00	1.06

	B	S.E.	Wald	df	Sig	Exp(B)	95% CI for Exp(B) Lower	Upper
Sequential	.04	.02	3.02	1	.08	1.04	1.00	1.09
Target-Present								
Simultaneous	.01	.02	.10	1	.75	1.01	.96	1.05
Elimination	.04	.03	2.61	1	.11	1.04	.99	1.10
Elimination-Plus Judgment One	.11	.04	6.49	1	.01	1.12	1.03	1.22
Elimination-Plus Judgment Two	.06	.03	4.26	1	.04	1.06	1.00	1.12
Elimination-Plus Combined	.12	.05	7.33	1	.01	1.13	1.04	1.24
Sequential	-.03	.07	.25	1	.62	.97	.85	1.11
Target-Absent								
Simultaneous	-.02	.03	.67	1	.41	.98	.93	1.03
Elimination	.02	.03	.53	1	.47	1.02	.97	1.08
Elimination-Plus Judgment One	-.01	.02	.61	1	.43	.99	.96	1.02
Elimination-Plus Judgment Two	.01	.02	.57	1	.45	1.01	.98	1.05
Elimination-Plus Combined	-.003	.02	.02	1	.90	1.00	.95	1.04

Choosers versus non-choosers. Data were then separated into those who chose someone of out the lineup (N = 124), regardless of target presence, and those that did not (N = 117). Overall, there was a significant relationship between choosing and confidence, $r(209) = .19$, $p = .006$. There was also a significant relationship between choosing and confidence when judgment one confidence from the elimination-plus procedure replaced the identification decision confidence, $r(209) = .14$, $p = .04$. Data were then separated between choosers and non-choosers to examine whether there was a confidence-accuracy relationship between the two groups. A significant relationship was found for choosers using the identification confidence, $r(124) = .25$, $p = .006$. Moreover, there was a significant relationship observed when judgment one confidence from the elimination-plus procedure replaced the identification decision confidence, $r(124) = .24$, $p = .007$. No significant relationship was observed between confidence and accuracy for non-choosers.

Data for choosers and non-choosers were then compared across lineup procedure. When examining the identification confidence from the elimination-plus procedure, there was a significant confidence-accuracy relationship for choosers using the identification decision confidence, $r(30) = .53$, $p = .003$. Similarly, when examining the judgment one confidence, a significant relationship was found, $r(30) = .50$, $p = .005$. When examining the combined average of judgment one and judgment two confidence, a significant relationship for choosers also emerged, $r(30) = .55$, $p =.002$. No significance was observed for the simultaneous, elimination, or sequential procedures. There was also no confidence-accuracy relationship observed for non-choosers across all four lineup procedures.

Confidence ratings. In order to examine whether the use of confidence ratings at the end of judgment one in the elimination-plus lineup procedure were useful in re-defining accuracy, a maximum value had to be established. Each participant's confidence rating was then evaluated against this value. This value represented a cut-off score that maximized the combined proportion of correct identifications and correct rejections (i.e., a fit ratio; Sauer et al., 2008). Any confidence decision above this value was considered an identification and any confidence value falling below the max value was considered a foil identification in target-present lineups and a rejection in target-absent lineups. The max value was established through the use of an Excel add-in, Solver, which uses an algorithm to create the max value. Once the max value had been established, each participants' confidence rating was then transferred into either a correct identification, an incorrect rejection, an incorrect identification for target-present lineups and a correct rejection or incorrect identification for target-absent lineups. These data were then transferred into SPSS for analysis.

Target-present lineups. Similar to the traditional identification data, data were separated for target-present and target-absent lineups. To examine whether the use of confidence ratings at the end of judgment one of the elimination lineup procedure was helpful at increasing identification accuracy in target-present lineups, a chi-square analysis was run. The dependent variable was accuracy, and it included the yes/no lineup decisions from all lineup procedures (i.e., simultaneous, elimination, elimination-plus, and sequential) and the accuracy decisions converted from the elimination-plus judgment one confidence ratings. A significant effect was found for target-present lineups, $\chi^2(8, N = 152) = 16.38$, $p = .04$, Cramer's $\nu = .23$. The identification accuracy results are

identical to when the identification data were analyzed in the traditional way; therefore, I will only report comparisons to the elimination-plus confidence ratings. Similar to when data were analyzed with the traditional binary decision, the simultaneous lineup elicited significantly more correct identifications (.80) than when using the confidence at judgment one of the elimination-plus lineup to determine accuracy (.45), $\chi^2(2, N = 61) = 12.51$, $p = .002$, Cramer's $\nu = .45$. The simultaneous lineup also elicited significantly fewer false rejections (.10) compared to the confidence from judgment one of the elimination-plus lineup (.52). The rate of correct identifications was comparable across the elimination, elimination-plus confidence ratings, and sequential lineups (see Table 4).

Target-absent lineups. To examine whether the use of confidence ratings at the end of judgment one of the elimination lineup procedure was helpful at increasing identification accuracy in target-absent lineups, a chi-square analysis was run. The dependent variable was accuracy, and it included the yes/no lineup decisions from all four lineup procedures and the accuracy decisions converted from the confidence ratings from the elimination-plus procedure. No significant differences emerged, $\chi^2(4, N = 150) = 6.31$, $p = .18$. While there was no overall influence of lineup procedure on identification accuracy in target-absent lineups, it is interesting to note that there was a significant difference in the rate of correct rejection between the simultaneous lineup and elimination-plus confidence ratings, such that the elimination-plus confidence ratings elicited more correct rejections (.80) compared to the simultaneous lineup (.53), $\chi^2(1, N = 60) = 4.80$, $p = .03$, Cramer's $\nu = .45$.

Table 4

Identification Accuracy as a Function of Lineup Procedure using Confidence ratings from the Elimination-plus Lineup at Judgment 1.

	Simultaneous	Elimination	Elim-plus	Sequential	Elim-Plus Confidence
Target-present					
Correct ID	0.80 (24)	0.40 (12)	0.55 (17)	.63 (19)	.45 (14)
False ID	0.10 (3)	0.10 (3)	0.06 (2)	.07 (2)	.03 (1)
False Rej.	0.10 (3)	0.50 (15)	0.39 (12)	.30 (9)	.52 (16)
Target-absent					
Correct Rej.	0.53 (16)	0.67 (20)	0.63 (19)	.77 (23)	.80 (24)
False ID	0.47 (14)	0.33 (10)	0.37 (11)	.23 (7)	.20 (6)

Discussion

The purpose of Study 1 was to examine whether a modified version of the elimination lineup procedure (i.e., the elimination-plus lineup) could help combat the decrease in the survival status of the suspect and the correct identification rate of the suspect. Study 1 made an addition to the first judgment of the elimination lineup procedure. Once the participant had made a decision as to who looked most like the criminal, he or she was then asked to rate his or her confidence that the person looking most like the criminal was the criminal. I hypothesized that these confidence ratings would be helpful in increasing the rate of correct rejection in target-absent lineups and that using the confidence would provide a correct identification rate of the suspect similar to the survival status of the suspect.

Identification Data. Overall, the simultaneous lineup procedure elicited higher rates of correct identification compared to both the elimination and elimination-plus lineup procedures; however, comparable rates of correct identification were observed for the simultaneous and sequential lineups. These results support previous research that has found that eyewitnesses are significantly more likely to make a correct identification when presented with a simultaneous lineup compared to an elimination lineup (e.g., Pozzulo & Lindsay, 1999; Pozzulo et al., 2013) possibly due to the fact that simultaneous encourages only a relative judgment. Although not significant, Pozzulo and colleagues (2008) also observed a trend for the simultaneous lineup to be superior to the elimination lineup when examining the rates of correct identification. The current study also yields similar results to those of Wells and colleagues (2015) such that the current study observed that the rate of correct identification was slightly lower, albeit not significantly, in the sequential lineup compared to the simultaneous lineup.

The results of Study 1 also depart from previous research that has found no differences in rates of correct identification between the simultaneous and elimination lineup procedures in target-present lineups (e.g., Pozzulo et al., 2008, 2015). The results also depart from Humphries and colleagues (2012) who found the simultaneous, sequential, and elimination lineups produced comparable rates of correct identification. With the contradictory findings in the literature, it is of great importance to determine whether there is one lineup procedure that is superior when presenting an adult eyewitness with an identification task. The elimination lineup procedure is a promising procedure, and it does give an additional piece of information (i.e., the survival status);

therefore, if a slight modification can be made to the current elimination lineup, it may prove to be beneficial.

When examining target-absent lineups, the sequential lineup did not elicit significantly more correct rejections than the simultaneous lineup. There was a trend in the expected direction which supports previous research that has found the use of the sequential lineup procedure elicits higher rates of correct rejection than the simultaneous (e.g., Pozzulo et al., 2008). Similarly, there was a trend in the direction of higher rates of correct rejections for the elimination lineup compared to the simultaneous lineup which also supports previous research examining the elimination and simultaneous lineups (e.g., Humphries et al., 2012; Pozzulo et al., 2015).

The results of the present study suggest that both the simultaneous and sequential procedures may be diagnostically superior compared to the elimination and elimination-plus procedures when examining the relative risk ratio of suspect identifications; however, the differences between the procedures were not significant. These findings are in contradiction to a previous study that found the elimination lineup elicits a higher diagnosticity ratio than both the simultaneous and sequential procedures (e.g., Pozzulo et al., 2015). The elimination-plus lineup procedure had the highest false identification ratio; a higher false identification ratio indicates the likelihood that the suspect the police put in the lineup is innocent. When examining the relative risk ratio of rejection, the simultaneous had the highest suggesting that eyewitnesses who reject a lineup are more likely to make a correct decision; even more so, this was significantly higher than the rejection ratio for the elimination lineup procedure. This suggests that when a rejection is made in the simultaneous lineup, it is more likely that the suspect is innocent compared to

when a rejection is made in the elimination lineup. This is one of the first studies to examine the false identification and rejection diagnosticity ratios with the elimination lineup, as such, it is an exploratory finding and there is no previous research to compare to.

Survival Status. The current study hypothesized that the suspect would survive at a higher rate than any other lineup member in both the elimination and elimination-plus lineup procedures; this hypothesis was supported. These findings support previous research that have employed the elimination lineup and examined the survival rate (e.g., Humphries et al., 2012; Pozzulo et al., 2008, 2013, 2015). The high survival rate of the suspect increases the chance that he is indeed the perpetrator which can be used as an additional piece of information in determining whether the police have apprehended the guilty suspect. However, the high survival rate of the suspect did not transfer to a high rate of correct identification. There was a drop in the survival status for the elimination lineup (.73) and elimination-plus (.84) to a correct identification rate of .40 and .55, respectively. However, the rate of correct identification in the simultaneous lineup was comparable to the survival status of the guilty suspect in both the elimination and elimination-plus procedures.

The drop in the survival rate of the suspect, as well as the fact that the survival status and rate of correct identification in the simultaneous lineup are comparable, suggests that something is causing participants to change their minds between judgment one and judgment two. Previous research has suggested that the second identification question of the elimination lineup procedure may causes witnesses to second guess themselves (e.g., Humphries et al., 2012; Pozzulo & Lindsay, 1999). Eyewitnesses may

also feel pressure when encouraged to make an absolute decision as to whether the person they selected is in fact the perpetrator. Future research is needed to determine what factors are playing a role in witness' decision making process between these two judgments.

Confidence. This is the first study to examine the role of confidence in predicting accuracy when utilizing the elimination lineup. Confidence was found to be a significant predictor of overall accuracy only for the elimination lineup procedure. These are novel findings as this is a first attempt at examining whether confidence is useful in predicting accuracy in a two-judgment lineup procedure. Confidence was also examined to determine whether it predicted accuracy in target-present and target-absent lineups, separately. The elimination-plus was the only lineup found to be predictive of accuracy in target-present lineups suggesting that the addition of the second confidence judgment in the elimination procedure appeared to be helpful. Confidence does appear to be helpful in determining whether one will make a correct identification when presented with a target-present lineup; however, an eyewitness' confidence in his or her decision must be at least 75% to be above chance level, based on the current study's findings. These results suggest that when an identification is made in a target-present lineup, those with higher confidence are more likely to be correct in their identification decision. Confidence taken directly after judgment one, after the identification task, and the average of confidence from judgment one and judgment two all significantly predicted whether a witness would make a correct identification. Interestingly, once a witness reached a level of 75% confidence, he or she had a probability greater than chance level of making a correct decision.

The current study did not find a significant relationship between confidence and accuracy in target-absent lineups for all four lineup procedures. Given that confidence is a degree of a match between the witness' memory for the perpetrator and the lineup photographs, no confidence-accuracy relationship in target-absent lineups makes sense. When the perpetrator is not present among the lineup photographs, there will be no match with the eyewitness' memory; therefore, no confidence-accuracy relationship in target-absent lineups is ideal.

Supporting previous research (e.g., Sporer et al., 1995), the current study found that the confidence-accuracy relationship was strongest for choosers. When examining lineup procedure, the elimination-plus procedure was the only procedure to have a significant relationship between confidence and accuracy for choosers. Confidence from judgment 1, judgment 2, and their average all significantly predicted accuracy for choosers. Given that this is the first study to examine how confidence may play a role in the elimination lineup, and its modified version, these results are helpful in determining the guilt of the suspect placed in the elimination-plus lineup.

While the current study did not replace the binary identification decision with confidence ratings, the data from the confidence after judgment one of the elimination-plus procedure were analyzed similarly to determine the degree of match between the photograph selected and the eyewitness' memory of the perpetrator. Similar to Weber and Varga (2012), this modified procedure allowed us to collect both confidence ratings that the photograph selected was indeed the criminal as well as their binary yes/no identification decision. The rate of correct rejection was not significantly higher when using confidence ratings compared to the binary decision, however, there was a trend in

that direction. There was a higher rate of correct rejection when using the confidence ratings from judgment one of the elimination-plus lineup procedure (.80) compared to the binary decision from judgment two (.63). This trend supports previous research that has found that confidence ratings may be more useful in target-absent lineups compared to target-present lineups (Sauer et al., 2008). Similarly, the elimination-plus confidence also elicited a higher rate of correct rejection compared to the simultaneous lineup, without a significant decrease in the rate of correct identification. The fact that the confidence ratings produced a higher rate of correct rejection compared to a standard simultaneous lineup suggests that future research is needed on how to best utilize confidence ratings. There was no significant influence on the rate of correct identification, suggesting that incorporating this modified version may be beneficial for target-absent lineups without compromising accuracy in target-present lineups. However, it would be useful to modify a lineup procedure which would result in an increase in the rate of correct identification as well as correct rejection.

The aim of Study 1 was to examine whether a modification to the elimination lineup procedure would help increase identification accuracy and give more information as to whether the suspect was the perpetrator. The results of this study suggest that a modification at judgment one of the elimination does provide additional information to the suspect's guilt; however, a higher rate of accuracy was not observed. This begs the question as to whether a modification of the lineup instructions would be more beneficial in increasing identification accuracy for the elimination lineup procedure.

