A Comparison of Multiple and Single-Suspect Lineup Accuracy, Confidence and Repeated Exposure

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Abstract

Legal guidelines suggest that police lineups should include a single suspect. However, when police have multiple suspects, this practice could compromise a witness's ability to make an accurate identification. This could be prevented by including multiple suspects in a lineup, although there is limited existing research on how using multiple-suspect lineups could affect eyewitness accuracy. In this study, participants (N=650) watched a simulated crime video and made an identification from a multiple or single-suspect lineup. Participants were also asked about their confidence in their decision and their meta-cognitive processes. The results showed that there were generally no significant differences in accuracy between multiple and single-suspect lineups, or between multiple-suspect lineups which contained 10 and 14 foils. However, decisions made after viewing two single-suspect lineups were more accurate than those made after viewing any other type of lineup. Additionally, witnesses in single-suspect conditions reported higher levels of automatic recognition decisions than those in multiple-suspect conditions. Guidelines are outlined for future research, which is necessary before practical implications can be advised.

Keywords: accuracy, confidence, multiple-suspect lineups, single-suspect lineups

A Comparison of Multiple and Single-Suspect Lineup Accuracy, Confidence and Repeated Exposure

In legal systems around the world, eyewitness testimony and identifications are of great importance, as they provide contextual evidence that physical evidence alone cannot (Wells et al., 1998). For example, physical evidence can suggest that the suspect was present at the scene of the crime, but it cannot account for when they were there or what they were doing there – eyewitness testimony on the other hand can (Wells et al., 2020). Despite the immense importance of eyewitness testimony in judicial systems, there are many risks associated with relying on it as evidence. This is clear when reviewing the role that eyewitness identifications have played in wrongful convictions. For example, 225 of the 300 cases that the Innocence Project proved to be wrongful convictions were based on inaccurate eyewitness identifications (Gronlund et al., 2014).

Both so-called 'system' and 'estimator' variables can influence the ability of a witness to make an accurate identification. System variables are those factors that fall under the influence of the police, and estimator variables are those that do not (Nortje & Tredoux, 2020). There is a large body of psychological research that informs procedural guidelines about how different system variables should be controlled (Wells et al., 1998). These guidelines generally relate to the administration of police lineups and focus on aspects such as the number of suspects in a lineup, and the recording of witnesses' confidence in their identifications (Wells et al., 1998). However, there is a limited body of research about multiple-suspect lineups and the viability of using them instead of single-suspect lineups (Nortje & Tredoux, 2020). This is problematic as it means that guidelines that relate to multiple-suspect lineups may be inadequate.

Single-Suspect and Multiple-Suspect Lineups

Legal Guidelines

The above-mentioned guidelines suggest that only one suspect should be included in a lineup (a 'single-suspect' lineup) (Wells et al., 2020). A single-suspect lineup contains one suspect and at least five innocent individuals (foils) (Wells et al., 2020). This suggestion is informed by the research of Wells and Turtle (1986), who suggested that the use of single-suspect lineups is more diagnostic and results in lower lineup-wise error rates (the chances that any lineup member will be falsely identified) than other forms of lineups. However, their study did not yield any empirical evidence to suggest that the use of multiple-suspect lineups inhibited eyewitness identifications, as they only compared single and all-suspect lineups (Nortje & Tredoux, 2020). It is proposed that single-suspect lineups allow for the detection of error in eyewitness identifications, as a foil identification is a known error (Wells & Turtle, 1986). However, multiple-suspect lineups include foils and as such also allow for the detection of known errors. They also account for the inclusion of additional suspects by increasing the number of foils in the lineup (South African Police Services [SAPS], 2007). Therefore, the use of multiple-suspect lineups should not be ruled out on account of either of the above-mentioned factors.

The application of diagnostic feature detection theory to multiple-suspect lineups suggests that using such lineups may aid witnesses in making accurate identifications. This theory posits that placing a suspect amongst foils should allow witnesses to compare the features of lineup members (Wixed & Mickes, 2014). This in turn should allow them to identify diagnostic features which may help them identify the perpetrator (Wixed & Mickes, 2014). Therefore, the use of multiple-suspect lineups may improve the ability of a witness to make an accurate identification as it would allow them to compare the suspect's distinct features. Moreover, the additional foils that are included in a multiple-suspect lineup may

allow for more comparison and as such improved accuracy (Nortje & Tredoux, 2020). Thus, this further depicts that the use of multiple-suspect lineups is an important area that requires further research.

Contrary to the recommendations regarding single-suspect lineups, many countries around the world allow for the use of multiple-suspect lineups (Nortje & Tredoux, 2020). In South Africa and the United Kingdom guidelines promote the use of single-suspect lineups, and whilst they caution the use of multiple-suspect lineups, they do not prohibit them (Naude, 2015; Seale-Carlisle & Mickes, 2016; SAPS, 2007). In fact, research has suggested that multiple-suspect lineups are commonly used in South Africa and the United Kingdom. According to some studies, up to 74.67% of South African police report having administered a multiple-suspect lineup, and police in the United Kingdom report similar use (Hobson & Wilcock, 2011; Nortje, 2018). This may be done for many reasons, such as police having more than one suspect or because this requires fewer resources than conducting more than one single-suspect lineups (Nortje, 2018).

Despite this evident use of multiple-suspect lineups, the existing procedures informing them are not well defined or informed. An example which depicts this is how there is limited existing research informing the guideline which dictates the inclusion of a minimum of 10 and a maximum of 14 foils in multiple-suspect lineups (du Toit et al., 2019). Thus, this further substantiates the need for research on the use of multiple-suspect lineups (Nortje & Tredoux, 2020).

Consequences of Exposure to Multiple Lineups

The procedural guidelines in South Africa state that if a witness must be exposed to more than one lineup, there must be people other than just the suspect present in both (Nortje, 2018). If the suspect is the only person who appears in both lineups this may indicate to the witness that they are the suspect, which may influence the witness's identification (du Toit et

al., 2019). These guidelines hint at the problem of repeated exposure to lineups, which can occur in many different situations, such as if the police have more than one suspect, or when they use follow-up lineups to confirm the witness's original lineup decision (Hinz & Pezdek, 2001; Steblay et al., 2013).

These situations can be problematic as exposure to more than one lineup can result in a witness's memory of the crime becoming contaminated, or in commitment effects influencing their choices in later lineups (Steblay & Dysart, 2016). Commitment effects are when a witness makes an identification in the first lineup they view and then maintains this choice in subsequent lineups (Steblay & Dysart, 2016). It is proposed that once a witness has made an identification, they will be hesitant to make another identification in later lineups that do not contain the individual that they originally identified (Steblay & Dysart, 2016). The use of multiple-suspect lineups could potentially avoid the development of commitment effects by preventing exposure to more than one lineup. Therefore, further research should be conducted on the viability of using multiple-suspect instead of single-suspect lineups.

Confidence and Accuracy

A common procedural guideline for lineup administration involves taking a witness's confidence statement immediately after they make an identification (Wells et al., 1998, 2020). This is important as confidence is one of the measures used by researchers to assess the accuracy of eyewitness identifications in police lineups (Wixted & Wells, 2017). Recent literature suggests that confidence levels at the time of the identification may be a highly reliable indicator of accuracy, with high confidence indicating high accuracy (Brewer & Palmer, 2010; Wixted & Wells, 2017). However, the procedural guidelines in South Africa do not discuss documenting a witness's confidence in their identification (SAPS, 2007).

The question of witness confidence is related to repeated lineup exposure, as a witness's confidence in their first identification could influence their decision in later lineups.

This could occur due to the witness being very confident in their first lineup decision and thus not making an identification in the second lineup (a commitment effect) (Steblay & Dysart, 2016). Alternatively, repeated exposure could also influence the witness's confidence, as it could act as negative feedback for their answer in the first lineup, which could decrease the witness's confidence in their identification (Wells et al., 1998). Multiple-suspect lineups could provide a solution for this, as they may prevent commitment effects and negative feedback from occurring.

Overall, it is evident that using multiple-suspect lineups may provide a solution to the above-mentioned problems. Therefore, it is important that more research is conducted to determine what the most effective procedures are for the use of multiple-suspect lineups, the effects that the use of multiple-suspect lineups may have on eyewitness identifications and to establish if they are a viable alternative to single-suspect lineups.

Aims and Hypotheses

The above-mentioned gaps in the literature led to a multifaceted investigation into the use of multiple-suspect lineups. Additionally, the evident problems associated with repeated exposure led to an investigation into what the best way to conduct more than one single-suspect lineup is.

1) The overarching aim of this study was to investigate if multiple-suspect lineups could provide a viable and superior alternative to single-suspect lineups. The superiority of these lineups was judged by comparing how accurate and confident participants were in their identifications across the single and multiple-suspect lineup conditions. Based on how multiple-suspect lineups avoid repeated exposure and the consequent commitment effects, it was hypothesized that participants in the multiple-suspect lineup conditions would make more accurate identifications and have better calibrated confidence in their decisions than

those in the single-suspect lineup conditions. Thus, it was hypothesized that multiple-suspect lineups would provide a viable and superior alternative to single-suspect lineups.

2) A secondary aim of this study was to investigate if having a different number of foils (10 vs 14) in multiple-suspect lineups would impact eyewitness identification accuracy. It was hypothesized that 14-foil lineups would yield higher rates of accurate identifications than 10-foil lineups, as the increased number of foils should have protected against mistaken identifications of innocent lineup members (SAPS, 2007).

3) Additionally, this study aimed to investigate if participants who saw single-suspect lineups would report different meta-cognitive patterns to those who saw a multiple-suspect lineup. It was hypothesized that there would be significant differences in meta-cognitive patterns between lineup conditions, as a result of the increased number of faces that the participants needed to differentiate between when viewing a multiple-suspect lineup.

4) Finally, this study also aimed to investigate how implementing different conditions for how participants were allowed to make a choice when they were exposed to more than one single-suspect lineup would affect accuracy. This was done to see how to maximize accuracy in instances of repeated exposure. It was hypothesized that participants who viewed single-suspect lineups and were not allowed to continue after making an identification would be more accurate than those who viewed single-suspect lineups and were allowed to continue after making an identification.

Method

Design

To investigate the above-mentioned aims, this study employed a 2 (Type of Lineup: Single-Suspect vs Multiple-Suspect) x2 (Multiple-Suspect Lineup Foils: 10 vs 14) x3 (Choice Condition: After Viewing All Lineups vs After Viewing Each Lineup – Stop vs After

Viewing Each Lineup – Change) x2 (Perpetrator-Presence: Target-Absent vs Target-Present) between-subjects experimental design.