Study Two

Given that previous research has reliably demonstrated that there is a reduction between the survival status of the guilty suspect from judgment one of the elimination lineup and the rate of correct identification in judgment two, Study 2 examined whether informing participants ahead of time that there were two questions would help bridge the gap. Some researchers speculate that the second question causes witnesses to second guess their initial selection from judgment one (Pozzulo & Lindsay, 1999; Pozzulo et al., 2013). If participants are explicitly told ahead of time that there will be two identification questions, regardless of who is selected at judgment one, this may lessen the chance that they second guess themselves, which could increase the rate of correct identification at judgment two. Therefore, the purpose of Study 2 was to examine whether explicit instructions informing the participants they would be asked two questions would help increase identification accuracy in target-present lineups compared to the traditional elimination lineup instructions.

Lineup Instructions

The instructions given to an eyewitness prior to the identification task have been found to influence identification accuracy (e.g., Clark, 2005). One of the first studies to examine the influence of instructions on eyewitness identification accuracy was conducted by Buckhout, Figueroa, and Hoff (1975). Participants were witnesses to a staged crime and were later asked to participate in an identification task. Buckhout and colleagues varied instructions given prior to the lineup to be either low bias or high bias. Low bias instructions asked the witness if he or she recognized anyone in the photographs whereas high bias instructions told the witness that the actual perpetrator was in the lineup. There was a significant effect of biased instructions such that witnesses

were more likely to select someone from the lineup when given the biased instructions compared to the unbiased instructions.

Since Buckhout and colleagues' (1975) examination of lineup instructions, many other researchers have found similar effects (for reviews see Clark, 2005; Steblay, 1997). It has been reliably demonstrated that biased instructions that do not inform the witness that the perpetrator may or may not be present lead to a higher rate of false identifications (e.g., Clark, 2005; Malpass & Devine, 1981; Pozzulo & Dempsey, 2006; Steblay, 1997). This issue is also highly agreed upon among the experts in the field. Kassin, Ellsworth, and Smith (1989) surveyed the experts in the field regarding various eyewitness identification issues. One question pertained to instructions and whether the experts believed instructions had the power to influence a witness' behavior. Kassin and colleagues found that 95% ($N = 63$) of the experts believed that the instructions provided to the witness at the time of the identification can affect their willingness to make an identification. These results were later replicated in a more recent survey of the experts (e.g., Kassin, Tubb, Hosch, & Memon, 2001). It has now been suggested that every lineup administrator informs the eyewitness that the perpetrator may or may not be present (Technical Working Group for Eyewitness Evidence, 1999). Not doing so can lead the witness to believe that the police have the guilty suspect in custody which is why they are showing a lineup and that it is the witness' job to select the guilty suspect.

Lineup instructions have also been used for different reasons other than informing the witness that the perpetrator may or may not be present. For example, Charman and Wells (2007) examined whether informing an eyewitness that the perpetrator's appearance may have changed between the time of the crime and the identification

influenced accuracy. Results indicated that there were no beneficial effects of the appearance-change instruction, and that it was actually detrimental to identification accuracy (Charman & Wells, 2007).

Different instructions have been studied to examine whether they have any impact on eyewitness identification, beneficial or detrimental. Cautioning participants that the perpetrator may or may not be in the lineup has been shown to help reduce false identifications. Previous research has shown that the survival status of the guilty suspect in judgment one of the elimination lineup is typically higher than the correct identification rate of the guilty suspect in judgment two. Perhaps cautioning eyewitnesses that the elimination lineup is a two judgment lineup and the second question will be asked regardless of who they select at the first judgment can help reduce the rate of false rejections of the guilty suspect.

Hypotheses

1. There will be a higher rate of correct identification when using the modified elimination instructions that explicitly inform the participants that there will be two identification questions.
2. The suspect will survive the first judgment in the elimination and the elimination lineup with modified instructions procedures at a higher rate than any other lineup member.
   a. The use of the explicit instructions informing the participants that there are two identification questions will produce a survival rate of the suspect (e.g., the rate at which the suspect is chosen as most resembling the perpetrator) that is comparable to the correct identification rate.

Method

Participants. Undergraduate psychology students (N = 120) were recruited from Carleton University via an online participation pool (i.e., SONA). Participants' ages ranged from 18- to 39-years-old (M = 20.30; SD = 3.57); there were 74 females and 46 males. The majority of participants (43.3%) identified themselves as White/Caucasian, with small numbers of Asians (25%), Latino/Latinas (3.3%), Black/African-Canadians (17.5%), Aboriginals (4.2%) and those who identified themselves as either mixed or "other" (6.7%)[3]. Participants received course credit for their participation.

Design. A 2 (lineup: TP vs. TA) x 4 (lineup procedure: elimination vs. elimination with modified instructions) between-subjects design was used. There were four conditions with 30 participants per condition resulting in N = 120.

Procedure. The same materials and procedure that were used in Study 1 were also used in Study 2; however, participants who were in the elimination with modified instructions condition were given an extra set of instructions. These instructions stated, "*This is a two-step identification procedure. I will be asking you two questions regarding your memory for the criminal. I ask both of these questions regardless of who you select. My asking you two questions does not reflect whether you were correct or incorrect in your selection*" (see Appendix L). Participants were then read the traditional elimination lineup instructions.

Results

Preliminary Analyses

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[3] There were no significant differences in the number of males and females in each lineup condition, $\chi^2(1, N = 120) = .00$, $p < .05$, $\varphi = .00$. There also were no significant differences in ethnic make-up (White vs. non-White), $\chi^2(1, N = 120) = .14$, $p < .05$, $\varphi = .03$.

Data screening. Prior to analyzing the data, the data were screened for any potential outliers, skewness, or kurtosis in the confidence data; the identification data were categorical, as such, no outliers were observed. Univariate outliers were examined for participants' confidence ratings in their identification decisions. In order to examine outliers, participants' confidence ratings were transformed into their respective z-scores. Given the large sample size (N = 120), any participant with a z-score higher than 3.29 or lower than -3.29 was considered an outlier (Cohen et al., 2003). Two participants had z-scores above 3.29; however, similar to Study 1, it was revealed that this was due to low confidence in their identification decisions (both participants reported being 8% confident in their identification decisions). These two outliers were kept in because confidence was a primary variable of interest and it is important to understand how confidence plays a role in the confidence-accuracy relationship whether the participant is 0% confident or 100% confident.

Skewness and kurtosis were then examined for participants' confidence ratings. A descriptive analysis was run with SPSS to obtain the values of skewness (-1.08, SE = .31) and kurtosis (2.61, SE = .61) for the elimination lineup and the skewness (-1.34, SE = .31) and kurtosis (4.21, SE = .61) for the elimination with modified instructions lineup. These tests indicated there was not a substantial deviation from normality (West et al., 1995).

Assumptions. Assumptions for Study 2 were identical to those of Study 1. Similar analyses to check assumptions were used and the current study met all assumptions for the Pearson chi-square and logistic regression.

Study Results

Identification data were first examined to determine if one lineup elicited higher rates of accuracy over the other, collapsed across target presence. There was no influence of lineup type on overall accuracy, $\chi^2(1, N = 120) = .03$, $p > .85$. Similar to Study 1, identification data were then separated between target-present and target-absent lineups as combining the correct identifications with the correct rejections may obscure the advantages and/or disadvantages associated with each procedure.

Target-present lineups. In order to examine whether identification accuracy differed between the two lineup procedures, a chi-square was calculated. Results indicated there were no significant differences in accuracy rates between the lineups, $\chi^2(2, N = 60) = 1.01$, $p = .30$ (see Table 5 for identification rates as a function of lineup). Each lineup procedure produced comparable rates of correct identification.

Target-absent lineups. In order to examine differences in identification accuracy between the lineup procedures, a chi-square was calculated. Results indicated there was no significant difference in accuracy rates between the lineups, $\chi^2(1, N = 60) = 1.71$, $p = .19$. Each lineup procedure produced comparable rates of correct rejection.

Table 5

Identification Accuracy as a Function of Lineup Procedure in Study 2.

	Elimination lineup	Modified elimination lineup
Target-present		
Correct identification	0.40 (12)	0.53 (16)
False identification	0.10 (3)	0.07 (2)
False rejection	0.50 (15)	0.40 (12)
Target-absent		
Correct rejection	0.67 (20)	0.50 (15)
Foil identification	0.33 (10)	0.50 (15)

Survival status. The survival status is the rate at which each lineup member is selected (i.e., survives) during the first judgment in the elimination and modified elimination procedures (Pozzulo & Lindsay, 1999). In the target-present elimination lineup, a binomial test indicated that the suspect survived judgment one at a significantly higher rate than any other lineup member combined, $p < .001$. Similar results were obtained when examining the survival status in the modified elimination, a binomial test indicated that the suspect survived judgment one at a significantly higher rate than any other lineup member combined, $p < .001$ (see Table 6 for survival rates and identification rates as a function of lineup type and lineup member).

Table 6

Survival Rates (*and Identification Rates*) as *a Function of Lineup Member and Lineup Procedure.*

	Lineup Member					
	1	2	3	4	5	6
Target-Present						
Elimination	.20 (.07)	.00	.00	.07 (.03)	.00	.73 (.40)*
Modified Elim	.23 (.07)	.00	.00	.00 (0)	.00	.77 (.53)*
Target-Absent						
Elimination	.33 (.10)	.03 (.00)	.07 (.00)	.27 (.10)	.07 (.00)	.23 (.13)
Modified Elim	.60 (.23)	.00 (0)	.07 (.03)	.20 (.13)	.03 (.03)	.10 (.07)

* denotes target

Diagnosticity. Similar to Study 1, the relative risk ratios for each lineup procedure were calculated. A higher suspect identification ratio indicates that when a selection is made in that lineup, it is likely the suspect is guilty. The elimination lineup elicited a relative risk ratio of a suspect identification of 7.19, 95% CI [1.54, 33.44], and the modified elimination elicited a ratio of 6.40, 95% CI [1.86, 21.96]; both ratios were significantly different from zero, but not from each other. A higher filler identification ratio indicates that when a selection is made in that lineup, it is likely that the suspect is innocent. The elimination lineup elicited a relative risk ratio of filler identification of 3.33, 95% CI [1.02, 10.92], and the modified elimination elicited 7.50, 95% CI [1.88, 29.99]; similar to suspect identification ratios, both filler identification ratios were significantly different from zero, but not from each other. A higher rejection ratio indicates that when a selection is made in that lineup, it is likely that the suspect is innocent. The elimination lineup elicited a relative risk ratio of a rejection of 1.33, 95%

CI [.86, 2.07], and the modified elimination elicited 1.21, 95% CI [.69, 2.12]; neither of the two ratios were significantly different from zero, nor were they different from each other. When examining the survival status diagnosticity ratio, the elimination lineup procedure produced a diagnosticity ratio of 4.29, and the modified elimination produced a diagnosticity ratio of 4.53. Therefore, when a witness was presented with an elimination lineup, it was 4.29 times likely that the selected person was the guilty suspect compared to an innocent person and it was 4.53 times likely in the modified elimination procedure.

Confidence. While confidence was not the primary variable of interest in Study 2, analyses were still run to determine whether confidence had any predictive ability. Given that confidence was only taken at one time for both lineups in Study 2, the confidence from judgment two was analyzed. A series of logistic regressions were run to examine whether confidence predicted overall accuracy in both the elimination lineup and modified elimination lineup, as well as whether the predictive ability varied between target-present and target-absent lineups (see Table 7).

Confidence was found to be a significant predictor of overall accuracy for the elimination lineup, B = .04, *SE* = .02, *p* = .04 (see Figure 5) as well as the modified elimination lineup, B = .04, *SE* = .02, *p* = .05 (see Figure 6)[4]. For both lineups, once a witness was 75% confident in his or her decision the predictive ability of confidence rose above chance. However, when analyzing the data by target presence, confidence was found to be predictive only in the modified elimination target-present lineup, B = .09, *SE*

[4] When the outliers were removed, both the Elimination, B = .04, *SE* = .02, *p* = .07 and Elimination with wildcard, B = .04, *SE* = .02, *p* = .08, were only marginally significant in predicting accuracy.

= .04, p = .02 (see Figure 7). Similar to overall accuracy, once a witness was 75% confident, the predictive ability of confidence in target-present lineups rose above chance level.

Choosers versus non-choosers. Data were then separated into those who chose someone of out the lineup (N = 58), regardless of target presence, and those that did not (N = 62). Overall, there was no significant relationship between choosing and confidence, $r(120) = .08$, $p = .42$. Data were then separated between choosers and non-choosers to examine whether there was a confidence-accuracy relationship between the two groups. A significant relationship was found for *non*-choosers using the identification confidence, $r(62) = .34$, $p = .007$. No significant relationship was observed between confidence and accuracy for choosers. Data for choosers and non-choosers were then compared across lineup procedure. There was also no confidence-accuracy relationship observed for choosers or non-choosers across both lineup procedures.

Table 7

Logistic Regression Coefficients for Confidence in Study 2.

	B	S.E.	Wald	df	Sig	Exp(B)	95% CI for Exp(B)	
							Lower	Upper
Overall Confidence								
Elimination	.04	.02	4.12	1	.04	1.04	1.00	1.08
Modified Elim	.04	.02	3.82	1	.05	1.04	1.00	1.08
Target-Present								
Elimination	.04	.03	2.61	1	.11	1.04	.96	1.05
Modified Elim	.09	.04	5.16	1	.02	1.09	1.01	1.17
Target-Absent								
Elimination	.02	.03	.53	1	.47	1.02	.97	1.08
Modified Elim	.01	.02	.34	1	.56	1.01	.97	1.06

Figure 5

Probability of Making an Overall Correct Decision in the Elimination Lineup with Identification Confidence.

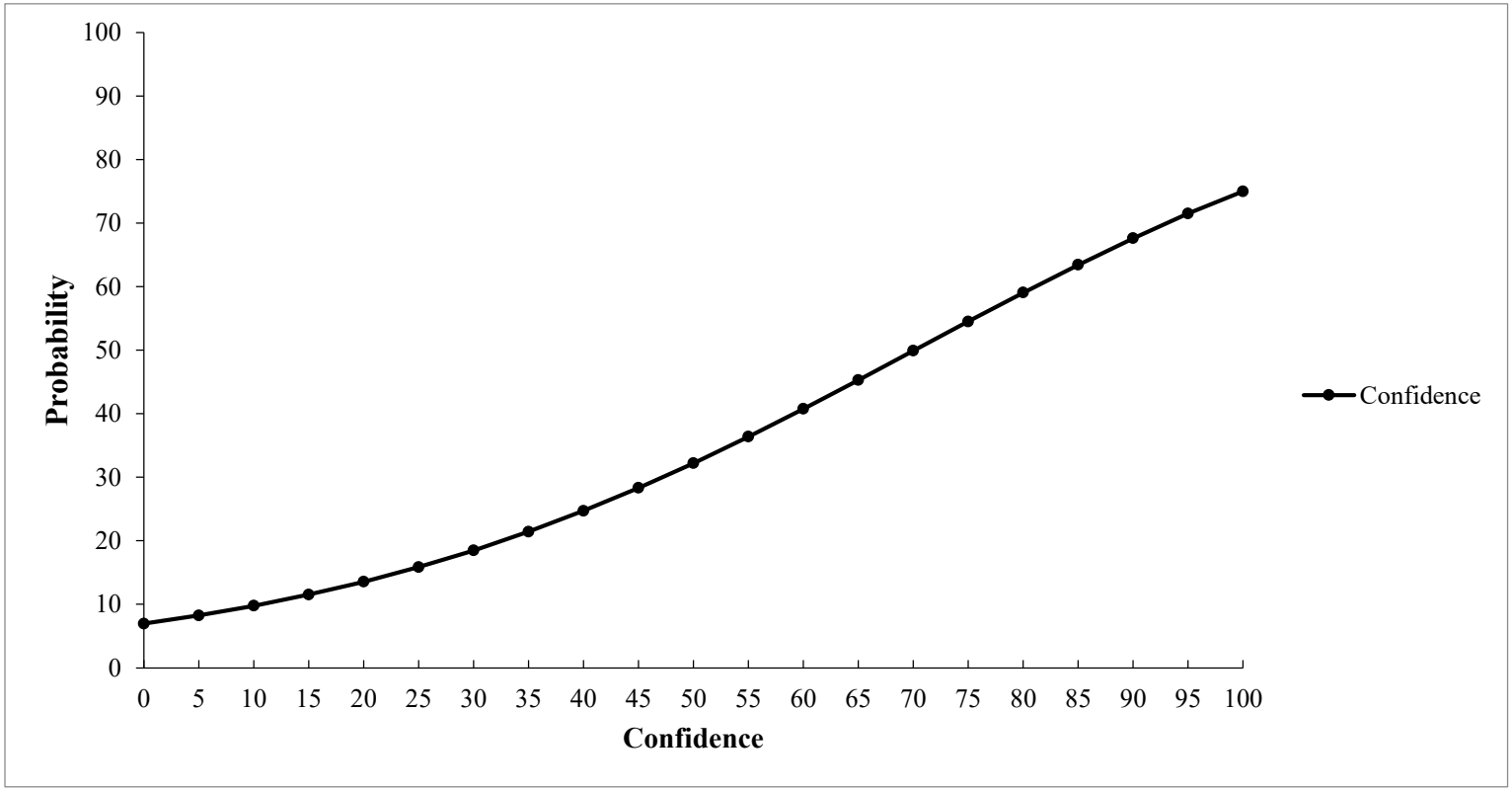


Figure 6

Probability of Making an Overall Correct Decision in the Modified Elimination Lineup with Identification Confidence.

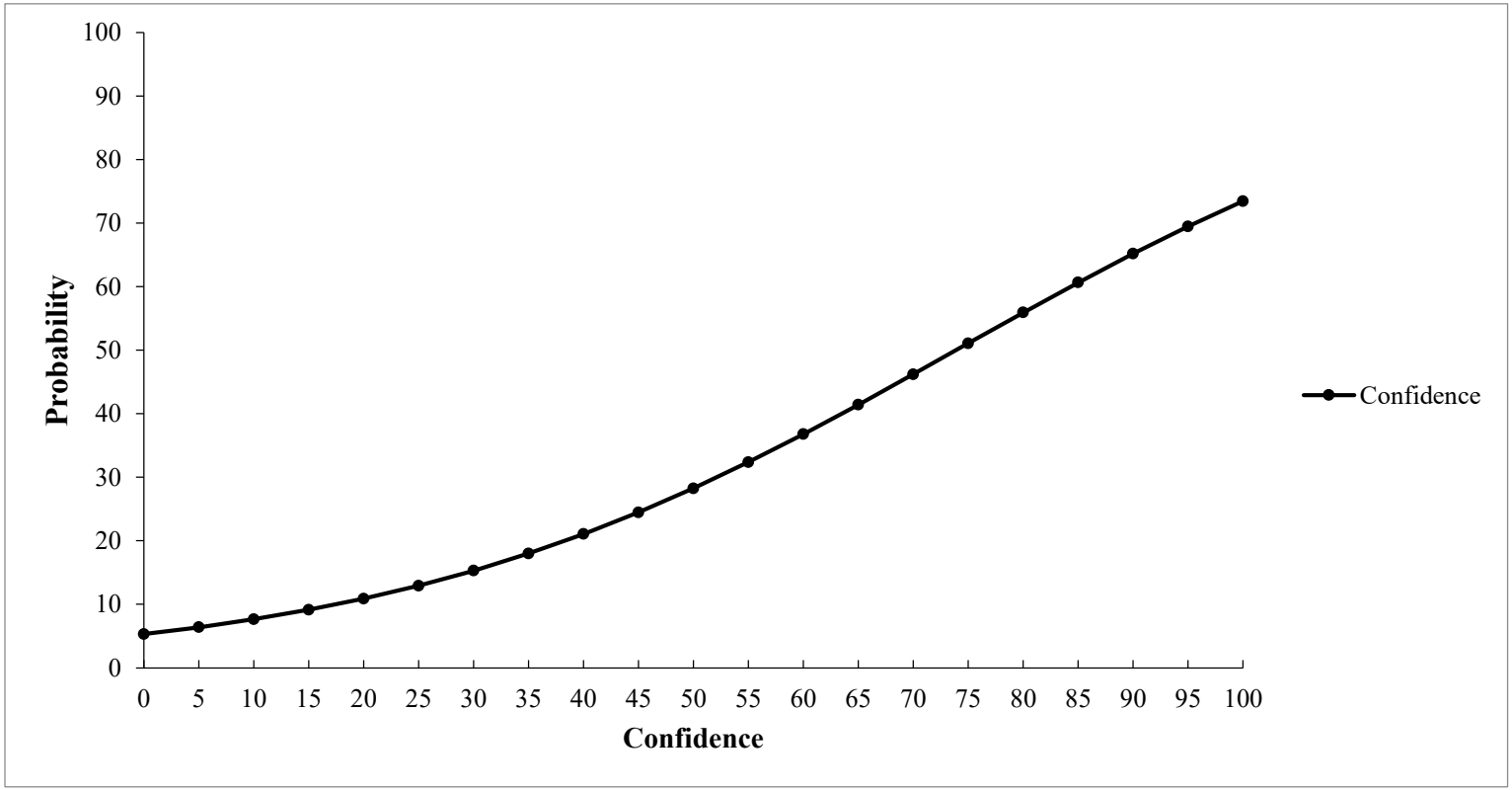
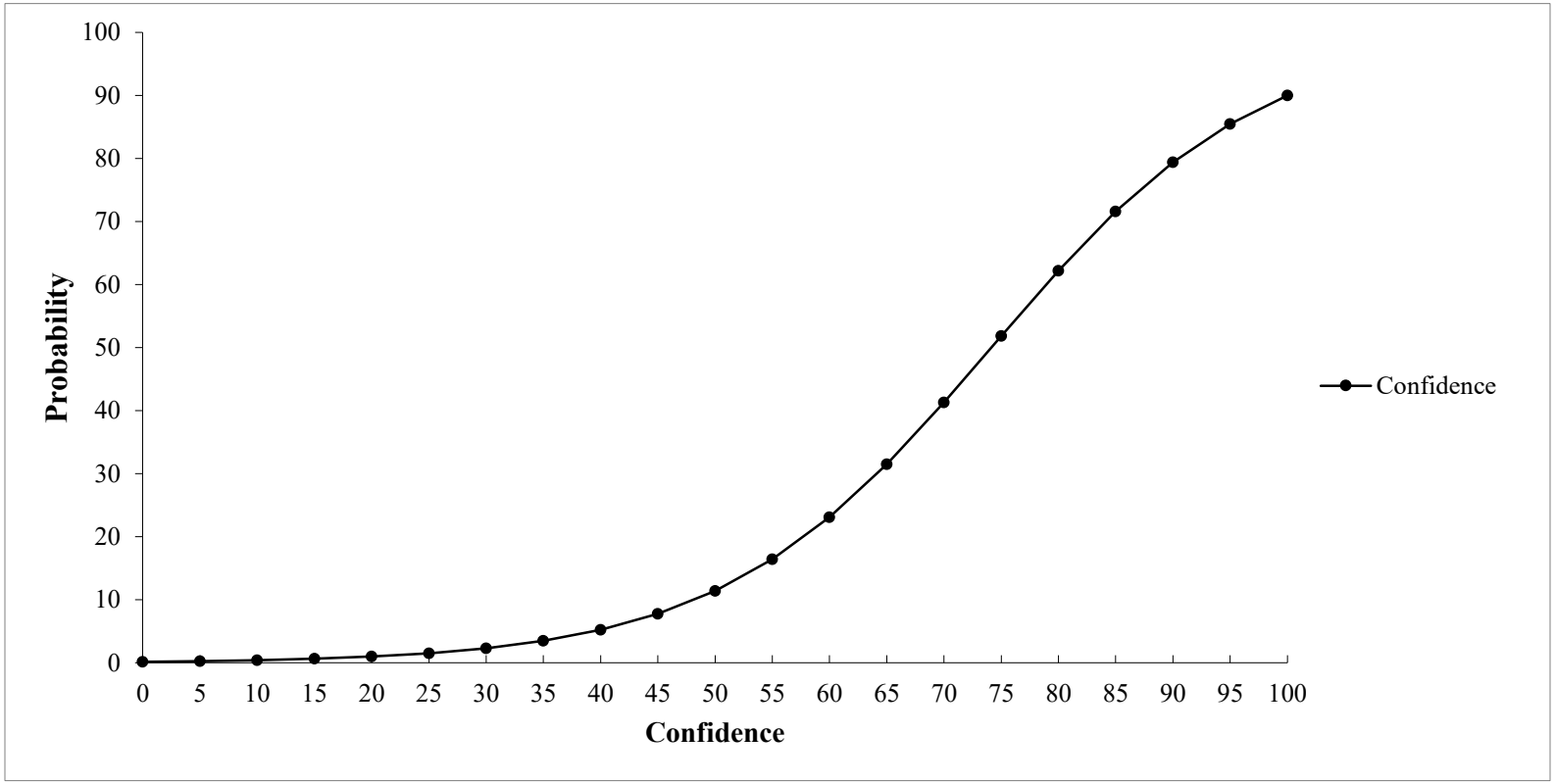


Figure 7

Probability of Making a Correct Decision in Target-Present Elimination with Modified Instructions Lineup with Identification Confidence.



Discussion

Previous research has reliably demonstrated that the rate at which the suspect survives judgment one of the elimination lineup is lower than the rate of correct identification of the guilty suspect (e.g., Humphries et al., 2012; Pozzulo & Lindsay, 1999; Pozzulo et al., 2008, 2013, 2015). There have been different speculations as to why this occurs. A common speculation is that the two judgment process violates the witness' preconceived notions of how a lineup is conducted (e.g., Pozzulo & Lindsay, 1999). Humphries and colleagues (2012) speculated that the strict rules of the second judgment may weaken the eyewitness' confidence of their choice from judgment one.

The purpose of Study 2 was to examine whether informing participants there would be two identification questions regardless of choice made would help increase identification accuracy. This addresses both the issues discussed by Pozzulo and Lindsay (1999) and Humphries and colleagues (2012). Eyewitnesses are informed prior to the lineup instructions that there will be two identification questions so they are not surprised by this and the eyewitnesses will know ahead of time that the lineup will end at judgment two (not one). Therefore, I predicted that specifically informing witnesses of the two identification questions would help increase the rate of correct identification of the suspect and bridge the gap that is commonly found between the survival status of the suspect and the rate of correct identification of the suspect. There were no differences between the rates of correct identification and correct rejection between the elimination and elimination lineup with modified instructions. This suggests that warning participants ahead of time that there will be two identification questions is not beneficial to accuracy.

The data from Study 2 suggest that eyewitnesses are simply moving their decision criterion and not their sensitivity or discrimination when given instructions that they would be asked two identification questions. Faces are selected only if they exceed an absolute standard or match criterion (Ebbesen & Flowe, 2002). Ebbesen and Flowe (2002) report that a lower decision criterion increases the rate at which the target is selected from a target-present lineup and a "best match" is selected in a target-absent lineup. The data from the current study reflect this, such that the rate of correct identification in target-present lineups was higher in the modified elimination as was the rate of false identification in target-absent lineups compared to the traditional elimination lineup. Perhaps informing eyewitnesses that the second question is asked regardless of who they select in the first judgment relaxed their decision criterion during judgment two.

The modified elimination yielded a higher suspect identification relative risk ratio suggesting that when an eyewitness makes an identification, it gives the investigator more incriminating information compared to the traditional elimination lineup; however, these results were not significant. Similarly, the modified elimination yielded a higher filler identification relative risk ratio; when an eyewitness selects a known to be innocent filler, it is more likely that the suspect is innocent compared to the traditional elimination lineup. The rejection diagnosticity ratios were comparable across the two lineups suggesting that when a rejection is made it is equally likely to be a correct rejection in both lineups.

Confidence was found to be a significant predictor of overall accuracy in both lineups; when a witness was 75% or more confident in his or her identification decision, the probability that the witness made a correct decision rose above chance level. Similar

to Study 1, only a modified version of the elimination lineup predicted accuracy in target-present lineups; similar to Study 1, confidence was not a predictor of accuracy in target-absent lineups. When examining the data between choosers and non-choosers, there was only a significant confidence-accuracy relationship observed for non-choosers. These results contradict previous research (e.g., Sauerland & Sporer, 2009; Sporer et al., 1995). However, these results support previous research that has examined the confidence-accuracy relationship for single faces (e.g., Lindsay et al., 2013).

Similar to Study 1, and previous studies that have examined the elimination lineup, the suspect survived the first judgment at a higher rate than any other lineup member in both the elimination lineup and the modified elimination. Moreover, also in line with previous research, the rate at which the suspect survived the first judgment was much lower than the rate of correct identification of the suspect. While the modified instructions did slightly increase the rate of correct identification, the modified instructions were not enough to significantly improve identification accuracy. This suggests that there is something else that may be underlying eyewitness' decisions between judgment one and judgment two of the elimination lineup to cause them to change their minds between the two judgments, perhaps a modification at judgment two of the elimination lineup will help improve identification accuracy.

Study Three

The purpose of Study 3 was to examine whether a modification to judgment two would influence accuracy. More specifically, Study 3 examined whether the inclusion of a wildcard at judgment two would influence accuracy compared to the traditional elimination lineup procedure. Including a salient rejection option at judgment two may

increase the salience of rejecting the lineup which may caution participants against incorrectly rejecting the suspect (i.e., they may become more aware of making a rejection).