The different choice conditions applied to the single-suspect lineup conditions and were designed to replicate the way that witnesses may be allowed to make an identification when exposed to more than one single-suspect lineup in practice. In the 'after viewing all lineups' condition participants viewed two consecutive single-suspect lineups and made one decision after viewing both. In the 'after viewing each lineup – change' condition participants viewed two single-suspect lineups and were allowed to make an identification after viewing each lineup. In the 'after viewing each lineup – stop' condition participants viewed one single-suspect lineup and only viewed a second if they indicated that the perpetrator was not present in the first lineup.

Both target-absent and target-present lineups were included in this study. Target-absent lineups are those which do not include the perpetrator and instead consist exclusively of innocent foils. Target-absent lineups were included to replicate their use in real life settings, where they may occur when police include a suspect in a lineup who is in fact not the perpetrator (Wells et al., 2006). Target-present lineups are those which include the perpetrator and a number of foils. These were included to test the participants' ability to accurately identify the perpetrator.

Participants were randomly assigned to either the single-suspect or multiple-suspect lineup conditions. Approximately two-thirds (n=416) of the participants were randomly assigned to the single-suspect conditions, whilst one-third (n=234) were randomly assigned to the multiple-suspect conditions. This uneven split was employed as there were more cells in the single-suspect conditions (six cells) than there were in the multiple-suspect conditions (four cells). The difference in the number of cells was due to participants in the single-suspect condition being divided amongst the three above-mentioned choice conditions, whilst those

in the multiple-suspect condition were only divided into the two foil conditions (10 vs 14). The participants in the multiple-suspect conditions were not divided into the choice conditions because as was mentioned above, the choice conditions were designed to replicate instances of repeated exposure to more than one lineup. This meant they were not applicable to the multiple-suspect conditions as those in the multiple-suspect condition only viewed one lineup. However, the 'after viewing all lineups' choice condition closely resembled the multiple-suspect lineup conditions, as in this condition participants were only allowed to make one decision despite seeing two lineups. Therefore, for the sake of comparison, within the design all multiple-suspect lineups were considered under the 'after viewing all lineups' condition.

In addition to being randomly assigned to one of the choice or foil conditions participants were randomly assigned to see either a target-absent or a target-present lineup. Participants in the single-suspect conditions were randomly assigned to view either two target-absent lineups (ie. a 'targets both absent' condition) or one target-present lineup and one target-absent lineup (ie. a 'targets one present' condition). The design of this study is visualized in Table 1.

Table 1

Multiple vs Single-Suspect Study Design

	Choice conditions					
Type of Lineup	After viewing all lineups		After viewing each lineup – stop		After viewing each lineup – change	
SSLU	TA|TA	TA|TP	TA|TA	TA|TP	TA|TA	TA|TP
	After viewing all lineups					
MSLU (10-foil)	TA		TP			
MSLU (14-foil)	TA		TP			

Note. MSLU = Multiple-Suspect Lineup; SSLU = Single-Suspect Lineup.

[a] TA = Target-Absent; TP = Target-Present. TA|TP means that the participant was in the 'targets one present' condition; TA|TA means that the participant was in the 'targets both absent' condition.

All of the lineup conditions were counterbalanced by using two versions of each lineup, in which the position of the lineup members varied. Additionally, the order that the single-suspect lineups were presented in varied. For example, in the 'targets both absent' condition (TA|TA) participants could have viewed target-absent lineup 1 and then target-absent lineup 2, or alternatively target-absent lineup 2 and then target-absent lineup 1. The same procedure was followed for the 'targets one present' condition (TP|TA). This was done

to ensure that neither the way the photos were arranged in the lineup, nor the order the lineups were presented in had an effect on the participants' lineup decision.

Participants

The proposed sample size for this experiment was 394 participants (*N*=394), which was determined by running an a priori power analysis on G*Power (Faul et al., 2007). This sample size was calculated using an effect size of 0.80, an odds ratio of 2.30 and an alpha of .05. In the process of data collection, the randomization schedule of the experiment was compromised. This was observed after 179 participants had completed the experiment. Therefore, to restore both the proper split and the integrity of the randomization schedule, additional data was collected.

Overall, only the data of participants who answered the attention question correctly, described the crime with a reasonable likeness to the video and did not show a distinct answer pattern in the questionnaire was included in the analysis. Consequently, the final sample size for this experiment was 650 participants (*N*=650).

This sample consisted of undergraduate psychology students from the University of Cape Town (UCT) and members of the broader public, all of whom were recruited through convenience sampling. The undergraduate psychology students were recruited through UCT's Student Research Participation Programme (SRPP) (see Appendix A). Participants who were recruited from the broader public were recruited through social media platforms such as Facebook, Instagram and WhatsApp (see Appendix B).

The exclusion criterion for this study detailed that participants were not permitted to continue the study if upon viewing the simulated crime video, they recognized the perpetrator.

Materials

Target Stimuli

Each participant viewed one of two simulated crime videos which showed a white male entering a bookshop and stealing a book. The only significant difference between these videos was that in each one the perpetrator was played by a different actor. These videos were chosen based on their non-violent nature and their use in previous studies on multiple-suspect lineups, where in target-present lineups they were found to produce 50% accuracy in the multiple-suspect conditions and 36% in the single-suspect conditions (Nortje & Tredoux, 2020). Participants were randomly assigned to view one of the videos, to ensure that none of the characteristics of the video influenced their ability to identify the perpetrator from a lineup.

Lineups

The lineups that were used in this experiment consisted of a combination of existing lineups and lineups which were created specifically for use in this study (see Appendix C) (Schmidt, 2010). The existing lineups were created for use in previous studies which used the same simulated crime videos, whilst the new lineups were created in a preliminary stage of this research (see Appendix D).

Single-Suspect Lineups. The target-present lineups included seven foils, the perpetrator and a ‘target absent’ option. In the target-absent lineups the perpetrator was replaced by an eighth foil, which in reality would be a suspect. This lineup presentation follows the South African legal requirement of seven foils accompanying a suspect in a lineup (SAPS, 2007).

Multiple-Suspect Lineups. In the target-absent multiple-suspect lineups, the 10-foil lineups included 12 foils and the 14-foil lineups included 16 foils. In reality two of the foils

from each lineup would be replaced by suspects. In the target-present versions of each of these lineups one of the foils was replaced by the perpetrator.

Survey Platform

The survey used in this experiment was administered using the online survey tool Qualtrics (Qualtrics, Provo, UT; https://www.qualtrics.com).

Distractor Task and Attention Question

This study included 20 anagrams as a distractor task to try and change the type of memory that the participants were engaged in from episodic memory to working memory (see Appendix E). This was done to replicate the time between encoding and recall that would be present in real-life circumstances (Tongaonkar, 2017). This study also included a short attention question, to allow the researchers to judge if participants actively engaged in the experiment (see Appendix F).

Questionnaire

A 13-item questionnaire was administered at the end of the survey to determine if viewing different lineup conditions influenced one's meta-cognitive processes (see Appendix G). These items were adapted from two questionnaires which have previously been used to investigate meta-cognitive processes during lineup identification tasks (Wittwer et al., n.d.). These questions were presented in a Likert style format with response options ranging from 1-6 ('1= *strongly disagree*' – '5= *strongly agree*'; '6=*not applicable*').

Procedure

This experiment began by gaining participants' informed consent (see Appendix H and I). However, the information on the consent form misled participants about the true nature of the study. This was done to allow the participants to incidentally encode the perpetrators face, which emulates realistic circumstances in which witnesses would not be expecting to witness a crime. Participants then watched one of the simulated crime videos,

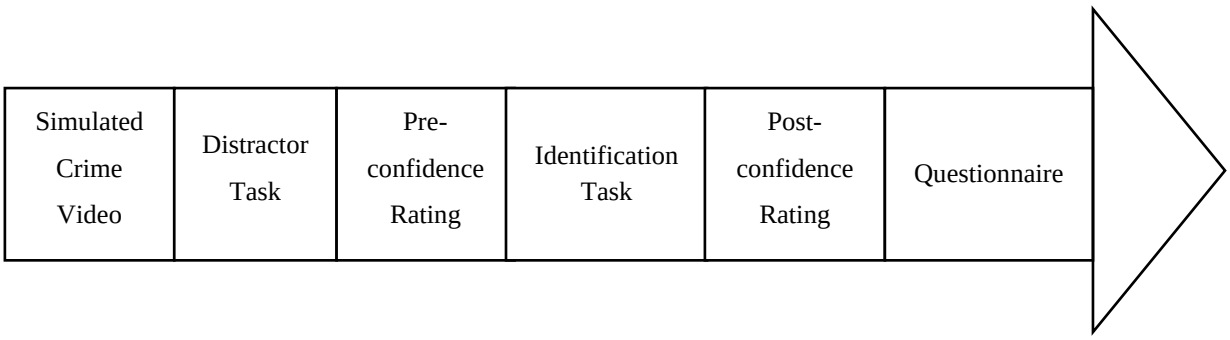
which was followed by the distractor task and the attention question. Thereafter, the participants were informed that they had been misled and were told the true nature of the study. They were also offered apologies for any inconvenience this may have caused them and were reminded that they could withdraw from the study at any time (see Appendix J and K). Those who continued were asked to describe the perpetrator and the crime that they had witnessed in the video. Participants were then asked to rate how confident they were that they would be able to identify the perpetrator from a lineup, on a scale of 0%-100% (see Appendix L).

Thereafter, participants were given lineup instructions, which were specific to the lineup and choice condition that they were in (see Appendix M). All the versions of these instructions included a disclaimer that the perpetrator may not be present in the lineup and that if they thought this was the case, they should select the 'target absent' option. Participants were given an unlimited amount of time to make their decision.

Immediately after making a lineup decision, participants were asked to rate how confident they were in their decision (see Appendix L). Finally, participants were asked to complete the above-mentioned questionnaire. The participants were then debriefed about the study as a whole (see Appendix N), which brought the experiment to an end. This procedure is visualized in Figure 1.

Figure 1

Procedure Timeline



Data Analysis

Descriptive statistics, logistic regression, analysis of variance (ANOVA) and factor analysis were used to analyse the data. These analyses were conducted using the statistical programs R and R-Studio (Version 1.4.1106) (R Core Team, 2021; RStudio Team, 2021).

Logistic regression was used to investigate if perpetrator-presence, choice condition and lineup type predicted the accuracy of the participants' identifications. Factor analysis was used to create latent variables from the questionnaire and ANOVA was used to see if there were any differences in meta-cognitive processes between the lineup types, based on participants' scores on the latent variables. ANOVA was also used to investigate if there were any differences in confidence across the different lineup types and choice conditions.

Ethical Considerations

Prior to beginning this study ethical approval was gained from UCT's Psychology Department's Research Ethics Committee (see Appendix O and P).

Consent, Voluntary Participation and Confidentiality

Participants' informed consent was gained before they began the survey and they were informed that their participation was voluntary and that they could, without consequence, withdraw from the study at any time (see Appendix H and I). The participants' personal information was stored on a password protected computer and was used exclusively for SRPP and raffle purposes.