Lineup Modifications

Researchers have proposed a new approach to help decrease the amount of false identifications made by children through a revision to the standard simultaneous lineup. This technique is the inclusion of a wildcard that can take the form of a silhouette photo, a "not here" option, an "I don't know" option, or a question mark (Karageorge & Zajac, 2011; Zajac & Karageorge, 2009). The wildcard is presented as an alternative option to lineup photographs in a simultaneous lineup (see Figure 8). Zajac and Karageorge (2009) were the first to investigate whether including the wildcard option influenced identification accuracy among children. Children in the wildcard condition were significantly more likely to correctly reject the target-absent lineup compared to the control condition; furthermore, the inclusion of the wildcard did not compromise the rate of correct identification for target-present lineups (Zajac & Karageorge, 2009). Karageorge and Zajac (2011) conducted a follow up study to explore whether the wildcard's efficacy extended to different conditions and found children were more accurate in correctly rejecting the target-absent lineup when the wildcard was presented; however, the younger children were less accurate in correctly identifying the confederate in the target-present lineup. Together, these studies suggest that the inclusion of a wildcard can help reduce the rate of false identification in a target-absent lineup for child witnesses. The inclusion of a wildcard has also been shown to increase identification accuracy when using video lineups (e.g., Havard & Memon, 2013).

Figure 8

Wildcard.

While the wildcard has shown to be beneficial for child eyewitnesses, research on the effectiveness for young adults is inconclusive. Bruer, Fitzgerald, Therrien, and Price (2015) examined whether the wildcard lineup would be beneficial for young adults in comparison to children. Similar to previous research (e.g., Zajac & Karageorge, 2009; Karageorge & Zajac, 2011), the presence of the wildcard did reduce false choosing in target-absent lineups; however, this came at the cost of also decreasing the rate of correct identifications in target-present lineups for both children and adults. Pozzulo and colleagues (2015) also examined whether identification accuracy was influenced by presenting eyewitnesses with a simultaneous, sequential, elimination, or wildcard lineup. Correct identifications were comparable across the four lineup types; however, when presented with a target-absent lineup, eyewitnesses were more likely to make a correct rejection when presented with an elimination lineup compared to both the wildcard and simultaneous lineups. These results suggest that while the wildcard lineup may be beneficial for children, it may not be a suitable option for young adult eyewitnesses; however, more research is needed to substantiate this claim.

Lindsay and colleagues (1991) examined whether different modifications to the sequential lineup procedure influenced accuracy. Specifically, Lindsay and colleagues

examined the effects of revealing the number of lineup members the witness would be presented with and allowing witnesses a "second chance" to identify someone by allowing them to go through the entire lineup for a second time. In Experiments 1 and 2, participants were asked to identify a suspect from a simultaneous or sequential lineup after being exposed to a staged crime. Those in the experimental condition were able to view the lineup again after seeing the entire lineup sequentially compared to the control condition in which participants were only able to view the lineup once. In Experiment 1, the second viewing of the lineup was in a simultaneous format and in Experiment 2 it varied between simultaneous or sequential. Experiment 3 examined whether telling the eyewitness how many photographs he or she saw influenced identification accuracy. Lindsay and colleagues (1991) found that when witnesses were not aware of the number of lineup members and were not given a second viewing of the lineup, the false identification rates were substantially reduced. These findings suggest that repeated viewings and telling witnesses the number of lineup photographs to be seen reduces accuracy, and thus, the traditional sequential lineup was found to be superior to the modified sequential lineup.

Steblay, Dietrich, Rya, Raczynski, and James (2011) further examined the effects of repeated viewings of the sequential lineup. In Experiment 1, participants viewed a videotaped mock crime and were later asked to make an identification. Participants were presented with either a simultaneous or sequential lineup. At the end of the lineup, participants were given the option of whether they would like to view the lineup again. Repeated viewing of a sequential lineup significantly increased choosing rates, thus elevating both correct and erroneous identifications (Steblay et al., 2011). There was a

significant increase in false identifications for repeated target-absent lineups compared to a non-significant increase in correct identifications for repeated target-present lineups.

A second experiment examined whether it was the second viewing itself that induces a negative impact or a characteristic of the witness who elects for a second viewing that induces the negative impact of repeated viewings. The procedure was similar to Experiment 1 with the exception of the lineup being presented with paper photographs instead of on computer and in one condition participants were required to view the lineup a second time. Results were similar to those found in Experiment 1, repeated viewings were harmful to identification accuracy. Furthermore, witnesses who elected to view the lineup a second time (Experiment 1) made significantly more errors than witnesses who chose to stop after one viewing or those who were required to view the lineup twice (Experiment 2). Thus, viewing a lineup for a second time is more detrimental to eyewitness identification accuracy than it is helpful.

Pozzulo and Lindsay (1997) examined four lineup modifications to determine whether identification accuracy would improve. Younger children (*M*age = 10.3 years), older children (*M*age = 12.5 years), and young adults (*M*age = 19 years) were presented with one of five lineups. The lineups included: (1) a standard control lineup, (2) an "I don't know" condition which allowed participants to select an "I don't know" option if they were unsure whether the target was present, (3) an extended instructions condition with included instructions pertaining to the importance of the lineup task, (4) a video demonstration condition which showed participants how to participate in an identification task, and (5) a reference handout condition that explained to participants how to participate in a lineup task. Younger children had a significantly lower rate of correct

identification compared to the adult group; however, no significant differences were found between the rate of correct identification for adults and older children (Pozzulo & Lindsay, 1997). All four experimental conditions increased the rate of correct identification for young children and all but the extended instructions condition increased the rate of correct identification for older children. Adults produced comparable rates of correct identification across all five lineups. When examining target-absent lineups, all three age groups produced comparable rates of correct rejection. All experimental lineups, with the exception of the "I don't know" condition increased the rate of correct rejection for each age group.

Researchers have also attempted to modify the elimination lineup to help increase identification accuracy. For example, Pozzulo and Lindsay (1999) manipulated lineup instructions with the elimination lineup procedure. Children and adults were presented with the fast-elimination instructions which instructed participants to identify who looks most like the criminal at judgment one. All remaining photographs were then taken away, and the participant was then asked whether the person he or she selected was the criminal. They also used slow-elimination instructions which asked participants who looked *least* like the criminal and then removed the photograph selected. This was repeated until only one photograph was remaining, and then participants were asked whether the remaining person was the criminal. These two conditions were then compared with the standard simultaneous lineup. For both children and adults, the rate of correct identification was higher in the simultaneous lineup compared to both the fast- and slow-elimination lineups. When examining target-absent lineups, children exhibited fewer false identifications when presented with the fast- and slow-elimination lineups

compared to the simultaneous lineup. Adults made comparable rates of false identifications across the simultaneous, fast-elimination, and slow-elimination (Pozzulo & Lindsay, 1999).

Similar to the slow elimination lineup, Horry, Brewer, and Weber (2015) examined a novel lineup procedure known as the grain-size lineup. Horry and colleagues (2015) compared the standard simultaneous lineup to the grain-size lineup to examine whether the grain-size lineup would influence identification accuracy. After watching a videotaped mock crime, witnesses participated in the identification task. Instead of eliminating all but one photograph as in the slow elimination lineup (Pozzulo & Lindsay, 1999), participants were instructed to eliminate any number of photographs to create a smaller lineup. Once the witness reduced the lineup to a size he or she was comfortable with, the participant was then instructed to rate their confidence that each face was the target from the video. A fine grain-sized lineup would be one photograph left whereas a coarse grain-sized lineup would be one with many photographs left. The rate of correct identification in target-present lineups did not vary as a function of lineup procedure; however, the likelihood that a filler identification would be made was higher in the coarse grain-size lineup compared to the simultaneous lineup. Horry and colleagues (2015) found that the grain-size lineup was more detrimental to identification accuracy compared to the standard simultaneous procedure.

Wells and Pozzulo (2006) examined a new lineup procedure aimed to help eyewitness identification accuracy when there are two culprits. Participants were shown a videotaped crime that included both an assailant and an accomplice. Participants were then presented with a simultaneous, sequential, or the modified two-person serial lineup.

The two-person serial lineup consisted of participants being presented with two photographs at once. Each suspect (i.e., the assailant and accomplice) was paired with a foil. The remaining pairs of photographs were both foils. The pairs of photographs were then presented one at a time to the participants. There were no differences in correct identifications across all three lineups; however, the correct rejection rate approached significance. Participants were more likely to correctly reject the assailant lineup when the modified two-person serial lineup was used compared to the sequential lineup. Similarly, participants were more likely to correctly reject the accomplice lineup when the modified two-person serial lineup was used compared to the simultaneous lineup (Wells & Pozzulo, 2006). Although this lineup was created for when multiple perpetrators are present, it is important to understand how new lineup procedures work across all potential crime types.

As can be seen from the literature, researchers are aware that there is not one definitive procedure that improves identification accuracy across both target-present and target-absent lineups. Research is moving in the right direction as there have been modifications made to the simultaneous lineup (e.g., the wildcard lineup; Zajac & Karageorge, 2009) and the sequential lineup (e.g., Lindsay et al., 1991); however, to date, no published study has examined modifications to the elimination lineup procedure other than the slow elimination in 1999. The wildcard modification was found to be beneficial for children, but not adults, and the modifications to the sequential lineup were found to be detrimental to identification accuracy. Therefore, modifications to the elimination lineup seems to be the next logical step in attempting to improve identification accuracy with a modification to the traditional elimination lineup procedure.

Hypotheses

1. There will be a higher rate of correct rejection when using the elimination with wildcard lineup compared to the traditional elimination lineup.
2. The suspect will survive the first judgment in the elimination and the elimination with wildcard lineup procedures at a higher rate than any other lineup member.

   a. Including a salient rejection option at the end of judgment two of the elimination lineup with the wildcard will produce a survival rate of the suspect (e.g., the rate at which the suspect is chosen as most resembling the perpetrator) that is comparable to the correct identification rate (as participants may be more cautious when deciding to accept or reject the photograph selected at judgment one).

Method

Participants. Undergraduate psychology students (N = 240) were recruited from Carleton University via an online participation pool (i.e., SONA; see Appendix M). Participants' ages ranged from 18- to 48-years-old (M = 20.10; SD = 4.28); there were 171 females and 69 males. The majority of participants (51.7%) identified themselves as White/Caucasian, with small numbers of Asians (28.3%), Aboriginal-Canadian (0.4%) Black/African-Canadians (10.4%), and those who identified themselves as either mixed or "other" (7.9%)[5]. Participants received course credit for their participation. A total of 245 students participated in the current study; however, five participants' data were

[5] There were no significant differences in the number of males and females in each lineup condition, $\chi^2(1, N = 120) = .25$, $p < .05$, $\varphi = .05$. There also were no significant differences in ethnic make-up (White vs. non-White), $\chi^2(1, N = 120) = .88$, $p < .05$, $\varphi = .09$.

discarded due to prior knowledge that they would be participating in a study on eyewitness identification.

Design. A 2 (lineup: TP vs. TA) x 4 (lineup procedure: elimination vs. elimination with wildcard) between-subjects design was used. There were four conditions with 60 participants per condition resulting in $N = 240$.

Procedure. The same materials and procedure that were used in Study 1 were also used in Study 3; however, participants who were in the elimination with wildcard condition were given slightly different instructions at judgment two. These instructions stated, "*Think back to the video. Think back to what the criminal looks like. Compare your memory of the criminal to this picture. This may or may not be a picture of the criminal. If this is a picture of criminal, please place a checkmark underneath this box* (i.e., a box representing the photograph he or she selected)*, If this is not a picture of the criminal, please place a checkmark underneath the blackened silhouette*" (see Appendix N).

Results

Preliminary Analyses

Data screening. Prior to analyzing the data, the data were screened for any potential outliers, skewness, or kurtosis in the confidence data; the identification data were categorical, as such, no outliers were observed. Univariate outliers were examined for participants' confidence ratings in their identification decisions. In order to examine outliers, participants' confidence ratings were transformed into their respective z-scores. Given the large sample size ($N = 240$), any participant with a z-score higher than 3.29 or lower than -3.29 was considered an outlier (Cohen et al., 2003). Two participants had a

z-score above 3.29; however, similar to Studies 1 and 2, it was found that these participants' confidence were 10% and 20%. This participant was kept in because confidence was a variable of interest and it is important to understand how confidence plays a role in the confidence-accuracy relationship whether the participant is 0% confident or 100% confident.

Skewness and kurtosis were then examined for the confidence ratings. A descriptive analysis was run with SPSS to obtain the values of skewness (-.97, *SE* = .22) and kurtosis (1.61, *SE* = .44) for the elimination lineup and the skewness (-.75, *SE* = .22) and kurtosis (1.40, *SE* = .44) for the elimination with wildcard lineup. These tests indicated there was not a substantial deviation from normality (West et al., 1995).

Assumptions. Assumptions for Study 3 were identical to those of Studies 1 and 2. Similar analyses to check assumptions were used and the current study met all assumptions for the Pearson chi-square and logistic regression.

Study Results

Identification data were first examined to determine if one lineup elicited higher rates of accuracy over the other, collapsed across target presence. There was no influence of lineup type on overall accuracy, $\chi^2(3, N = 240) = .76$, $p = .86$. Similar to Study 1 and Study 2, identification data were then separated between target-present and target-absent lineups as combining the correct identifications with the correct rejections may obscure the advantages and/or disadvantages associated with each procedure.

Target-present lineups. In order to examine whether identification accuracy differed between the elimination lineup and the elimination with wildcard lineup, a chi-square was calculated. Results indicated there were no significant differences in accuracy

rates between the lineups, $\chi^2(2, N = 120) = .73$, $p = .70$ (see Table 8 for identification rates as a function of lineup). Each lineup procedure produced comparable rates of correct identification.

Target-absent lineups. In order to examine differences in identification accuracy between the elimination lineup and the elimination with wildcard lineup, a chi-square was calculated. Results indicated there was no significant difference in accuracy rates between the lineups, $\chi^2(1, N = 120) = .03$, $p = .85$. Each lineup procedure produced comparable rates of correct rejection.

Table 8

Identification Accuracy as a Function of Lineup Procedure in Study 3.

	Elimination lineup	Elimination with wildcard lineup
Target-present		
Correct identification	0.35 (21)	0.28 (17)
Foil identification	0.25 (15)	0.25 (15)
False rejection	0.40 (24)	0.47 (28)
Target-absent		
Correct rejection	0.60 (36)	0.58 (35)
Foil identification	0.40 (24)	0.42 (25)

Survival status. The survival status is the rate at which each lineup member is selected (i.e., survives) the first judgment in the elimination and elimination-plus procedures (Pozzulo & Lindsay, 1999). In the target-present elimination lineups, the

suspect survived judgment one at a higher rate than any other lineup members. Similar results were obtained when examining the survival status in the elimination with wildcard lineup. However, unlike studies 1 and 2, a binomial test indicated that the suspect did not survive judgment one at a significantly higher rate than any other lineup member, combined, in both procedures, $p > .05$ (see Table 9 for survival rates and identification rates as a function of lineup type and lineup member).