Deception and Debriefing

Participants in this study were only deceived where it was absolutely necessary. This deception was minor, and it involved participants being told that the study was investigating what people considered socially acceptable behaviour. Neither the deception nor the true nature of the study should have caused any harm to the participants. Participants were informed of the true nature of the study and were offered apologies for being misled after

completing the distractor task (see Appendix J and K). This was the earliest participants could be debriefed about the true nature of the study without compromising the integrity of the study. Participants were further debriefed at the end of the study (see Appendix N).

Risks and Benefits

There were minimal anticipated risks for participants in this study, as they were not exposed to any harmful stimuli. However, to account for any potential discomfort that the participants may have felt as a result of their participation, they were provided with the contact details of UCT's Student Wellness Centre, the Lifeline National Counselling line, and the South African Depression and Anxiety Group UCT Student Careline to contact if they required assistance. Participants were also provided with the contact details for UCT's Psychology Department's Research Ethics Committee, to contact if they had any questions concerning the ethics of the experiment, or their rights as a participant.

Participants were compensated for their participation in this study. Those who were recruited through SRPP were compensated with 1 SRPP point for completing the full study. SRPP points are a course requirement for many of the undergraduate psychology courses at UCT. Those who were recruited through social media were entered into a raffle from which they stood a chance to win one of three Takealot vouchers valued at R500, R250 and R250. The funding for these prizes was acquired from Professor CG Tredoux's research grant. A random name selector was used to select the winners of the raffle, to ensure that this selection was fair. Moreover, to account for the fact that there were different incentives associated with the different recruitment methods, the survey was not made available to both sample populations simultaneously.

Results

In this analysis the foil conditions were collapsed into the choice conditions for ease of use. Therefore, in this section, reference to the choice conditions includes the foil

conditions, unless otherwise specified. Additionally, for analysis to be run across the different experimental conditions, transformations were performed on the data.

Perpetrator-Presence Transformation

Perpetrator-presence refers to whether the lineups the participant saw included the perpetrator. In the multiple-suspect conditions, this variable directly reflected the perpetrator-presence of the single lineup that the participants saw. However, in the single-suspect conditions participants viewed two counterbalanced lineups, and as such, could have viewed two target-absent lineups ('targets both absent' condition) or one target-absent and one target-present lineup ('targets one present' condition). Therefore, to allow for perpetrator-presence to be compared across conditions an overall perpetrator-presence code was given to participants who viewed more than one single-suspect lineup. The way that final perpetrator-presence was coded is summarized in Appendix Q.

Identification Accuracy

In this study identification accuracy was scored in several ways, necessitated by the use of multiple single-suspect lineups. We coded variables reflecting 'absolute accuracy' (identification accuracy per individual lineup), 'partial accuracy' (a score which took the absolute accuracy of two single-suspect lineups into account) and 'final accuracy' (which scored accuracy based on rules that were specific to the different choice conditions). The way final accuracy was scored is summarized in Appendix R.

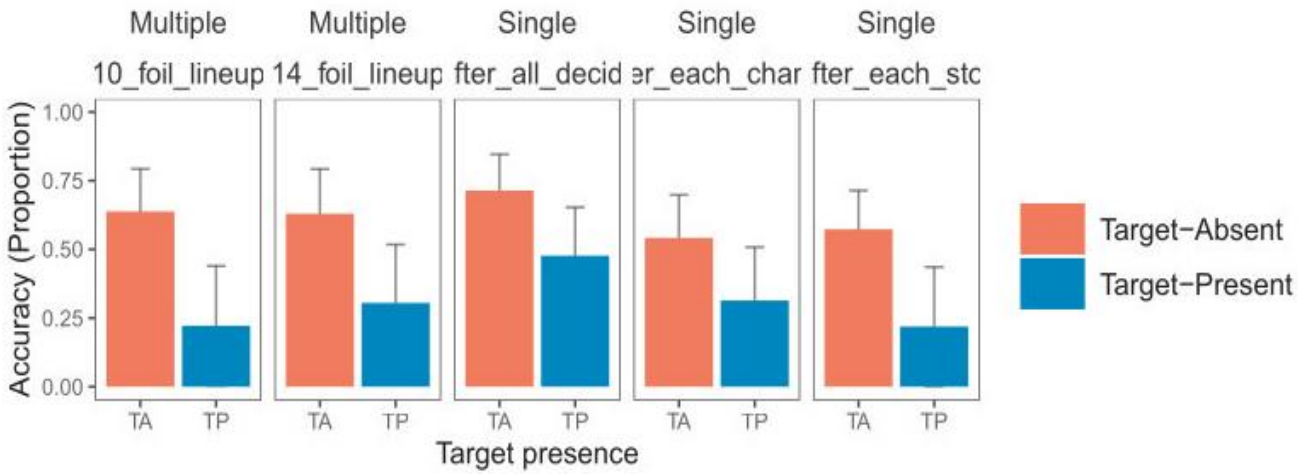
The 'final accuracy' variable allowed for accuracy to be compared across all the experimental conditions and was the primary accuracy variable used in the following analyses. Final accuracy was coded as a binary variable. In all figures and tables final accuracy is presented as a proportion, to account for the uneven number of participants in each cell. These differences were due to the uneven random assignment of participants to the different experimental conditions, and as a result of data being excluded from the sample.

Descriptive Statistics

Figure 2 visualizes a trend in which participants in the target-present lineups were less accurate than those in the target-absent lineups. This suggests that participants were better at rejecting lineups which did not contain the perpetrator, than they were at identifying the perpetrator from a lineup.

Figure 2

Proportion of Final Accuracy across Lineup Choice Conditions and Perpetrator-Presence



Note. 'TA' = target-absent lineups and 'TP' = target-present lineups.

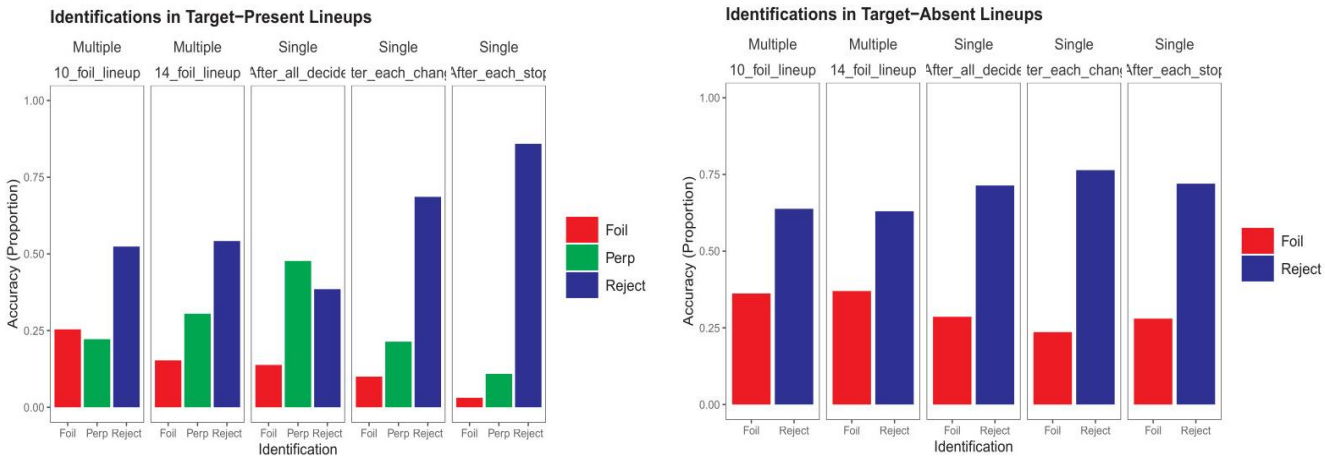
Despite the differences in accuracy across the perpetrator-presence conditions, the participants in the 'after viewing all lineups' condition appeared to be consistently more accurate than the participants in any of the other conditions. This is further summarized in Appendix S.

Figure 3 depicts that the high rates of inaccuracy in the target-present conditions were a result of participants incorrectly rejecting the lineups instead of making foil identifications. When viewed in conjunction with the rates of accuracy in the target-absent conditions, which

are also depicted in Figure 3, this suggests that the majority of participants across conditions rejected the lineups that they viewed.

Figure 3

Proportion of Accuracy in Target-Present and Target-Absent Lineups, per Choice Condition



Note. 'Perp' shows an accurate perpetrator identification, 'Foil' shows an identification of an innocent lineup member and 'Reject' shows that the participant indicated the perpetrator was not present in the lineup.

Logistic Regression

Two logistic regression models were run to determine if any of the lineup types or choice conditions had a significant effect on accuracy (see Appendix T for a detailed table of the models' results). This analysis was run using a generalized linear model from the glm package (Kosmidis et al., 2020), in R and R-Studio (Version 1.4.1106) (R Core Team, 2021; RStudio Team, 2021). In the first model the predictor variables were the lineup choice conditions (collapsing across single and multiple-suspect types to make a one-dimensional factor) and perpetrator-presence (target-present vs target-absent), with final accuracy as the outcome variable. This showed that there were significant differences in accuracy within the lineup choice conditions ($\chi^2(9) = 80.127$, $p = .006$) and the perpetrator-presence conditions

($\chi^2(9) = 80.127$, $p < .001$). Therefore, main effects and pairwise contrasts with Tukey adjustments were run on this model. These results were consistent with what was depicted in Figure 2, as they showed that participants who saw target-absent lineups were significantly more accurate than those who saw target-present lineups ($p < .001$).

The results of the main effects post-hoc analysis showed that participants were significantly more accurate in the 'after viewing all lineups' condition than they were in the other conditions ($p = .002$). Participants in the 'after viewing all lineups' condition were also significantly more accurate than those in the 'after viewing each lineup – change' condition ($p = .040$), the 'after viewing each lineup – stop' condition ($p = .006$) and the 10-foil multiple-suspect condition ($p = .050$).

A second generalized linear model was run with lineup type, collapsed to constitute a two-level factor (single-suspect vs multiple-suspect), and perpetrator-presence as predictors of final accuracy. Post-hoc analyses on this model showed that there was no significant difference in accuracy between the single-suspect and multiple-suspect conditions ($p = .056$). However, this difference is close to being significant. Similarly, to the first model, this model showed that participants in the target-absent condition were significantly more accurate than those in the target-present condition ($p < .001$).

Diagnosticity Ratios

Diagnosticity ratios acknowledge a trade-off between the rates of hits and false alarms (Mickes et al., 2012). When comparing diagnosticity ratios, a higher ratio suggests greater diagnosticity (Mickes et al., 2012). Diagnosticity represents the chances that the person who is identified from the lineup is guilty (Mickes et al., 2017). Table 2 depicts that of all of the choice conditions the 'after viewing all lineups' condition had the highest diagnosticity ratio. The diagnosticity ratios for each choice and foil condition are displayed in Table 2.

Table 2

Diagnosticity Ratios per Foil and Choice Condition

Lineup Condition	Diagnosticity Ratio (HR/FAR)
After viewing all	1.67
After viewing each - change	0.69
After viewing each – stop	0.51
10 foils	0.61
14 foils	0.82

Note. Diagnosticity Ratio refers to the ratio of the Hit Rate to False Alarm Rates.

[a] HR = hit rate. This denotes the total proportion of correct perpetrator identifications.

[b] FAR = false alarm rate. This denotes the total proportion of incorrect foil identifications.

Confidence

After viewing the lineup, participants were asked to rate their confidence in their ability to identify the perpetrator from a lineup on a scale of 0%-100%. As was the case with accuracy, a final confidence variable was scored to account for the fact that participants who saw more than one single-suspect lineup also made more than one post-identification confidence rating (see Appendix U for information on how this was coded).

Appendix V suggests that participants in the 'after viewing each lineup – stop' (M = 71.05%, SD = 22.12) and 'change' (M = 74.63%, SD = 20.78) conditions had the highest

average confidence rates. Additionally, participants appeared to be more confident when they were accurate than when they were inaccurate.

Using fitted linear models, two ANOVA models were run. Both included confidence as an outcome variable, whilst one included choice condition and perpetrator-presence as predictor variables and the other included lineup type in place of choice conditions. Post-hoc contrasts on these models showed that the 'after viewing each lineup – stop' (estimate = 4.53, $p = .038$) and 'change' conditions (estimate = 4.12, $p = .046$) had significant positive effects on confidence, whilst the 14-foil condition had a significant negative effect on confidence (estimate = -5.72, $p = .025$). They also showed that participants who saw multiple-suspect lineups had significantly lower rates of confidence than those who saw single-suspect lineups (estimate = -6.94, $p < .001$).

There was a weak but significant positive correlation ($r = .22$) between confidence and proportion of accuracy for those who did not choose someone from the lineup (non-choosers), and a weak significant negative correlation ($r = -.28$) for those who chose someone from the lineup (choosers). These correlations suggest that participants who correctly rejected the lineup were more confident in their decisions than those who incorrectly rejected the lineup, whilst those who accurately chose a lineup member were less confident than those who incorrectly selected a lineup member.

Figure 4 shows a confidence-accuracy characteristic curve (i.e., the relation between confidence and positive predictive value [PPV]. PPV is a measure of discrimination, an estimate of whether participants made their decision because they knew the answer and not because they were guessing [Wixted & Mickes, 2018]. It is essentially a trade-off between perpetrator identifications and foil identifications). This figure suggests that there were systematic, increasing relations between PPV and confidence in all the choice conditions

other than the 14-foil condition. This is particularly evident in the ‘after viewing all lineups’ condition where confidence was very strongly correlated with PPV.

Figure 4

Confidence-Accuracy Characteristic Curve per Choice Condition

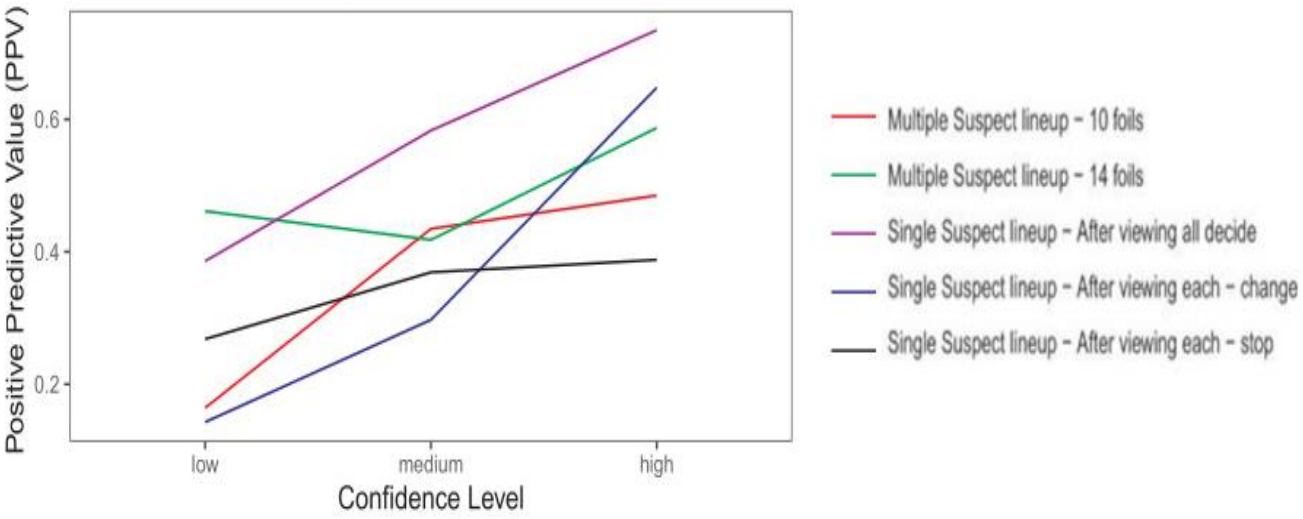
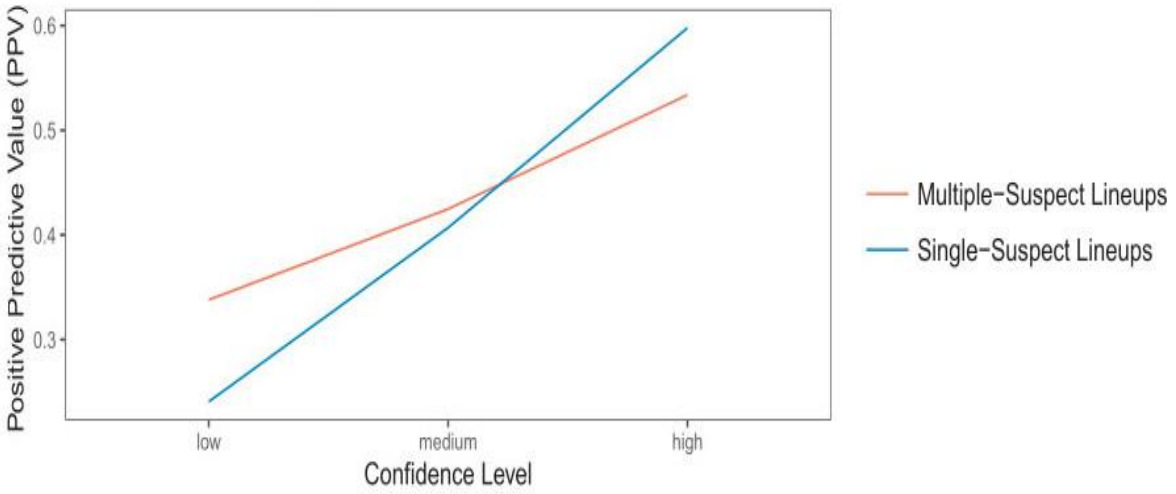


Figure 5 visualizes that there was a strong positive correlation between confidence and PPV in both the multiple-suspect and single-suspect lineup conditions. However, participants who were accurate in the single-suspect condition were more confident than those who were accurate in the multiple-suspect condition.

Figure 5

Confidence-Accuracy Characteristic Curve per Lineup Type



Meta-Cognitive Differences Between Lineup Types

The questionnaire that was included in this study to investigate meta-cognitive processes contained 13 items. A principal factor analysis was run to constitute latent variables (factors). Based on the results of this analysis a five-factor structure was adopted. The five factors were named ‘Lack of familiarity’; ‘Elimination strategies’; ‘Feeling of task difficulty’; ‘Relative judgement’ and ‘Automatic recognition’. See Appendix W and Appendix X for more information on the factor analysis and these factors.

To gain further insight into participants’ meta-cognitive processes, multiple ANOVA analyses were run using linear models. These analyses included metacognitive factors as outcome variables and lineup type (multiple-suspect vs single-suspect lineups) and perpetrator-presence as predictor variables. The results of these models showed that of all the meta-cognitive processes, only automatic recognition differed significantly between the lineup types ($F(1, 417) = 6.43$, $p = .007$, $\eta p^2 = 0.02$). This showed that those in the single-suspect conditions reported significantly more automatic recognition than those in the multiple-suspect conditions ($p = .001$).

Discussion

This section outlines and discusses the findings of this study in relation to the four aims and hypotheses that were presented earlier in this paper. In this section the results will be used to discuss and draw conclusions about the aims of this study.

Accuracy and Confidence in Multiple-Suspect vs Single-Suspect Lineups

The overarching aim of this study was to determine if multiple-suspect lineups could provide a viable and superior alternative to single-suspect lineups. It was hypothesized that multiple-suspect lineups would yield more accurate identifications and have more calibrated levels of confidence than single-suspect lineups. The results of this study suggest that multiple-suspect lineups are not superior to single-suspect lineups, although they support the hypothesis that they may be a viable alternative.

One of the reasons for this is that there were no significant differences in accuracy between multiple (target-absent = 63.40%, target-present = 26.20%) and single-suspect lineups (target-absent= 60.40%, target-present = 33.70%), considered in aggregate. This suggests that participants who saw one lineup type were neither more, nor less accurate than those who saw the other. Therefore, whilst multiple-suspect lineups did not produce superior rates of accuracy, they did not produce worse rates of accuracy than single-suspect lineups. This conclusion is inconsistent with the results of other studies that form part of the limited existing research on the use of multiple-suspect lineups, such as that by Nortje and Tredoux (2020). Unlike the current study, Nortje and Tredoux (2020) suggested that participants who view multiple-suspect lineups (target-absent = 58%, target-present = 50%) are more accurate than those who view single-suspect lineups (target-absent = 36%, target-present = 42%).

However, despite the lack of significant differences in accuracy the confidence-accuracy characteristic curves suggest that single-suspect lineups had greater discriminability than multiple-suspect lineups. This may be possible in spite of the lack of significant

differences in accuracy, as PVV is not equivalent to accuracy itself. This finding is inconsistent with diagnostic feature detection theory, as this theory would suggest that multiple-suspect lineups should have greater discriminability than single-suspect lineups. The reason for this is that this theory posits that including more foils in a lineup should allow for more comparison between lineup members which should result in greater discriminability and as such, more accuracy. However, the significance of these differences is unknown, therefore such conclusions should be interpreted with caution.

The hypothesis that multiple-suspect lineups would be superior to single-suspect lineups was also rejected based on the results relating to confidence. These results showed that confidence was significantly lower in the multiple-suspect conditions than in the single-suspect conditions. This is surprising based on the lack of difference in accuracy between the conditions, and it suggests that multiple-suspect lineups do not provide a superior alternative to single-suspect lineups.