Table 9

Survival Rates (and Identification rates) as a Function of Lineup Member and Lineup Type.

	Lineup Member					
	1	2	3	4	5	6
Target-Present						
Elimination	.33 (.18)	.00 (0)	.00 (0)	.17 (.08)	.00 (0)	.50 (.35)*
Elimination WC	.32 (.20)	.00 (0)	.02 (.00)	.22 (.30)	.00 (0)	.45 (.28)*
Target-Absent						
Elimination	.49 (.20)	.03 (0)	.00 (0)	.21 (.10)	.05 (.02)	.21 (.08)
Elimination WC	.54 (.25)	.00 (0)	.00 (0)	.25 (.05	.00 (0)	.20 (.12)

Diagnosticity. Similar to Studies 1 and 2, three separate relative risk ratios for each lineup procedure were calculated. Relative risk ratios in the current study were calculated similar to those reported in Studies 1 and 2. The suspect relative risk ratio for the elimination lineup procedure was 5.25, 95% CI [1.92, 14.38] and the ratio for the elimination lineup with wildcard procedure was 4.08, 95% CI [1.49, 11.19]; both procedures elicited a relative risk ratio significantly different from zero, and the two ratios did not significantly differ from each other. The elimination lineup elicited a

relative risk ratio of filler identification of 1.60, 95% CI [.94, 2.74], and the elimination lineup with wildcard lineup elicited 1.67, 95% CI [.98, 2.83]; neither ratio was significantly different from zero, nor were they significantly different from each other. The elimination lineup elicited a relative risk ratio of a rejection of 1.50, 95% CI [1.03, 2.18], and the elimination with wildcard lineup elicited .89, 95% CI [.60, 1.34]; neither ratio was significantly different from zero, nor were they significantly different from each other. When examining the survival status diagnosticity ratio, the elimination lineup procedure produced a survival status of 6, and the elimination lineup with wildcard produced a diagnosticity ratio of 4.91. Therefore, when a witness was presented with an elimination lineup, it was 6 times likely that the selected person was the guilty suspect compared to an innocent person and it was 4.91 times likely in the elimination with wildcard procedure.

Confidence. While confidence was not the primary variable of interest of Study 3, analyses were still run to determine whether confidence had any predictive ability. Since confidence was only taken at one time for both lineups in Study 3, the confidence from judgment two was analyzed. A series of logistic regressions were run to examine whether confidence predicted overall accuracy in both the elimination lineup and elimination with wildcard lineup as well as whether the predictive ability varied between target-present and target-absent lineups. Confidence did not predict overall accuracy in the elimination lineup, B = -.002, SE = .01, $p > .05$, or the elimination with wildcard lineup, B = .00, SE = .01, $p > .05$. Similarly, no predictive utility of confidence was found when the data were split between target-present and target-absent lineups for both procedures.

Choosers versus non-choosers. Data were then separated into those who chose someone of out the lineup (N = 118), regardless of target presence, and those that did not (N = 122). Overall, there was a significant relationship between choosing and confidence, $r(240) = .14$, $p = .03$. Data were then separated between choosers and non-choosers to examine whether there was a confidence-accuracy relationship between the two groups. No significant confidence-accuracy relationship was observed for choosers or non-choosers. Data for choosers and non-choosers were then compared across lineup procedure. There was also no confidence-accuracy relationship observed for choosers or non-choosers across both lineup procedures.

Discussion

The purpose of Study 3 was to examine whether including the wildcard at the end of judgment two of the elimination lineup would help increase identification accuracy. Previous research has demonstrated that the inclusion of a salient rejection option is beneficial in target-absent lineups when presented simultaneously with the lineup photographs without compromising the rate of correct identification in target-present lineups (e.g., Pozzulo et al., 2015; Zajac & Jack, 2015). However, to date, there has been no published research that examines the influence of a salient rejection option when an eyewitness is encouraged to use an absolute judgment strategy (i.e., judgment two of the elimination lineup procedure).

There were no differences between the rates of correct identification and correct rejection between the elimination and elimination with wildcard procedures. The rate of correct rejection between the two procedures was nearly identical suggesting that the inclusion of the wildcard in the elimination lineup does not add any benefits for target-

absent lineups. Interestingly, the inclusion of a salient rejection option was detrimental in target-present lineups, although this effect was not statistically significant. This contradicts previous research that has found no detrimental effects of the wildcard in target-present lineups (e.g., Karageorge & Zajac, 2011; Pozzulo et al., 2015). However, these results are similar to the findings reported by Bruer and colleagues (2015) who examined the influence of a salient rejection option in young adults with highly similar fillers. For those who were presented with a target-present wildcard lineup, the rate of correct identification decreased as witnesses were 30% more likely to make a false rejection compared to those who were in the low filler similarity condition. These results suggest that when it is difficult to determine who the guilty suspect is, eyewitnesses may make more use of a salient rejection option (Bruer et al., 2015).

Similar to the conclusions of Bruer and colleagues (2015), Study 3 found that the inclusion of a salient rejection option was neither beneficial nor detrimental in target-absent lineups; however, a salient rejection option proved to be detrimental in target-present lineups. Eyewitnesses tended to incorrectly reject target-present lineups. Verbal instructions are typically given at judgment two of the elimination lineup; eyewitnesses may not fully appreciate what a rejection means when they say “no, this is not the criminal”. Therefore, one can speculate that including a salient rejection option next to the criminal’s photograph in judgment two would increase the salience of what rejecting the chosen photograph entailed. I hypothesized that the inclusion of a salient rejection option would dissuade eyewitnesses from rejecting the lineup, especially when they selected the guilty suspect at judgment one; however, just the opposite occurred. While the suspect did survive judgment one at a higher rate than any other lineup member, this

did not transfer to the rate of correct identification. Perhaps a salient rejection option at judgment two of a target-present elimination lineup made it *easier* to make a rejection, especially if the eyewitnesses were uncertain as to whether they made a correct selection at judgment one. As previous researchers have speculated (e.g., Humphries et al., 2012; Pozzulo & Lindsay, 1999; Pozzulo et al., 2008; 2013; 2015), eyewitnesses may feel that a wrong choice was made at judgment one since they were being asked a second identification question; therefore, having a salient rejection to choose from may have made it more likely to reject the photograph selected at judgment one.

Conversely, it may be that a wildcard is detrimental when eyewitnesses are encouraged to use an absolute judgment decision strategy. Only one study has found the wildcard to be detrimental in target-present, wildcard lineups (e.g., Bruer et al., 2015); however, that was only when the suspect was highly similar to the foils in the lineup. To date, the wildcard lineup has not been tested with the sequential lineup. If similar results are obtained with a sequential lineup, that is, if the rate of correct identification decreases when a wildcard is presented alongside each lineup photograph compared to the traditional sequential lineup, one could speculate that the wildcard is detrimental when eyewitnesses are presented with a lineup procedure that encourages the use of an absolute judgment.

The suspect relative risk ratio for the elimination lineup procedure was higher than the elimination lineup with wildcard procedure suggesting that when an eyewitness makes an identification in the elimination lineup, it was more likely to be correct, albeit not significantly so. Similarly, the elimination lineup with modified instructions yielded a higher filler identification relative risk ratio; when an eyewitness selects a known to be

innocent filler, it is two times more likely that the suspect is innocent compared to the traditional elimination lineup. The rejection relative risk ratios were comparable across the two lineups suggesting that when a rejection is made it is equally likely to be a correct rejection in both lineups.

There was no predictive utility of confidence found for the elimination lineup or elimination with wildcard lineup in Study 3. These results contradict the results from Studies 1 and 2. The rate of correct identification was very low in the elimination with wildcard lineup procedure which could, perhaps, explain why confidence was not a significant predictor of accuracy in target-present lineups. It appears that, not only is a salient rejection option detrimental to identification accuracy in target-present lineups, it also is detrimental to the confidence-accuracy relationship. Similarly, no confidence-accuracy relationship was observed when examining choosers versus non-choosers. Future research should examine a combination of the elimination-plus and elimination with wildcard lineup procedures to determine whether confidence ratings taken after the first judgment of the elimination lineup is predictive of whether an eyewitness will be correct or incorrect in their identification decision at judgment two when a salient rejection option is present.

General Discussion

The purpose of this program of research was to examine whether modifications to the elimination lineup procedure could help increase identification accuracy. Previous research has established that when eyewitnesses are presented with an elimination lineup, the guilty suspect survives the first judgment at a higher rate than any other lineup member. However, when witnesses are forced to make a definitive decision as to

whether the person selected at judgment one is or is not the criminal, the rate of correctly saying the photograph is the criminal is much lower than his survival status. Therefore, the current studies sought to help bridge this gap between a high survival status of the suspect and a lower rate of correct identification of the perpetrator. Three different modifications were used: incorporating confidence after judgment one (Study 1), informing eyewitnesses they would be asked two identification questions prior to the lineup (Study 2), and including at wildcard at judgment two (Study 3).

These studies provide a novel examination of the elimination lineup procedure, and this is the first set of studies to specifically examine how confidence plays a role in identification accuracy when witnesses are presented with an elimination lineup procedure. In the United States, confidence is considered to be an important factor (Neil v Biggers, 1972); therefore, it is important to understand how confidence plays a role in all lineups, not just the simultaneous and sequential procedures.

Identification Accuracy

Faulty eyewitness identification has been reliably established as the leading cause of wrongful convictions (Innocence Project, 2016a). Because of this, it is important to determine ways in which identification accuracy can be increased. A lineup procedure is a system variable that could be easily changed by the legal system. With the debate in the literature as to whether the simultaneous lineup is superior to the sequential lineup, or vice versa, research should focus on other lineup procedures that may be better at increasing identification accuracy. While the elimination lineup procedure was first designed to help child eyewitnesses (e.g., Pozzulo & Lindsay, 1999), it is important to establish a lineup procedure that is beneficial for all age groups so that it can be

consistently used when an eyewitness is presented with a lineup. Therefore, the modifications examined in the current studies were used to determine whether a slight modification would help increase the rate of identification accuracy when eyewitnesses were presented with an elimination lineup procedure.

Identification accuracy was influenced by lineup procedure in target-present lineups in Study 1 of this research. The simultaneous lineup elicited significantly higher rates of correct identification compared to both elimination procedures. The most recent study to examine identification accuracy rates between the simultaneous, sequential, and elimination lineup procedures found no significant differences in target-present lineups (Pozzulo et al., 2015). While Study 1 found no significant differences between the simultaneous and sequential procedures, significant differences were observed between the simultaneous and elimination procedure as well as the simultaneous and elimination-plus procedure. One may conclude that this may be due to the encouragement of an absolute decision strategy in judgment two; however, this conclusion does not adequately explain these findings. If it were solely the absolute decision strategy behind these findings, a significant difference between the simultaneous and sequential lineups would have been observed. Results indicated that in the elimination and elimination-plus procedure, the guilty suspect was chosen in judgment one at a comparable rate to the correct identification rate in the simultaneous lineup. These findings suggest there is something that is causing the witnesses to change their minds from judgment one to judgment two in target-present lineups, other than the absolute decision they are asked to make.

There was no influence of lineup procedure on the rate of correct rejection. These findings are in contradiction to those reported by Pozzulo and colleagues (2008) and Humphries and colleagues (2012) who found that the elimination and sequential procedures resulted in significantly higher rates of correct rejection. Similarly, Pozzulo and colleagues (2013) found the elimination lineup procedure to elicit a significantly higher rate of correct rejection than the simultaneous lineup. While there were trends for the sequential and elimination procedures to elicit higher rates of correct rejection, no significance was observed. The pattern, however, does support other previous research (e.g., Humphries et al., 2012; Pozzulo et al., 2008, 2013).

Studies 2 and 3 did not find any significant differences between the traditional elimination lineup procedure and the modified versions. Study 2 was the first study to examine how specifically informing participants that the elimination lineup procedure asks two questions, regardless of the decision made in judgment one, influenced identification accuracy. Informing the participants resulted in a more conservative decision criterion; however, this did not influence their rate of identification accuracy in target-present or target-absent lineups. While the rate of correct identification in target-present lineups slightly increased in the elimination lineup procedure with modified instructions, the increase was not significantly different from the traditional elimination procedure. Interestingly, the modified instructions actually reduced the rate of correct rejection in target-absent lineups, possibly due to a criterion shift. Knowing ahead of time that there would be two identification questions, witnesses may have been more conservative in their decisions, as evidenced by a higher rate of both correct

identifications in target-present lineups and false positive identifications in target-absent lineups (Ebbesen & Flowe, 2002).

Similar to the conclusions drawn from Humphries and colleagues (2012) regarding the strict decision rule of judgment two, it can be speculated that the amount of time a witness has to make a decision in judgment two can also be influential. For example, the witnesses are told up front that there will two questions, perhaps they believe that they have to make a quick decision at judgment one since there is a follow-up question. However, once they reach judgment two, witnesses may believe they have more time to decide whether the photograph selected is or is not the perpetrator, thus giving them more time which allows a chance for the witnesses to second guess themselves. Future research should examine whether reaction time differs between judgment one and judgment two, and whether there is any influence of reaction time on identification accuracy, or choosing behaviors in general. While further research is needed, the results of Study 2 suggest that it may not be the fact that two questions are being asked that influences the low rate of correct identification in target-present elimination lineups. Future research should examine whether it is the wording of judgment two that causes a witness to change his or her mind.

Study 3 examined whether a modification to judgment two of the elimination lineup procedure influenced identification accuracy. The majority of research that examines the influence of a salient rejection option examines child eyewitnesses, as they have a difficult time rejecting target-absent lineups (e.g., Pozzulo & Lindsay, 1999; Zajac & Karageorge, 2009). Some studies have included different rejection options with young adults such as a blackened silhouette (Pozzulo et al., 2012) and an explicit “Not Here”

response option on the lineup response sheet (Pozzulo & Dempsey, 2006); however, these rejection options were not under direct examination so it is unknown whether these rejection options were beneficial.

In Study 3, the salient rejection option was provided in the form of a wildcard. This was directly compared to the traditional elimination lineup. It was predicted that the salience of rejecting the lineup would be beneficial in target-present lineups as witnesses would be able to physically reject the lineup instead of only verbally rejecting; however, just the opposite was found. Including a salient rejection option was detrimental to identification accuracy in target-present lineups. These results are similar to those reported by Bruer and colleagues (2015) who found no benefit in providing a salient rejection option for young adults, especially when the fillers were of high similarity to one another. The results of Study 3, and prior research that has examined salient rejection options in young adults, suggests that a verbal rejection statement in the lineup instructions (i.e., the perpetrator may or may not be present) may add more benefits to the eyewitness compared to a visual rejection option.

Survival status. Across all three studies, the survival status of the suspect from judgment one of the elimination lineup procedure was higher than the rate of correct identification in judgment two, but not significantly so in Study 3. These findings support previous research that has examined the elimination lineup procedure (e.g., Humphries et al., 2012; Pozzulo et al., 2008, 2013, 2015). When asking the eyewitness who looks most like the criminal, the guilty suspect is often selected; however, when the question format changes, and the witness is asked whether the picture is or is not the criminal, the high survival status then decreases to a lower rate of correct identification.

In Study 1, the survival status of the suspect in the elimination and elimination-plus procedures was comparable to the rate of correct identification in simultaneous lineups. These results support prior research that has found a relative judgment strategy is beneficial in target-present lineups (Wells, 1993). Previous research has also found a comparable rate of correct identification and survival status between the simultaneous and elimination lineup procedures (e.g., Pozzulo et al., 2013). These results also support the idea that eyewitnesses may second guess themselves when asked to make an additional identification decision (i.e., judgment two in the elimination lineup procedure). Eyewitnesses were just as likely to select the perpetrator in the simultaneous, elimination, and elimination-plus procedures; however, when asked to determine whether the person they selected was or was not the perpetrator in judgment two of the elimination procedures, their identification decision changed. One potential explanation that has not been explored, is that participants may believe the perpetrator is not in the lineup photographs at all; however, they are still asked to make a selection in the first judgment. Because they don't believe the perpetrator is there, they may not spend enough time really studying the selected photograph and go on to say "no, this is not the criminal" at judgment two.

Diagnosticity. When examining the relative risk ratios of the four lineups in Study 1, the simultaneous elicited a higher suspect identification diagnosticity ratio compared to the elimination lineup procedure; however, this difference was not significant. Combined with the significant differences observed for identification accuracy, these results suggest that a simultaneous lineup might be superior to the elimination lineup procedure in target-present lineups. What is perplexing is that the

simultaneous lineup elicited a significantly higher relative risk ratio of rejection, suggesting that when a rejection is made in the simultaneous lineup, it is more likely that a correct rejection has been made compared to the elimination procedure. This contradicts the rate of correct rejection observed in the elimination lineup (.67) and the simultaneous lineup (.53); however, when examining the rate of false rejection in target-present lineups, it is evident that there were more false rejections in the elimination lineup (.50) compared to the simultaneous lineup (.10) which could explain the significance.

In Studies 2 and 3, there were no significant differences observed between any of the relative risk ratios suggesting that the modifications to the elimination procedure examined in the current studies were not beneficial in increasing the diagnosticity of the elimination lineup procedure. Only one other study has reported the diagnosticity ratio of the elimination lineup (e.g., Pozzulo et al., 2015), and reported the diagnosticity ratio of the elimination lineup was 12.00, which is substantially higher than the diagnosticity ratios found in the current studies. This may be attributed to the difference in rates of correct identification and false identification Pozzulo and colleagues' (2015) study compared to the current studies reported in this program of research.

Only one other published study has examined the diagnosticity ratio of the survival status of the elimination lineup procedure (e.g., Pozzulo et al., 2015); therefore, the results of the current studies can only be compared to that study. Pozzulo and colleagues found that the diagnosticity ratio for the survival status of the elimination lineup procedure was 4.8, that is, when a selection was made in judgment one of the elimination lineup procedure, the guilty suspect was 4.8 times more likely to be selected

than an innocent suspect. In Study 1 of the current program of research, similar results were found such that the guilty suspect was 5.25 times more likely to be selected when presented with an elimination-plus procedure and 4.29 times more likely to be selected when presented with the traditional elimination procedure compared to an innocent suspect being selected. The diagnosticity ratio of the survival status in the elimination procedures provides yet another piece of evidence as to the guilt of the suspect included in the lineup. Similar results were obtained in Study 2, each procedure yielded a survival status diagnosticity ratio above four. In Study 3, the elimination lineup procedure had a survival status diagnosticity ratio of 2.94, and the elimination with wildcard had a survival status diagnosticity ratio of 2.18. Similar to the identification data reported in Study 3, the survival status of the suspect from the elimination with wildcard procedure is not particularly helpful as it was not significantly different from zero. The elimination with wildcard procedure was exploratory in nature, such that it was examined to determine whether including the wildcard at judgment two would help increase identification accuracy. After examining the rates of identification accuracy, diagnosticity ratios, and survival status, a conclusion can be made that the addition of the wildcard was detrimental to eyewitness identification accuracy.

Confidence ratings. There have only been a handful of studies that have examined a novel way of obtaining identification decisions: confidence ratings. Instead of asking witnesses for a binary yes/no decision, researchers ask the witness to rate his or her confidence that each picture is the criminal (e.g., Sauer et al., 2008, 2012; Weber & Varga, 2012). Confidence ratings have been found to be beneficial when the target is not present. Study 1 of this program of research is the first study to apply these confidence

ratings to the elimination lineup. As predicted, the use of confidence ratings at the end of the first judgment was beneficial in target-absent lineups. Compared to the dichotomous decision of judgment two in the elimination-plus procedure, utilizing confidence assessments increased the rate of correct rejection. This may be due to the conservative nature of the algorithm used (Sauer et al., 2008).

The inclusion of the confidence rating after judgment one may help alleviate any social pressures typically felt by an eyewitness when asked to make an identification decision. Given that eyewitnesses are not being forced to make a dichotomous decision they may not feel pressure to make the "correct" decision given they are placing their decision on a continuum. Moreover, the binary identification decision does not give us any information as to how well the photograph matches the witness' memory of the perpetrator whereas the use of confidence ratings does. Confidence ratings allow us to directly measure the degree of match. If the degree of match is high, it would be exhibited by a higher confidence rating.

Relative judgment decision strategies have been found to be detrimental when eyewitnesses are presented with a target-absent lineup (Wells, 1993; Wells et al., 1998). This is potentially problematic because the person who looks most like the criminal is not, in fact, the criminal. These confidence ratings obtained after judgment one of the elimination-plus procedure is an avenue for further research as the correct rejection rate in target-absent lineups was higher when examining confidence ratings compared to the dichotomous identification decision.

The results of the influence of confidence ratings on identification accuracy are intriguing. While confidence ratings did not influence identification accuracy in target-

present lineups, confidence itself at the end of judgment one of the elimination-plus procedure was predictive of identification accuracy. The results are reversed for target-absent lineups. Confidence ratings did appear to increase the rate of correct rejections, albeit not significantly, but had no predictive utility for identification accuracy. Unfortunately, when a police officer is conducting a lineup, he or she is typically unaware of whether the perpetrator is among the photographs. It is important to find a modification of a lineup that will help in both target-present and target-absent lineups so that the police do not have to worry that the strategy they are using is only beneficial for when the perpetrator is present, or vice versa.

Confidence

The current program of research examined confidence via the post-decisional locus model, that is, confidence was obtained after a decision was made (Sauer & Brewer, 2015). A witness is assumed to compare the lineup photographs to his or her memory of the perpetrator and then generate a degree of match between the photographs and his or her memory (i.e., confidence). If the degree of match is high, one can expect the witness to exhibit a high level of confidence; moreover, if the degree of match is low, one can expect the witness to exhibit a low level of confidence. The majority of studies that seek to examine a meaningful confidence-accuracy relationship typically employ a simultaneous or sequential lineup, however, if a meaningful confidence-accuracy relationship is being sought, all lineup procedures should be examined.

Similar to previous research that has examined the confidence-accuracy relationship with the point-biserial correlation approach, a significant confidence-accuracy relationship emerged. It is interesting that the confidence-accuracy relationship

was only significant in target-present lineups. Eyewitnesses who were accurate in their identification decision were more confident in their decisions in Studies 1 and 2; however, the effect was rather small. This supports the findings of Sauerland and Sporer (2009) who also found that accurate witnesses were also likely to be more confident. An overall confidence-accuracy relationship was found for only one type of lineup: the elimination lineup procedure; those eyewitnesses who report a higher identification decision confidence are also likely to be accurate in their decision. These results are somewhat perplexing because the elimination-plus procedure was nearly identical to the elimination lineup as the only change was the addition of confidence after judgment one. The fact that there were two confidence questions could be a potential explanation. Perhaps the fact that they were asked a second confidence question was detrimental to their perceived feelings of confidence. I have discussed how the rate of correct identification is lower at judgment two, this could also be the same for confidence. Participants may feel less confident in the actual identification task since they are being asked both an additional identification question as well as a confidence question. This is the first study to examine two confidence questions with the elimination lineup procedure, as such, there is no previous research to compare to.

Study 1 found that, in addition to survival status, asking for confidence after judgment one of the elimination lineup procedure provides an additional piece of information as to the guilt of the suspect in target-present lineups. If an eyewitness makes a selection and reports being 75% confident or more, the likelihood that the person selected the guilty suspect is higher than chance. Similarly, if the witness then replies with “yes, this is the criminal” at judgment two and reports a 70% confidence level or

higher, it is also above chance level that the witness correctly identified the guilty suspect. Therefore, the elimination-plus procedure provides four pieces of helpful information as to whether the witness selected the guilty perpetrator: (1) survival status, (2) confidence after judgment one, (3) the identification decision, and (4) the confidence in his or her identification decision.

If we take this one step further, and examine the average of the confidence from judgment one and judgment two, we find a fifth piece of evidence. If a witness reports a combined confidence of 75% or more, the probability that he or she made a correct decision rises above chance level. While these different pieces of helpful information do not necessarily bridge the gap between survival status and the rate of correct identification, it does give more information as to whether the lineup member selected is the guilty suspect.

These results suggest that asking an eyewitness how confident he or she is that the lineup member selected is the criminal can have good utility in determining the potential guilt of the alleged suspect. Sporer and colleagues (1995) report that confidence is more useful when an eyewitness makes a choice compared to not making a choice. The same conclusions can be drawn from Study 1. Choosers who were highly confident were also more likely to be correct in their decisions. This was true for all three confidence ratings that can be obtained from the elimination-plus procedure. Asking an eyewitness for his or confidence in the subsequent identification task of the elimination-plus lineup also has predictive utility when the suspect is present. In addition to the survival status, the elimination procedure may prove beneficial when asking eyewitness' what their confidence is that the person they selected as most looking like the criminal is indeed the

criminal. These are two additional pieces of information that are not given in the simultaneous or sequential lineups. The use of confidence ratings also provides additional pieces of information for the investigator; specifically, it provides information about the extent to which the suspect matches the witness' memory of the perpetrator and the similarity of the suspect to the witness' memory relative to the other lineup members (Sauer & Brewer, 2015). Placing guilt on a continuum may relieve some of the pressure an eyewitness feels when determining whether the person they selected is or is not the criminal.

Adding confidence after judgment one is an easy modification that can be implemented when administering the elimination lineup; however, the wording must be correct. The confidence question asked after judgment one was "how confident are you that the person you selected is the criminal". This is different than the confidence question after judgment two which asks "how confident are you that you made the right decision?". Future research may also want to incorporate different ways of asking witnesses for their confidence to see whether it elicits a stronger relationship between confidence and accuracy.

Interestingly, there was a significant confidence-accuracy relationship for non-choosers in Study 2. Those who did *not* select anyone from the lineup and had high confidence in their rejection were more likely to be accurate. While this is not what is typically observed in the literature, other researchers have found this (e.g., Dysart, Lindsay, & Dupius, 2006; Lindsay et al., 2013; Sauerland, Sagana, & Sporer, 2012) when examining the confidence-accuracy relationship for a single face. Given that participants had to choose or reject a single face at judgment two of elimination procedures, this may

be why the relationship was observed. Instead of rejecting multiple faces at once, the witness is only asked to make a rejection about a single face which may increase his or her confidence in the rejection.

This program of research was also one of the first to specifically examine the confidence-accuracy relationship for the elimination lineup procedure. When examining the predictive utility of confidence in the elimination procedure, confidence was found to predict overall accuracy (irrespective of target presence). However, confidence only predicted accuracy in target-present lineups in the modified versions of the elimination lineup in Studies 1 and 2. The elimination wildcard lineup procedure is identical to the elimination procedure with the exception that a wildcard is used in judgment two in place of selecting "no, this is not the criminal". Given that confidence was not predictive of target-present lineups in any of the elimination lineups utilizing the traditional methodology (i.e., not adding in confidence following judgment one), this could be the reason why confidence was not predictive of target-present accuracy in the elimination with wildcard procedure.

Across all three studies, confidence was not a significant predictor in any lineup examined in target-absent lineups. Trace access theory suggests there is direct access to memory when confidence and recognition decisions are being made, when there is a strong match, confidence is likely to be higher (Busey et al., 2002). When the perpetrator is not present, there is not a strong memory match between any of the photographs and the witness' memory for the perpetrator which could lead to a lower rate of confidence.

Limitations

There are methodological limitations that warrant discussion and provide an avenue for future research. The current study did not elicit the stress that is often observed when someone is witness to a crime. Witnesses watched a video in a safe environment and were also asked to participate in the lineup in the same location the crime was viewed. Similarly, while there may have been social pressure to make a correct decision when presented with the lineup task, participants knew that their selection was not going to determine whether an innocent person was sent to jail or a guilty person was wrongfully rejected. Moreover, the eyewitnesses in the current study had optimal conditions. For example, they were told they would be watching a video and there were no distractions throughout the duration of the video. In the real world, there will most likely be distractions that may divide the attention of the eyewitness between the crime being committed and any other distractions (i.e., fearing for one's life). The purpose of this program of research was to examine whether there was any influence of confidence in eyewitness identification decisions when presented with a modified version of the elimination lineup procedure. A relationship was found; therefore, future research could examine whether the same relationship is observed in a field setting with a staged, "live" crime compared to the videotaped crime used in this research.

Real World Implications

Researchers have been examining ways to improve identification accuracy for decades, and some findings have been implemented by the legal system. For example, a guide was created in 1999 that provided recommendations for the collection of eyewitness evidence, *Eyewitness evidence: A guide for law enforcement*. This guide was collaborated on by both psychologists and legal scholars. Investigators are asked to

obtain a confidence statement directly after an identification decision has been made. The use of the elimination-plus procedure is something that could be easily introduced to the legal system, as investigators would only have to ask for an additional confidence statement. This would be an easier modification than presenting and training investigators on an entirely new lineup procedure.

Not only can confidence be a useful predictor in determining whether the suspect apprehended is indeed guilty, it can also speak to the witness' memory and whether he or she would be a reliable witness to put on the stand, as eyewitness testimony is highly influential in juror decision making (Cutler & Penrod, 1995). For example, in Montana, Jimmy Bromgard spent almost fifteen years in prison for a crime he did not commit. The witness' confidence was taken, however, she reported being only about 65% confident in her decision (Innocence Project, 2016b). Perhaps 65% is too low as found in the current program of research. More research is needed regarding confidence.

Overall, confidence is an important part of the eyewitness identification process in and of itself, and it is highly influential in juror decision making (e.g., Desmarais & Read, 2011). The current studies support the notion that there is a relationship between confidence and accuracy; moreover, the current studies support the idea that how and when confidence is asked may play a role in the relationship. Further research is needed to explore the best way to ask a witness his or her confidence.