One possible explanation for these differences in confidence is the way in which the final confidence variable was scored in instances of repeated exposure to single-suspect lineups. It is possible that participants were more confident in either their first or second confidence rating, and therefore, considering one or the other as the final confidence score may have falsely increased or decreased the rates of confidence reflected in this data.

However, whilst these results did not support multiple-suspect lineups as a superior alternative to single-suspect lineups, they do support them as a viable alternative, as both single-suspect and multiple-suspect lineups had well calibrated confidence, with those who were accurate being more confident than those who were not. This finding is consistent with research which suggests that higher confidence at the time of the identification may be a reliable indicator of higher accuracy (Brewer & Palmer, 2010).

Foils in Multiple-Suspect Lineups (10 vs 14)

This study also aimed to investigate if including 10 or 14 foils in a multiple-suspect lineup would affect witness identification accuracy. It was hypothesized that including 14 foils in the lineup would result in higher rates of accurate identifications. This hypothesis was informed by theory which suggests that including more foils in a lineup should reduce the chances of an innocent suspect being selected (i.e., it should decrease lineup-wise error rates) (Wells & Turtle, 1986). It was also informed by existing South African legal practices, in which additional foils are added to a lineup to account for the inclusion of more than one suspect (SAPS, 2007). However, this hypothesis was rejected as the results of this study showed that there were no significant differences in accuracy between the 10-foil (42.10 %) and the 14-foil (46%) lineup conditions.

Whilst there were no significant differences in accuracy between the foil conditions, the 14-foil condition may still have provided greater protection against mistaken identifications of innocent suspects than the 10-foil condition. This is evident as the diagnosticity ratios were higher in the 14-foil conditions (0.82) than they were in the 10-foil conditions (0.61). This depicts that participants were better at differentiating between foils and the perpetrator in the 14-foil condition than they were in the 10-foil condition, meaning they would be less likely to falsely identify a foil in the 14-foil condition. Furthermore, in the target-present 14-foil lineups, of the 69.50% of participants who were inaccurate, only 15.30% falsely identified a lineup member, whilst the other 54.20% rejected the lineup. In the 10-foil condition of the 77.80% of those who were inaccurate, 25.40% falsely identified a lineup member, and the other 52.40% rejected the lineup. This demonstrates that there were higher rates of foil identifications in the 10-foil condition than there were in the 14-foil condition. In this study there were no designated suspects in each lineup, however, these figures suggest that in a real-life situation in which two suspects were included in a lineup, an

innocent suspect may be more likely to be identified in a 10-foil lineup than in a 14-foil lineup. Thus, this supports the notion that 14-foil lineups may provide greater protection against mistaken identifications of innocent suspects than 10-foil lineups.

Repeated Exposure and Single-Suspect Choice Conditions

In the interest of acquiring more information about what lineup presentation yields the highest rates of accuracy in instances of repeated exposure, this study also investigated different single-suspect choice conditions. It was hypothesized that participants in the 'after viewing each lineup – stop' condition would be more accurate than those in the 'after viewing each lineup – change' condition. This hypothesis was based on existing research which informs the use of sequential lineups. This research suggests that to maximize accuracy, witnesses should not be exposed to any additional lineup members, or in this instance lineups, after they have made an identification (Lindsay & Wells, 1985). The results of this study led to this hypothesis being rejected, as they showed that there was no significant difference in accuracy between these two conditions.

Alternatively, the results showed that participants in both the 'after viewing each lineup – stop' (41.80%) and the 'after viewing each lineup – change' (43%) conditions were significantly less accurate than those in the 'after viewing all lineups' condition (59.40%). These rates of accuracy suggest that to maximize accuracy in instances of repeated exposure, lineups should be presented as they were in the 'after viewing all lineups' condition. This is further supported by the fact that perpetrator identifications in the 'after viewing all lineups' (1.67) condition appeared to be more diagnostic of guilt than those in both the 'after viewing each lineup – stop' (0.51) and 'change' (0.69) conditions. Further research on this may provide more insight into the possibility of using this format in practice.

One reason that participants in the 'after viewing all lineups' condition may have been significantly more accurate than those in the other two single-suspect choice conditions, is

that unlike these conditions, the ‘after viewing all lineups’ condition may have avoided commitment effects. In this condition, although participants were exposed to more than one lineup, they were only required to make one decision after viewing both. This may have provided participants with the opportunity to change their minds in a second lineup without the pressure of committing to an identification made in a previous lineup. Therefore, allowing participants to make only one choice may have avoided the development of commitment effects.

The superiority of the ‘after viewing all lineups’ condition is further supported as the confidence-accuracy characteristic curves show that confidence was well calibrated in this condition, with confidence and PPV being very strongly positively correlated. This calibration provides support for existing literature on the relationship between confidence and accuracy (Brewer & Palmer, 2010). Despite this, unusual patterns of confidence were observed throughout this data, and therefore caution should be taken when interpreting these results.

Meta-Cognitive Processes

The final aim of this study was to investigate if there were any significant differences in meta-cognitive processes between single and multiple-suspect lineups. It was hypothesized that, due to the increased number of faces that participants needed to consider in the multiple-suspect conditions, there would be significant differences in meta-cognitive processes between these conditions.

The results showed that there were significant differences in automatic recognition between lineup types. Specifically, participants in single-suspect lineups reported experiencing significantly more automatic recognition than participants in multiple-suspect conditions.

This is an important finding as existing research on lineup meta-cognitive processes suggests that participants who automatically recognize the perpetrator are more likely to be accurate than those who use relative judgment strategies to identify the perpetrator (Dunning & Stern, 1994; Wittwer et al., n.d.). This would suggest that single-suspect lineups should have higher rates of accuracy than multiple-suspect lineups.

Limitations and Recommendations

Whilst this study yielded interesting results it faced limitations which may have negatively impacted its reliability. One such limitation was that the randomization schedule of this experiment was compromised and for a period of time participants were not properly randomly assigned to the different lineup conditions. Every effort was made to rectify this, however, it ultimately could not be reversed and is therefore a limitation of this study. Based on this the results of this study should be interpreted with caution as the effect this may have had on the results is unknown. To address this, future research should repeat this procedure whilst ensuring the randomization schedule is properly enforced.

Additionally, whilst this study had a large sample size (N=650), the sample profile was not very wide, as the sampling methods that were used meant that this study reached a population which consisted largely of students and young adults. Thus, whilst the sample size was large enough to allow for the results of this study to be generalized to the population, they may not provide a good representation across the population. Therefore, future research in this area should be conducted using broader samples, so as to make the results more representative.

Moreover, whilst the results of this study may be generalized to the population, this study lacks ecological validity. The reason for this is that despite every effort being made to recreate real-life conditions, due to ethical concerns this is not achievable in such studies. However, this is not a limitation that is specific to this study, as it is one which all eyewitness

studies face. Therefore, whilst future studies may not be able to address this, it should be taken into account when interpreting the results of this and other such studies.

Furthermore, there were unusual patterns of confidence observed throughout the data collected in this study. Therefore, future research should further investigate the relationship between confidence and accuracy in the lineup conditions that were included in this study. Further research on the use of multiple-suspect lineups is also needed to provide further insight into whether they provide a viable alternative to single-suspect lineups.

Conclusion

Multiple-suspect lineups are used in practice around the world. Despite this, there is limited existing research on how the use of multiple-suspect lineups affects eyewitness identification accuracy. Additionally, there are limited existing guidelines in place which govern the use of multiple-suspect lineups. Therefore, this study aimed to investigate if multiple-suspect lineups could provide a viable and superior alternative to single-suspect lineups. Furthermore, this study aimed to investigate if including 10 or 14 foils in multiple-suspect lineups affected accuracy, and if lineup type affected meta-cognitive processes. It also aimed to investigate what type of single-suspect lineup choice condition would result in the highest rates of accuracy in instances of repeated lineup exposure.

Overall, there were no differences in accuracy between the multiple-suspect and single-suspect lineup conditions. However, when the individual lineup choice and foil conditions were considered, participants in the ‘after viewing all lineups’ choice condition were significantly more accurate than those in all the other choice and foil conditions – other than the 14-foil multiple-suspect condition. Additionally, confidence and accuracy were well calibrated in the ‘after viewing all lineups’ condition. The results also showed that those who viewed single-suspect lineups experienced more automatic recognition than those who viewed the multiple-suspect lineups. Therefore, as a whole, it can be concluded that multiple-

suspect lineups are not a superior alternative to single-suspect lineups, although they may be considered a viable alternative. Additionally, it can also be concluded that in instances of repeated exposure, and overall, the ‘after viewing all lineups’ condition is most predictive of accuracy. However, due to the inconsistencies in this data further research is required to gain more clarity on this topic.

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Firstly, a heartfelt thank you to our supervisor, Professor Colin Tredoux. The guidance, insight, and support that you provided us with throughout the year played an invaluable role in the completion of this project. We will always be grateful to you for this.

We would also like to thank the members of UCT's Eyewitness research team. Our weekly discussions were always something to look forward to and having your experience and knowledge made navigating this research project much less daunting.

Lastly, we would like to thank our friends and families for their support throughout our Honours year. Although we cannot mention you all individually, we are very grateful for your support and advice which played a fundamental role in helping us navigate the challenges we faced this year.

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Appendix A

SRPP Vula recruitment announcement for participation in the experiment

Hello everyone!

You are invited to participate in a study where you will be asked questions about what you consider to be socially acceptable behaviour.

Details about the study: This is a computer-based study in which you will watch a short video clip, that depicts a student's behaviour on campus, after which you will be asked questions about your thoughts on what you saw in this video. This experiment will take around 20-30 minutes to complete.

Benefits: You will be awarded 1 SRPP point for completing this study.

If you would link to participate, please follow this link: https://toulousepsychology.eu.qualtrics.com/jfe/form/SV_9owm8oE4LCn4BKe

If there are any problems, or if you have any questions, please feel free to email either Kershen Govender, Katherine Hathorn or our supervisor professor Colin Tredoux directly on: **GVNKER018@myuct.ac.za, HTHKAT001@myuct.ac.za** or **colin.tredoux@uct.ac.za**

We apologize for reposting this again, we had trouble with our link. If you already completed the survey on the previous link, please do not do it again on this link - it is the same survey.

Thank you!

Kind regards,

Kershen Govender and Katherine Hathorn

Appendix B

Social media recruitment announcement for participation in the experiment

Hello everyone!

You are invited to participate in a study where you will be asked questions about what you consider to be socially acceptable behaviour.

Details about the study: This is a computer-based study in which you will watch a short video clip, that depicts a student's behaviour on campus, after which will be asked questions about your views on what you saw in this video. This experiment will take around 20- 30 minutes to complete.

Benefits: If you complete the full survey, you will be entered into a raffle and stand a chance to win one of the following cash prizes:

1st place= R500

2nd place= R250

3rd place= R250

If you would link to participate, please follow this link:

If there are any problems, or if you have any questions, please feel free to email either Kershen Govender, Katherine Hathorn or our supervisor Colin Tredoux directly on: GVNKER018@myuct.ac.za, HTHKAT001@myuct.ac.za or colin.tredoux@uct.ac.za.

Thank you!

Kind regards,

Kershen Govender and Katherine Hathorn

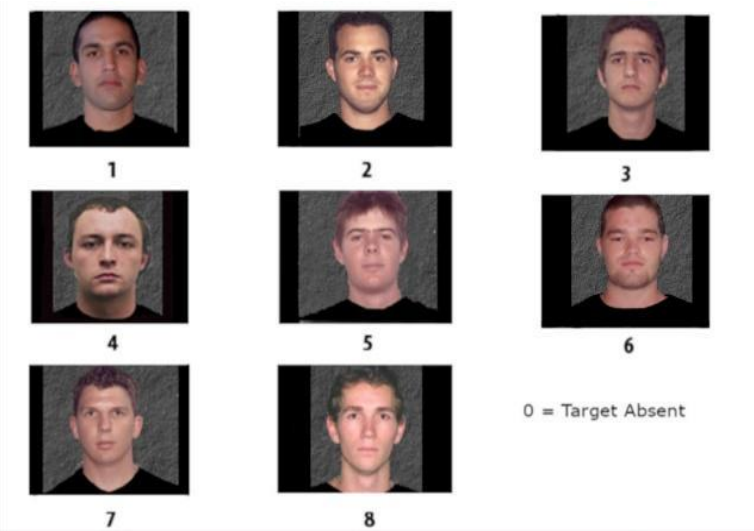

STAND A CHANCE TO WIN 1 OF 3 TAKEALOT VOUCHERS!
To be eligible to win one of these vouchers, you will need to complete a 20-25 minute survey on socially acceptable behavior.
Follow the link in bio/description to enter
Or email forsurvey011@gmail.com
R500
R250
R250

Appendix C

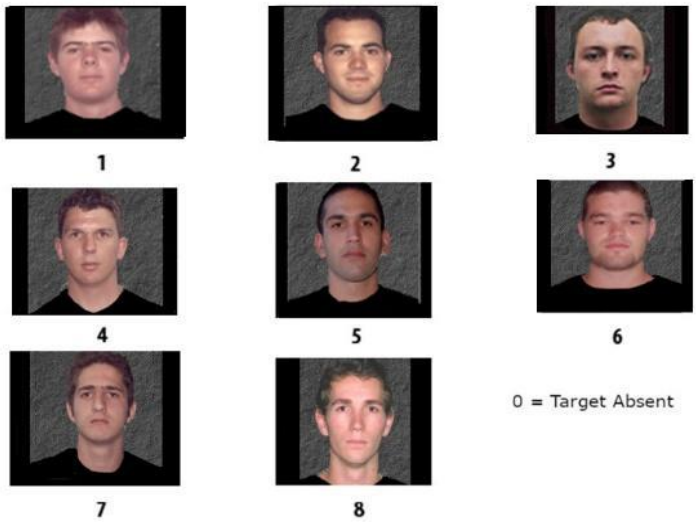
Lineups from the experiment

Single-Suspect Lineups

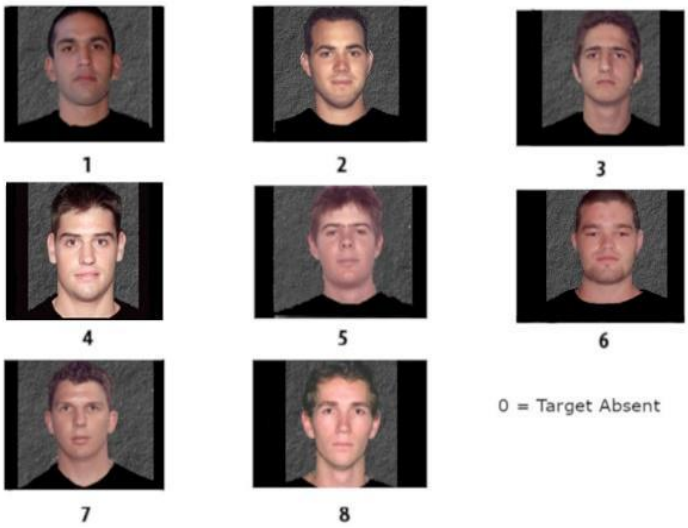
Perpetrator 1 existing lineup target-present order 1



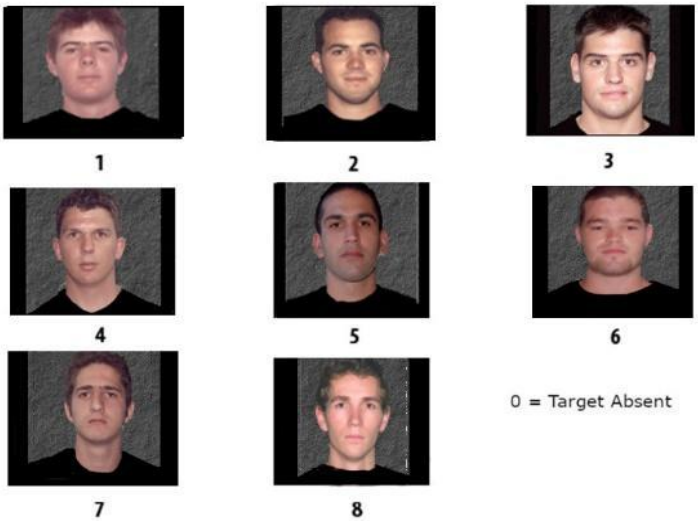
Perpetrator 1 existing lineup target-present order 2



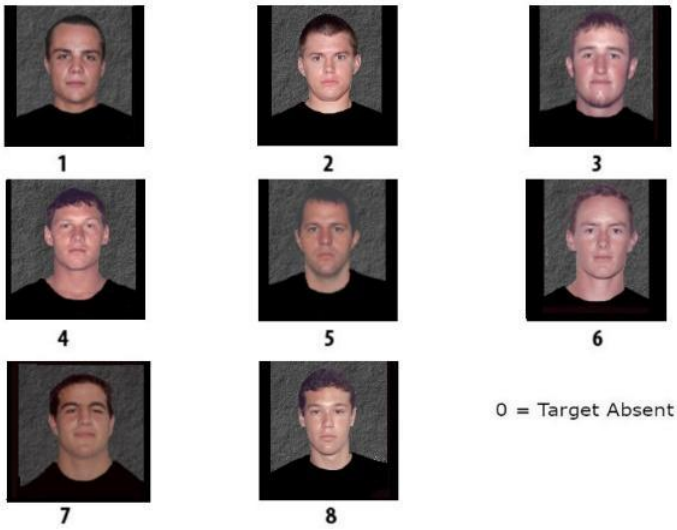
Perpetrator 1 existing lineup target-absent order 1



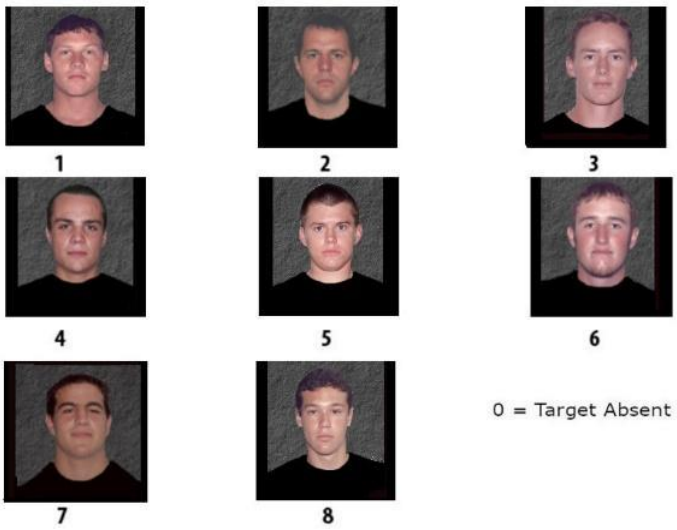
Perpetrator 1 existing lineup target-absent order 2



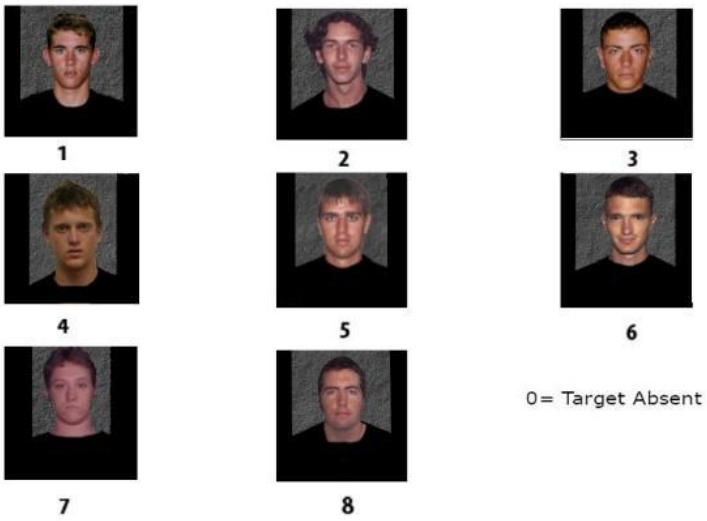
Perpetrator 1 new lineup target-absent order 1



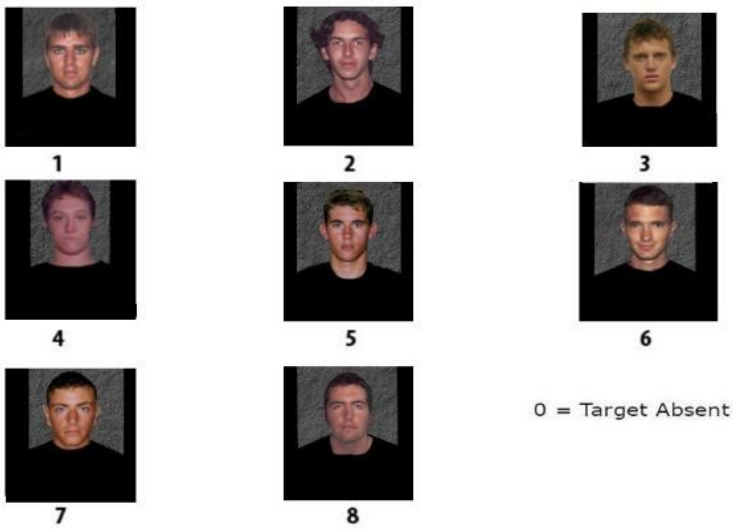
Perpetrator 1 new lineup target-absent order 2