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Wells, G.L., Smith, A., & Smalarz, L. (2015). ROC analysis of lineups obscures information that is critical for both theoretical understanding and applied purposes. *Journal of Applied Research in Memory and Cognition, 4*, 324-328. doi: 10.1016/j.jarmac.2015.08.010

Wells, G.L., Steblay, N., & Dysart, J. (2015). Double-blind photo lineups using actual eyewitnesses: An experimental test of a sequential versus simultaneous lineup procedure. *Law and Human Behavior, 29,* 1-14. doi: 10.1037/lhb0000096

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Zajac, R., & Jack, F. (2015). Improving children's performance on photographic line-ups: Do the physical properties of a 'wildcard' make a difference? *Legal and Criminological Psychology*. Advance online publication. doi: 10.1111/lcrp.12075

Zajac, R., & Karageorge, A. (2009). The wildcard: A simple technique for improving children's lineup performance. *Applied Cognitive Psychology, 23,* 358-368. doi: 10.1002/acp.1511

Appendix A

SONA Recruitment Notice (Studies 1 and 2)

Study Name: How confident are you?

Description: Participation in this study will require that you watch a short video, play a puzzle game on the computer, and answer some related questionnaires.

Eligibility Requirements: Must be 18-years-old or older

Duration: approximately 45 minutes

Location: SSRB 111, Carleton University

Compensation: 1% in PSYC 1001, PSYC 1002, PSYC 2001, PSYC 2002, NEUR 2001, or NEUR2002

Restrictions: Participants cannot sign up for this study if they have already participated in "Goals, Dreams, and Vocabulary Parts 1 & 2."

Researchers

Primary Investigator: Emily Pica

Phone: (613) 520-2600 ext. 3695

Email: emilypica@cmail.carleton.ca

Faculty Advisor: Dr. Joanna Pozzulo

This study has received clearance by the Carleton University Psychology Research Ethics Board (14-037).

Appendix B

Demographics Form

Your age:_____

Your sex:_____

Ethnicity: Please indicate which ethnic group you would consider yourself to belong to by checking the appropriate box (optional):

- ☐ White (e.g., European)
- ☐ Black (e.g., African, African American, African Canadian, Caribbean)
- ☐ East Asian (e.g., Chinese, Japanese, Korean, Polynesian)
- ☐ South Asian (e.g., Indian, Pakistani, Sri Lankan, Bangladeshi)
  Southeast Asian (e.g., Burmese, Cambodian, Filipino, Laotian, Malaysian, Thai, Vietnamese)
- ☐ West Asian (e.g., Arabian, Armenian, Iranian, Israeli, Lebanese, Palestinian, Syrian, Turkish)
- ☐ Latin American (e.g., Mexican, Indigenous Central, South American)
- ☐ Aboriginal Canadian/Native Canadian/First Nations
- ☐ Mixed origin, please specify:_____
- ☐ Other:_____

Appendix C

Event Description
Please write down everything that you can remember about the video.

Person Description
Please write down everything you can remember about the criminal.

Appendix D

Simultaneous Lineup Response Form

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 number. If you do not see the criminal, please place a check mark in the box at the bottom.

Photo 1 Photo 2 Photo 3

Photo 4 Photo 5 Photo 6

Not Here

Please rate your confidence in the accuracy of your decision using a numerical value between 0 (*not at all confident)* and 100 *(very confident)*: _____

Appendix E

Sequential Lineup Response Form

Think back to the video. Think back to what the criminal looks like. I am going to show you some pictures. Please look at each picture. The criminal's picture may or may not be here. You will only be allowed to look at each photo once. Please look at each photo and decide if it is or is not a picture of the criminal. If the picture is of the criminal, please place a check mark in the box labelled 'yes.' If it is not a picture of the criminal, please place a check mark in the box labelled 'no.' Please note that you will NOT be able to re-examine any pictures. Also, you will NOT be allowed to move forward until you make a decision about the picture you are looking at. After each decision, please rate your confidence in your decision on a 0 (*not at all confident*) to 100 (*very confident*) scale.

1. **Is #1 the criminal?**

   ☐ Yes ☐ No

   Confidence on a 0 (*not at all confident*) to 100 (*very confident*) scale: _____

2. **Is #2 the criminal?**

   ☐ Yes ☐ No

   Confidence on a 0 (*not at all confident*) to 100 (*very confident*) scale: _____

3. **Is #3 the criminal?**

   ☐ Yes ☐ No

   Confidence on a 0 (*not at all confident*) to 100 (*very confident*) scale: _____

4. **Is #4 the criminal?**

   ☐ Yes ☐ No

   Confidence on a 0 (*not at all confident*) to 100 (*very confident*) scale: _____

5. Is #5 the criminal?

☐ Yes ☐ No

Confidence on a 0 (*not at all confident*) to 100 (*very confident*) scale: _____

6. Is #6 the criminal?

☐ Yes ☐ No

Confidence on a 0 (*not at all confident*) to 100 (*very confident*) scale: _____

7. Is #7 the criminal?

☐ Yes ☐ No

Confidence on a 0 (*not at all confident*) to 100 (*very confident*) scale: _____

8. Is #8 the criminal?

☐ Yes ☐ No

Confidence on a 0 (*not at all confident*) to 100 (*very confident*) scale: _____

9. Is #9 the criminal?

☐ Yes ☐ No

Confidence on a 0 (*not at all confident*) to 100 (*very confident*) scale: _____

10. Is #10 the criminal?

☐ ☐

Yes No

Confidence on a 0 (*not at all confident*) to 100 (*very confident*) scale: _____

Appendix F

Elimination Lineup Response Form

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.

This might be a picture of the criminal or it might be a picture of somebody else. Think back to what the criminal looks like. I want you to compare your memory of the criminal to this picture. I would like you to tell me if this is a picture of the criminal or somebody else. If you think this is a picture of the criminal, place a checkmark beside *Yes, this is a picture of the criminal.* If you think this not a picture of the criminal, place a check mark beside *No, this is not a picture of the criminal*.

☐ ***Yes, this is a picture of the criminal.***

☐ ***No, this is not a picture of the criminal.***

Please rate your confidence in the accuracy of your decision using a numerical value between 0 (*not at all confident)* and 100 *(very confident)*: _____

Appendix G

Elimination-Plus Lineup Response Form

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.

Photo 1	Photo 2	Photo 3
Photo 4	Photo 5	Photo 6

Please rate your confidence that the person most similar looking to the criminal is the criminal using a numerical value between 0 (*not at all confident)* and 100 *(very confident)*: _____

This might be a picture of the criminal or it might be a picture of somebody else. Think back to what the criminal looks like. I want you to compare your memory of the criminal to this picture. I would like you to tell me if this is a picture of the criminal or somebody else. If you think this is a picture of the criminal, place a checkmark beside *Yes, this is a picture of the criminal.* If you think this not a picture of the criminal, place a check mark beside *No, this is not a picture of the criminal*.

☐ ***Yes, this is a picture of the criminal.***

☐ ***No, this is not a picture of the criminal.***

Please rate your confidence in the accuracy of your decision using a numerical value between 0 (*not at all confident)* and 100 *(very confident)*: _____

Appendix H

Study Checks

1. Did you know that you would be acting as an eyewitness to a crime before coming to the study session today? Please circle the appropriate response.

   YES NO

2. Did you know anyone from the criminal photo lineup (e.g., one of the boys is your friend)?

   YES NO

3. Before today, have you ever completed a photo lineup identification procedure? If yes, please explain.

   YES NO

4. Have you ever taken a class on eyewitness memory?

   YES NO

Appendix I

Informed Consent Form (Studies 1 and 2)

The purpose of informed consent is to ensure that you understand the purpose of the study and the nature of your involvement. Informed consent must provide sufficient information such that you have the opportunity to determine whether or not you wish to participate in the study.

Present study: How confident are you?

Research personnel: The following people will be involved in this research project and may be contacted at any time: Emily Pica (Principal Investigator, emilypica@cmail.carleton.ca, 613-520-2600, ext. 3695) or Dr. Joanna Pozzulo (Faculty Advisor, joanna.pozzulo@carleton.ca, 613-520-2600, ext. 1412).

Concerns: If you should have any ethical concerns about this study please contact, Dr. Shelley Brown (Chair, Carleton University Research Ethics Board-B, shelley.brown@carleton.ca, 613-520-2600, ext. 1505).

Purpose: The purpose of this study is to examine your confidence in different decisions.

Task requirements: You will be asked view a video and then complete questionnaires regarding that video.

Duration and locale: Testing will take place in Room 111, Social Sciences Research Building, Carleton University. This study will be completed in one testing session that will last approximately 45 minutes.

Token for participation: You will receive a 1% increase in your final grade of PSYC 1001, PSYC 1002, PSYC 2001, PSYC 2002, NEUR 2001, or NEUR2002 for participating in this study.

Potential risk/discomfort: There are no potential risks involved in this experiment. Should you experience any unease, you have the right to withdraw from the study and still receive course credit.

Anonymity/Confidentiality: All the information you provide will be strictly confidential. Data will only be used for research at Carleton University. Your answers will NOT be linked to your name or signature (i.e., consent form) and your responses will be coded in such a way that you cannot be identified.

Protection of Personal Information: This Informed Consent Form will be kept in the Lab for seven years. It will be placed in a room that has restricted access and is kept locked and closed at all times. At the seven year mark, it will be shredded and disposed of.

Right to withdraw: Your participation is strictly voluntary. At any point during the study you have the right not to complete certain questions or to withdraw from the study without any penalty whatsoever.

This study has received clearance by the Carleton University Psychology Research Ethics Board (14-037).

Signatures: *I have read the above form and hereby consent to participate in this study. The data in this study will be used for research publications and/or teaching purposes. I am aware that the data collected in this study will be kept strictly confidential and anonymous. My signature indicates that I understand the above and wish to participate in this study.*

Participant's Name (print): _____

Participant's Signature: _____

Researcher's Name (print): _____

Researcher's Signature: _____

Date: _____

Appendix J

True Informed Consent Form (Studies 1 and 2)

The purpose of informed consent is to ensure that you understand the purpose of the study and the nature of your involvement. Informed consent must provide sufficient information such that you have the opportunity to determine whether or not you wish to participate in the study.

Present study: Does an alternative lineup procedure utilizing confidence assessments increase identification accuracy?

Research personnel: The following people will be involved in this research project and may be contacted at any time: Emily Pica (Principal Investigator, emilypica@cmail.carleton.ca, 613-520-2600, ext. 3695) or Dr. Joanna Pozzulo (Faculty Advisor, joanna.pozzulo@carleton.ca, 613-520-2600, ext. 1412).

Concerns: If you should have any ethical concerns about this study please contact, Dr. Shelley Brown (Chair, Carleton University Research Ethics Board-B, shelley.brown@carleton.ca, 613-520-2600, ext. 1505).

Purpose: The purpose of this study is to examine your accuracy with remembering who and what you saw. You will be asked to describe the video and then you will be shown some photographs. We also will measure your confidence with this task. When you signed up for this study you were told that the purpose was to assess your confidence in different decisions; this was deceptive because the true nature of this study is actually eyewitness accuracy. Eyewitnesses are not made aware when a crime will occur; therefore, the purpose of the deception was to mimic a real life situation as much as possible. Had you been aware that you were about to watch a crime you may have attended to the video in a different way and your responses would not be representative of most criminal incidents. You have the opportunity to withdraw your data without penalty. However, if you wish to continue with this study, you can give your consent by signing this informed consent form.

Task requirements: You will be asked to answer a few short questionnaires relating to the video you watched and play a computer game.

Duration and locale: Testing will take place in Room 111, Social Sciences Research Building, Carleton University. This study will be completed in one testing session that will last approximately 45 minutes.

Token for participation: You will receive a 1% increase in your final grade of PSYC 1001, PSYC 1002, PSYC 2001, PSYC 2002, NEUR 2001, or NEUR2002 for participating in this study.

Potential risk/discomfort: There are no potential risks involved in this experiment. Should you experience any unease, you have the right to withdraw from the study without penalty.

Anonymity/Confidentiality: All the information you provide will be strictly confidential. Data will only be used for research at Carleton University. Your answers will NOT be linked to your name or signature (i.e., consent form) and your responses will be coded in such a way that you cannot be identified.

Protection of Personal Information: This Informed Consent Form will be kept in the Lab for seven years. It will be placed in a room that has restricted access and is kept locked and closed at all times. At the seven year mark, it will be shredded and disposed of.

Right to withdraw: Your participation is strictly voluntary. At any point during the study you have the right not to complete certain questions or to withdraw from the study without any penalty whatsoever.

This study has received clearance by the Carleton University Psychology Research Ethics Board (14-037).

Signatures: *I have read the above form and hereby consent to participate in this study. The data in this study will be used for research publications and/or teaching purposes. I am aware that the data collected in this study will be kept strictly confidential and anonymous. My signature indicates that I understand the above and wish to participate in this study.*

Participant's Name (print): _____

Participant's Signature: _____

Researcher's Name (print): _____

Researcher's Signature: _____

Date: _____

Appendix K

Debriefing Form (Studies 1 and 2)

What are we trying to learn in this research?

The purpose of the present study is to assess the use of an alternative lineup procedure using confidence ratings compared to saying 'yes, this is the criminal' or 'no, this is not the criminal' to see whether it is better at diagnosing the guilt of a suspect compared to traditional lineup procedures. The use of confidence ratings has been found to increase the rate of correct identification when using a simultaneous procedure (the lineup photos are presented all at once to a witness) and a sequential procedure (the lineup photos are presented one at a time to a witness). There has been no research examining its ability to better diagnose guilt when using the elimination lineup, which is a two judgment lineup. The first judgment consists of presenting all of the photos at once to the witness and asking him or her to decide which photo most looks like the suspect. Once a choice has been made, all photos, except the one the witness chose, are taken away and the witness is then asked to decide whether that photo is indeed the criminal. We are examining whether the use of confidence ratings in the elimination lineup procedure (e.g., the elimination-plus procedure) is better and increasing accuracy.

Why is this important to scientists or to the general public?

This research is important because faulty eyewitness identifications are one of the leading causes of innocent people being sent to jail. It is important to know if there is an alternative method that helps increase accurate identification decisions compared to the standard procedures currently in place.

What are our hypotheses and predictions?

We predict that there will be higher a higher rate of identification accuracy when using the modified elimination lineup procedure that utilizes confidence ratings compared to both the traditional simultaneous and elimination lineups. We also predict that utilizing the confidence ratings will help transfer the high "survival status" of the suspect in judgment one (e.g., how often the suspect is chosen as most resembling the perpetrator) of the elimination lineup to a high rate of correct identification in judgment two.

Where can I learn more?

Pozzulo, J., & Lindsay, R.C.L. (1999). Elimination lineups: An improved identification procedure for child witnesses. *Journal of Applied Psychology, 84,* 167-176.