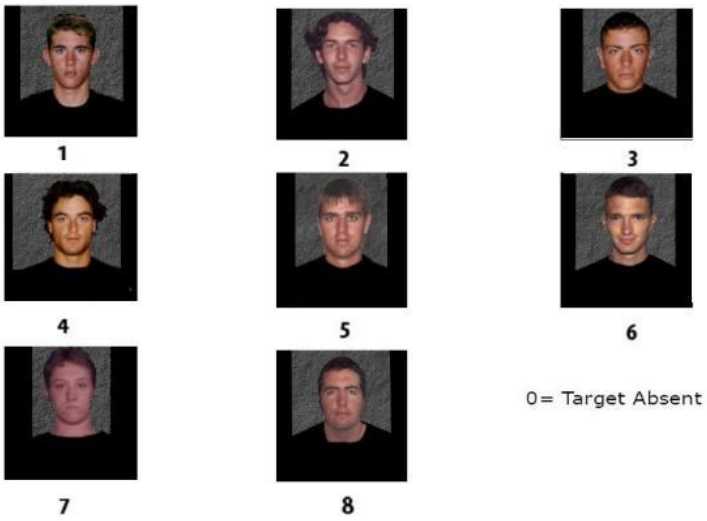
Perpetrator 2 existing lineup target-present order 1



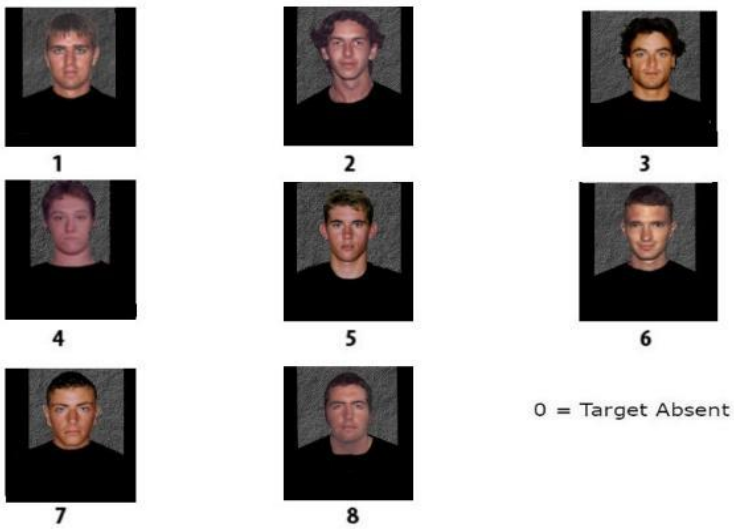
Perpetrator 2 existing lineup target-present 2



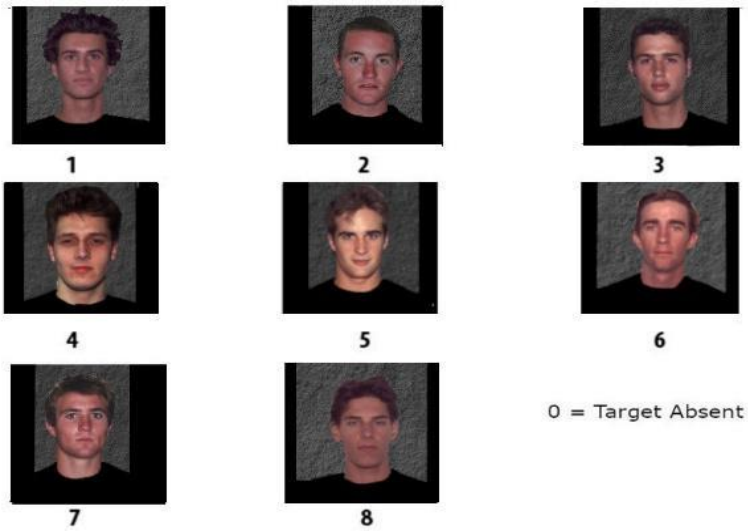
Perpetrator 2 existing lineup target-absent order 1



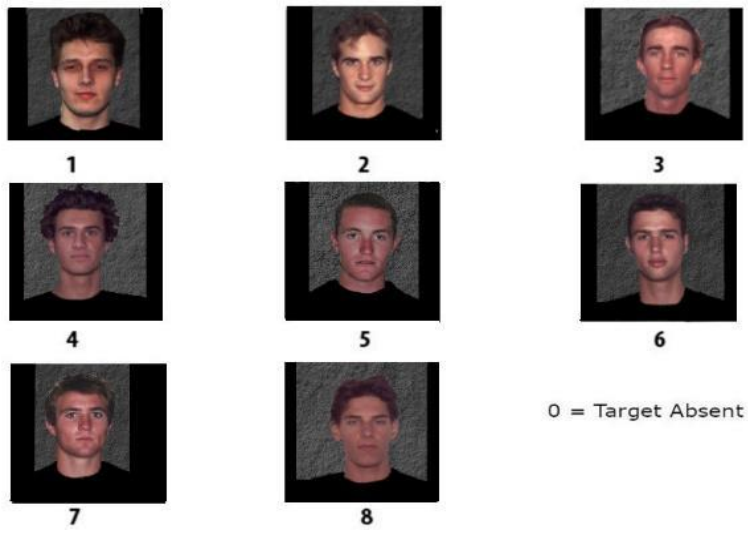
Perpetrator 2 existing lineup target-absent order 2



Perpetrator 2 new lineup target-absent order 1



Perpetrator 2 new lineup target-absent order 2



Multiple-Suspect Lineups

10 Foil Multiple-Suspect Lineups

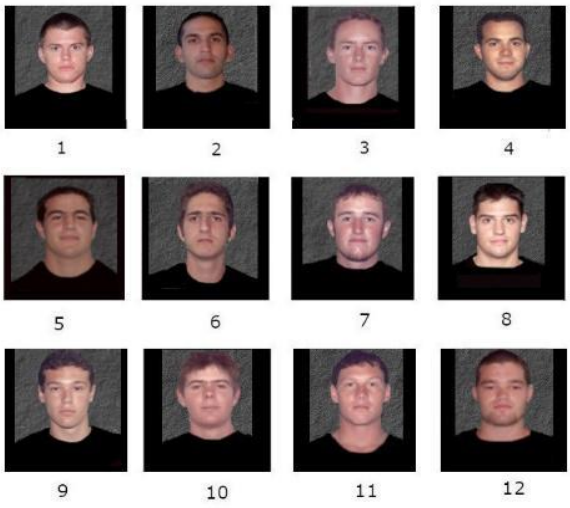
Perpetrator 1 new lineup target-present order 1

0 = target absent

Perpetrator 1 new lineup target-present order 2

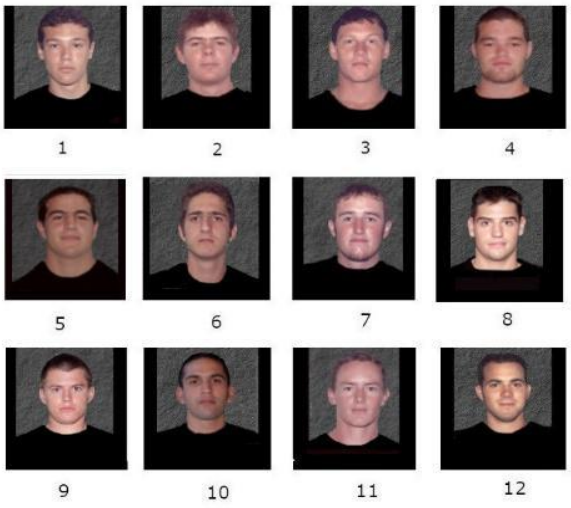
0 = target absent

Perpetrator 1 new lineup target-absent order 1



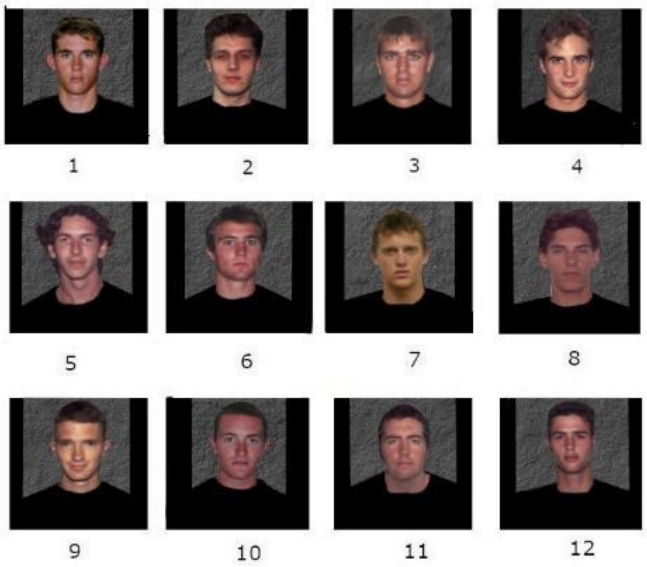
0 = target absent

Perpetrator 1 new lineup target-absent order 2

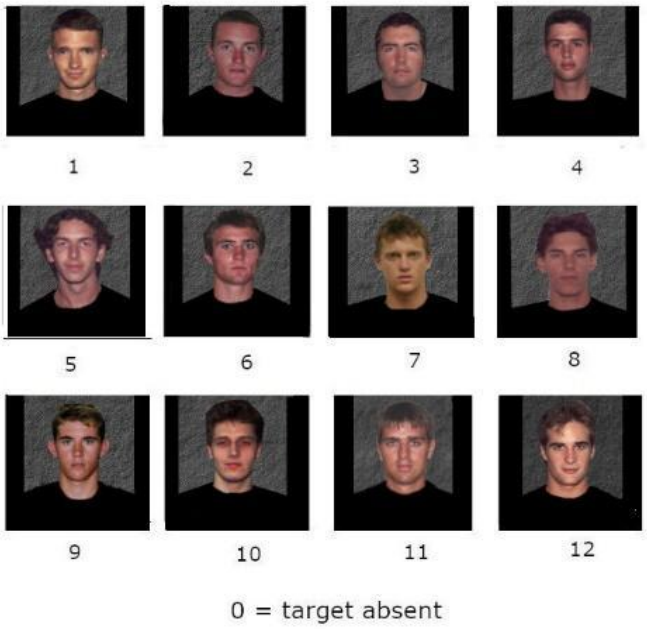


0 = target absent

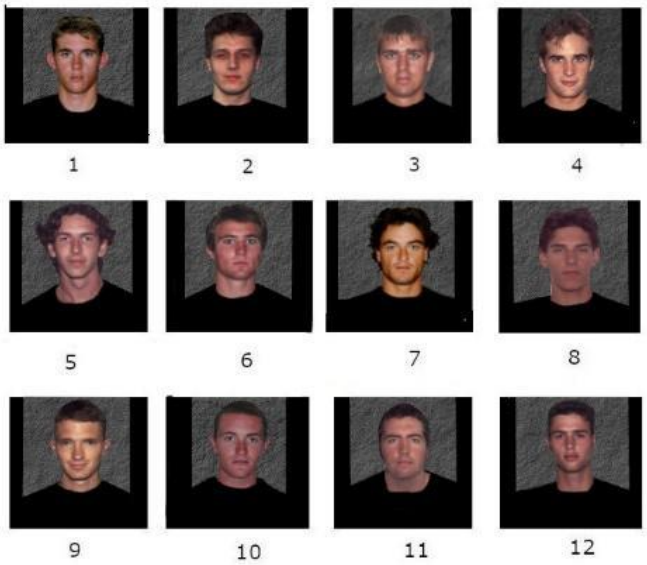
Perpetrator 2 new lineup target-present order 1