Sauer, J.D., Brewer, N., & Weber, N. (2008). Multiple confidence estimates as indices of eyewitness memory. *Journal of Experimental Psychology: General, 137,* 528-547. doi: 10.1037/a0012712

Sauer, J., Weber, N., & Brewer, N. (2012). Using ecphoric confidence ratings to discriminate seen from unseen faces: The effects of retention interval and distinctiveness. *Psychonomic Bulletin & Review, 19,* 490-498.

Why didn't you tell me I was going to watch a video of a crime?

We did not tell you that you would be watching a videotape of a theft because we wanted to mimic real life as much as possible and real life crime happens unexpectedly. Had you been forewarned of the crime aspect of the study, you may have paid attention to the video in a different way and, in turn, this would have influenced your responses to our questions. In this case, your responses would not have been useful to us because they would not be representative of how a real life witness would experience a similar situation.

Note. The video you watched was completely fictional, no crime was actually committed.

What if I feel distress or anxiety after participating in this study?

If you feel any distress or anxiety after participating in this study, please feel free to contact the Carleton University Health and Counseling Services at: 613-520-6674, or the Distress Centre of Ottawa and Region at 613-238-3311 (http://www.dcottawa.on.ca).

What if I have questions later?

If you wish to discuss this research any further feel free to contact any one of the following people: Emily Pica (Principal Investigator, emilypica@cmail.carleton.ca, 613-520-2600, ext. 3695) or Dr. Joanna Pozzulo (Faculty Advisor, Joanna.pozzulo@carleton.ca, 613-520-2600, ext. 1412).

What if I have concerns?

If you should have any ethical concerns about this study please contact, Dr. Shelley Brown (Chair, Carleton University Research Ethics Board-B, shelley.brown@carleton.ca, 613-520-2600, ext. 1505).

At this time we would like to thank you for taking the time to take part in this study. Your participation has been greatly appreciated!

Appendix L

Elimination Lineup with Modified Instructions Response Form

This is a two-step identification procedure. I will be asking you two questions regarding your memory for the criminal. I ask both of these questions regardless of who you select. My asking you two questions does not reflect whether you were correct or incorrect in your selection.

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.

This might be a picture of the criminal or it might be a picture of somebody else. Think back to what the criminal looks like. I want you to compare your memory of the criminal to this picture. I would like you to tell me if this is a picture of the criminal or somebody else. If you think this is a picture of the criminal, place a checkmark beside *Yes, this is a picture of the criminal.* If you think this not a picture of the criminal, place a check mark beside *No, this is not a picture of the criminal*.

☐ ***Yes, this is a picture of the criminal.***

☐ ***No, this is not a picture of the criminal.***

Please rate your confidence in the accuracy of your decision using a numerical value between 0 (*not at all confident)* and 100 *(very confident)*: _____

Appendix M

SONA Recruitment Notice (Study 3)

Study Name: To See or Not to See, that is the Question?

Description: Participation in this study will require that you watch a short video, play a puzzle game on the computer, and answer some related questionnaires.

Eligibility Requirements: Must be 18-years-old or older. This is a visual activity. If you have any vision problems that prohibit you from viewing a video, you are ineligible to participate in the current study.

Duration: approximately 45 minutes

Location: SSRB 111, Carleton University

Compensation: 1% in PSYC 1001, PSYC 1002, PSYC 2001, PSYC 2002, NEUR 2001, or NEUR2002

Restrictions: Participants cannot sign up for this study if they have already participated in "Goals, Dreams, and Vocabulary Parts 1 & 2" or "How Confident are You?"

Researchers

Primary Investigator: Emily Pica, Psychology Department, PhD Student

Phone: 613-520-2600, ext. 3695

Email: emilypica@cmail.carleton.ca

Primary Investigator: Adrianna Ruggiero, Psychology Department, Honours Student

Phone: 613-520-2600, ext. 3695

Email: adriannaruggiero@cmail.carleton.ca

Faculty Advisor: Dr. Joanna Pozzulo

This study has received clearance by the Carleton University Research Ethics Board-B (15-172) on October 2, 2015.

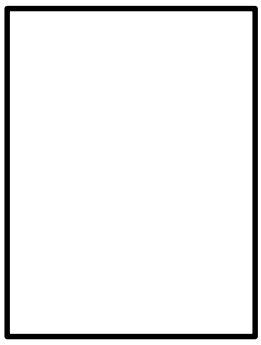
Appendix N

Elimination with Wildcard Lineup Response Form

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. Now let's look at the photos.

To start off, please pick out the person who looks MOST like the criminal.

Think back to the video. Think back to what the criminal looks like. Compare your memory of the criminal to this picture. This may or may not be a picture of the criminal. If this is a picture of criminal, please place a checkmark underneath his box, If this is not a picture of the man who stole the purse, please place a checkmark underneath the blackened silhouette.



_____ _____

Please rate your confidence in the accuracy of your decision using a numerical value between 0 (*not at all confident)* and 100 *(very confident)*: _____

Appendix O

Informed Consent Form (Study 3)

The purpose of informed consent is to ensure that you understand the purpose of the study and the nature of your involvement. Informed consent must provide sufficient information such that you have the opportunity to determine whether or not you wish to participate in the study.

Present study: To See or Not to See, that is the Question?

Research personnel: The following people will be involved in this research project and may be contacted at any time: Adrianna Ruggiero (Principal Investigator, adriannaruggiero@cmail.carleton.ca, 613-520-2600, ext. 3695), Emily Pica (Principal Investigator, emilypica@cmail.carleton.ca, 613-520-2600, ext. 3695), Chelsea Sheahan (Principal Investigator, Chelsea.sheahan@carleton.ca, 613-520-2600, ext. 3695) or Dr. Joanna Pozzulo (Faculty Advisor, joanna.pozzulo@carleton.ca, 613-520-2600, ext. 1412).

Concerns: If you should have any ethical concerns about this study please contact, Dr. Shelley Brown (Chair, Carleton University Research Ethics Board-B, shelley.brown@carleton.ca, 613-520-2600, ext. 1505). You can also contact the Carleton University Research Office at ethics@carleton.ca for any other concerns.

Purpose: The purpose of this study is to examine your decision-making processes.

Task requirements: You will be asked view a video and then complete questionnaires regarding that video.

Duration and locale: Testing will take place in Room 111, Social Sciences Research Building, Carleton University. This study will be completed in one testing session that will last approximately 45 minutes.

Token for participation: You will receive a 1% increase in your final grade of PSYC 1001, PSYC 1002, PSYC 2001, PSYC 2002, NEUR 2001, or NEUR2002 for participating in this study.

Potential risk/discomfort: There are no potential risks involved in this experiment. Should you experience any unease, you have the right to withdraw from the study and still receive course credit.

Anonymity/Confidentiality: All the information you provide will be strictly confidential. Data will only be used for research at Carleton University. Your answers

will NOT be linked to your name or signature (i.e., consent form) and your responses will be coded in such a way that you cannot be identified.

Protection of Personal Information: This Informed Consent Form will be kept in the Lab for seven years along with your data, kept separately. It will be placed in a room that has restricted access and is kept locked and closed at all times. At the seven year mark, it will be shredded and disposed of.

Right to withdraw: Your participation is strictly voluntary. At any point during the study you have the right not to complete certain questions or to withdraw from the study without any penalty whatsoever.

This study has received clearance by the Carleton University Research Ethics Board-B (15-172).

Signatures: *I have read the above form and hereby consent to participate in this study. The data in this study will be used for research publications and/or teaching purposes. I am aware that the data collected in this study will be kept strictly confidential and anonymous. My signature indicates that I understand the above and wish to participate in this study.*

Participant's Name (print): _____

Participant's Signature: _____

Researcher's Name (print): _____

Researcher's Signature: _____

Date: _____

Appendix P

Secondary Consent Form (Study 3)

The purpose of informed consent is to ensure that you understand the purpose of the study and the nature of your involvement. Informed consent must provide sufficient information such that you have the opportunity to determine whether or not you wish to participate in the study.

Present study: Does the elimination lineup with wildcard procedure increase correct identifications and correct rejections?

Research personnel: The following people will be involved in this research project and may be contacted at any time: Adrianna Ruggiero (Principal Investigator, adriannaruggiero@cmail.carleton.ca, 613-520-2600, ext. 3695), Emily Pica (Principal Investigator, emilypica@cmail.carleton.ca, 613-520-2600, ext. 3695), Chelsea Sheahan (Principal Investigator, Chelsea.sheahan@carleton.ca, 613-520-2600, ext. 3695), or Dr. Joanna Pozzulo (Faculty Advisor, joanna.pozzulo@carleton.ca, 613-520-2600, ext. 1412).

Concerns: If you should have any ethical concerns about this study please contact, Dr. Shelley Brown (Chair, Carleton University Research Ethics Board-B, shelley.brown@carleton.ca, 613-520-2600, ext. 1505). You can also contact the Carleton University Research Office at ethics@carleton.ca for any other concerns.

Purpose: The purpose of this study is to examine your accuracy with remembering who and what you saw. You will be asked to describe the video and then you will be shown some photographs. When you signed up for this study you were told that the purpose was to assess your confidence in different decisions; this was deceptive because the true nature of this study is actually eyewitness accuracy. Eyewitnesses are not made aware when a crime will occur; therefore, the purpose of the deception was to mimic a real life situation as much as possible. Had you been aware that you were about to watch a crime you may have attended to the video in a different way and your responses would not be representative of most criminal incidents. You have the opportunity to withdraw your data without penalty. However, if you wish to continue with this study, you can give your consent by signing this informed consent form.

Task requirements: You will be asked to answer a few short questionnaires relating to the video you watched and play a computer game.

Duration and locale: Testing will take place in Room 111, Social Sciences Research Building, Carleton University. This study will be completed in one testing session that will last approximately 45 minutes.

Token for participation: You will receive a 1% increase in your final grade of PSYC 1001, PSYC 1002, PSYC 2001, PSYC 2002, NEUR 2001, or NEUR2002 for participating in this study.

Potential risk/discomfort: There are no potential risks involved in this experiment. Should you experience any unease, you have the right to withdraw from the study without penalty.

Anonymity/Confidentiality: All the information you provide will be strictly confidential. Data will only be used for research at Carleton University. Your answers will NOT be linked to your name or signature (i.e., consent form) and your responses will be coded in such a way that you cannot be identified.

Protection of Personal Information: This Informed Consent Form will be kept in the Lab for seven years, along with your data, kept separately. It will be placed in a room that has restricted access and is kept locked and closed at all times. At the seven year mark, it will be shredded and disposed of.

Right to withdraw: Your participation is strictly voluntary. At any point during the study you have the right not to complete certain questions or to withdraw from the study without any penalty whatsoever.

This study has received clearance by the Carleton University Research Ethics Board-B (15-172).

Signatures: *I have read the above form and hereby consent to participate in this study after knowing the true purpose of the study. The data in this study will be used for research publications and/or teaching purposes. I am aware that the data collected in this study will be kept strictly confidential and anonymous.* ***My signature indicates that I understand the above and wish to participate in this study.***

Participant's Name (print): _____

Participant's Signature: _____

Researcher's Name (print): _____

Researcher's Signature: _____

Date: _____

Signatures: *I have read the above form and* ***do not consent*** *to participate in this study after knowing the true purpose of the study. The data in this study will be used for research publications and/or teaching purposes. I am aware that the data collected in this study will be kept strictly confidential and anonymous.* ***My signature indicates that I understand the above and do not wish to participate in this study.***

Participant's Name (print): _____

Participant's Signature: _____

Researcher's Name (print): _____

Researcher's Signature: _____

Date: _____

Appendix Q

Debriefing Form (Study 3)

What are we trying to learn in this research?

The purpose of the present study is to assess the use various lineup procedures to determine whether one is more effective at increasing identification accuracy. Participants were either shown a lineup procedure known as the elimination lineup where participants are shown a set of photographs and asked to pick out the person that looks most like the criminal. Once that photo is selected, the participant is asked if the most similar is in fact the criminal. This procedure was compared with a variation on it that included adding a "wildcard" to the second decision of whether the most similar person is in fact the criminal. The wildcard is a blackened silhouette of a male. We are examining whether the use of this wildcard photograph in the elimination lineup procedure (e.g., the elimination lineup with wildcard) is better at increasing identification accuracy.

Why is this important to scientists or to the general public?

This research is important because incorrect eyewitness identifications are one of the leading causes of innocent people being sent to jail. It is important to know if there is an alternative method that helps increase accurate identification decisions compared to the standard procedures currently in place.

What are our hypotheses and predictions?

We predict that there will be higher a higher rate of identification accuracy when using the modified elimination lineup procedure that utilizes a wildcard technique compared to the traditional elimination lineup. We also predict that utilizing the wildcard photograph will help transfer the high "survival status" of the suspect in judgment one (e.g., how often the suspect is chosen as most resembling the perpetrator) of the elimination lineup to a high rate of correct identification in judgment two.

Where can I learn more?

Pozzulo, J., & Lindsay, R.C.L. (1999). Elimination lineups: An improved identification procedure for child witnesses. *Journal of Applied Psychology, 84,* 167-176.

Zajac, R., & Karageorge, A. (2009). The Wildcard: A Simple Technique for Improving Children's Target-Absent Lineup Performance. *Journal of Applied Cognitive Psychology, 23, 358-368.*

Why didn't you tell me I was going to watch a video of a crime?

We did not tell you that you would be watching a videotape of a theft because we wanted to mimic real life as much as possible and real life crime happens unexpectedly. Had you been forewarned of the crime aspect of the study, you may have paid attention to the video in a different way and, in turn, this would have influenced your responses to our questions. In this case, your responses would not have been useful to us because they would not be representative of how a real life witness would experience a similar situation.
Note. The video you watched was completely fictional, no crime was actually committed.

What if I feel distress or anxiety after participating in this study?

If you feel any distress or anxiety after participating in this study, please feel free to contact the Carleton University Health and Counseling Services at: 613-520-6674, or the Distress Centre of Ottawa and Region at 613-238-3311 (http://www.dcottawa.on.ca).

What if I have questions later?

If you wish to discuss this research any further feel free to contact any one of the following people: Adrianna Ruggiero (Psychology Department, Honours Student, Principal Investigator, adriannaruggiero@cmail.carleton.ca, 613-520-2600, ext. 3695), Emily Pica (Psychology Department, PhD Student, Principal Investigator, emilypica@cmail.carleton.ca, 613-520-2600, ext. 3695), Chelsea Sheahan (Psychology Department, PhD Student, Principal Investigator, Chelsea.sheahan@carleton.ca, 613-520-2600, ext. 3695), or Dr. Joanna Pozzulo (Faculty Advisor, Joanna.pozzulo@carleton.ca, 613-520-2600, ext. 1412).

What if I have concerns?

If you should have any ethical concerns about this study please contact, Dr. Shelley Brown (Chair, Carleton University Research Ethics Board-B, shelley.brown@carleton.ca, 613-520-2600, ext. 1505). You can also contact the Carleton University Research Office at ethics@carleton.ca for any other concerns.

At this time we would like to thank you for taking the time to take part in this study. Your participation has been greatly appreciated!