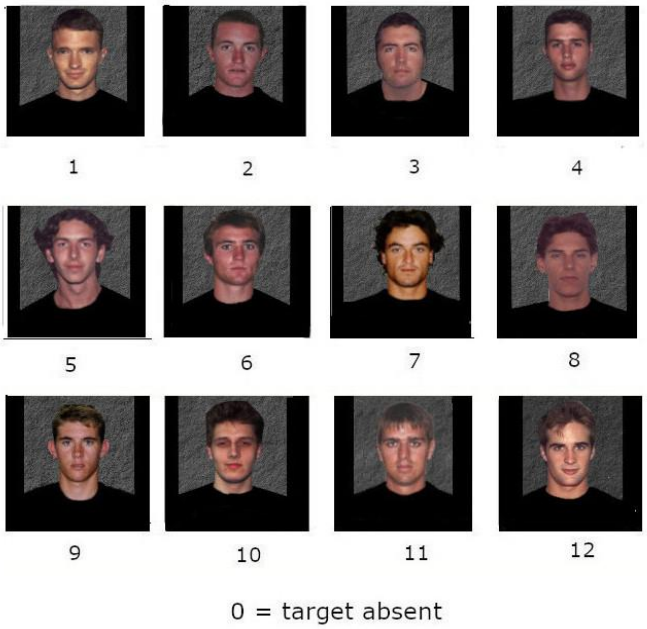
Perpetrator 2 new lineup target-present order 2



Perpetrator 2 new lineup target-absent order 1



Perpetrator 2 new lineup target-absent order 2



14 Foil Multiple-Suspect Lineups

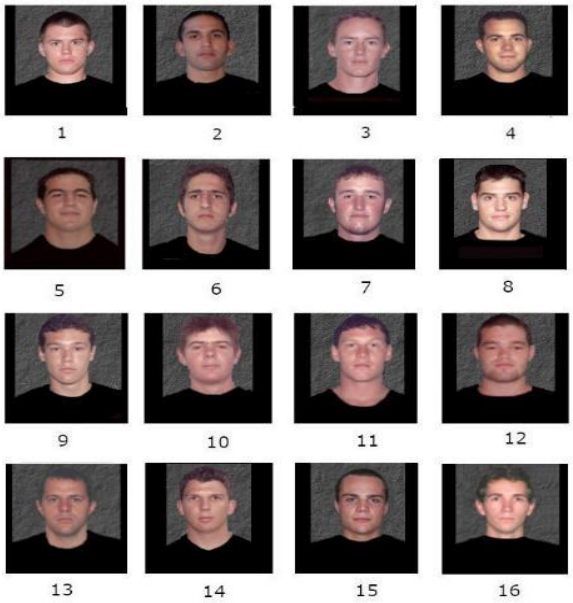
Perpetrator 1 new lineup target-present order 1

0 = target absent

Perpetrator 1 new lineup target-present order 2

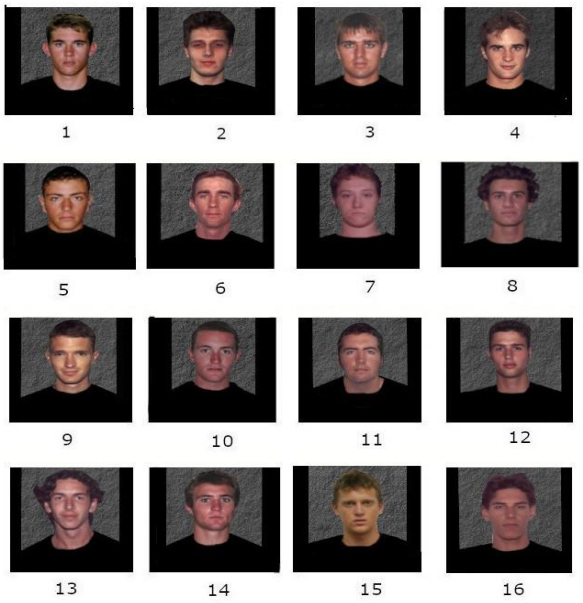
0 = target absent

Perpetrator 1 new lineup target-absent order 1

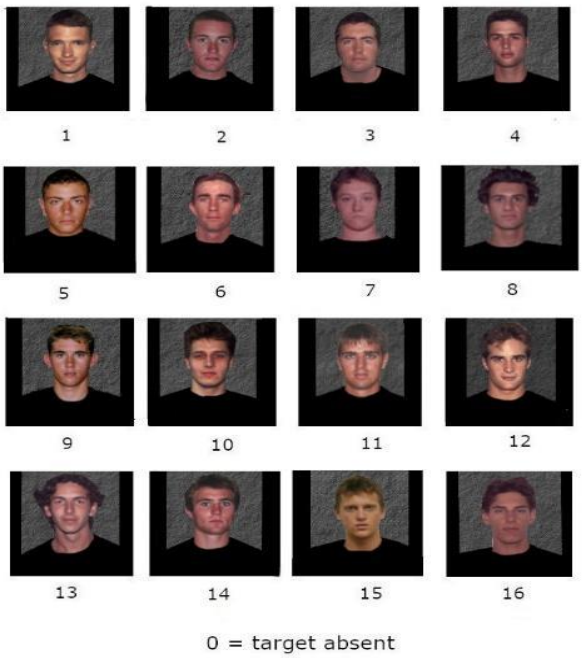


Perpetrator 1 new lineup target-absent order 2

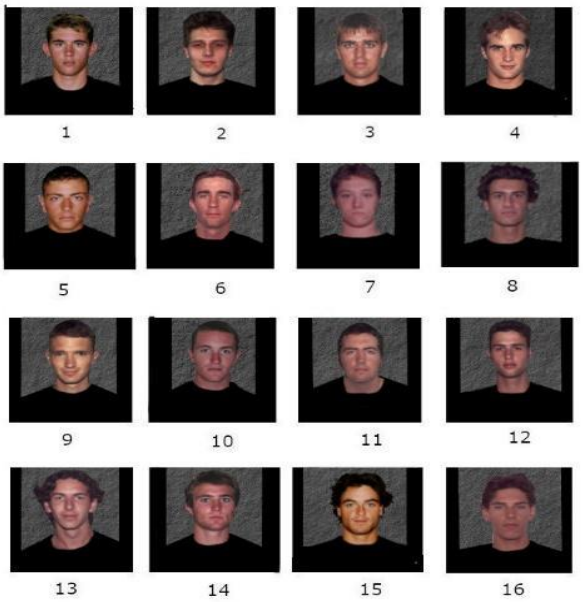
Perpetrator 2 new lineup target-present order 1



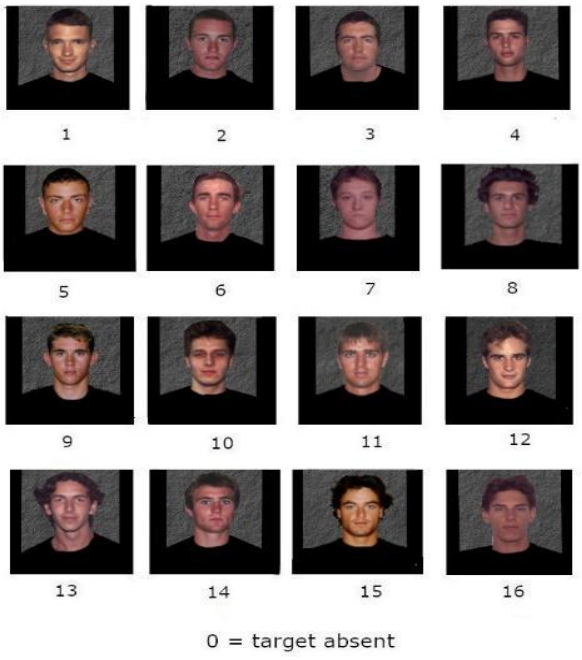
Perpetrator 2 new lineup target-present order 2



Perpetrator 2 new lineup target-absent order 1



Perpetrator 2 new lineup target-absent order 2



Appendix D

Lineup creation

Method

The lineups that were used in this experiment consisted of a combination of existing lineups, which were created for use in previous studies that used the same simulated crime video, and lineups that were created specifically for this study.

The construction of these lineups consisted of two phases, namely the foil selection phase and the lineup rating stage. The foil selection phase was used to identify foils to be included in the lineups and the lineup rating stage was used to judge the fairness of the lineups that were created from the foil selection phase. These procedures were completed twice as the lineups that were created in the first attempt proved not to be fair or unbiased.

Construction of Lineups First Attempt

This section details the first attempt that was made to create unbiased lineups for use in the experimental section of this study. The procedure that was used to create these lineups was that which was used by Vredeveldt et al. (2015). The fairness of these lineups was judged according to the suggestions made by Malpass et al. (2007).

Participants

Through convenience sampling 191 friends, family members and classmates of the researchers were recruited to participate in the lineup construction (*N*= 191). Of these 10 participants took part in the foil selection stage (*n*=10), and the remainder engaged in the lineup rating stage (*n*=181). The number of participants in the lineup rating stage exceeded the originally proposed sample size of 160. This sample size was proposed to allow each of the 16 foils which were included in the newly constructed lineups to each be rated by 10 participants. Convenience sampling was used to enable this part of the study to be conducted

during the mid-year vacation, so that data collection for the experimental section of the study could begin early in the second semester.

Materials

Target Stimuli

Foil Selection. In the foil selection stage, participants were provided with a frontal photograph and modal description of one of the two perpetrators who appeared in the two different versions of a simulated crime video that was first used by Schmidt (2010) (See Appendix D.i). Each version of this video showed a white male perpetrator entering a bookshop and stealing a book. The main difference between these videos was that in each one a different actor played the perpetrator. Participants were also provided with 350 photographs from the Eyewitness and ASCENT laboratories (EYE) database.

Lineup Rating. In the lineup rating stage participants were provided with the same modal description that was used during the foil selection phase and with a lineup that was created from the foil selection phase. The modal descriptions of these perpetrators were obtained from the study in which these videos were first used, to ensure that any new foils that were included were consistent with those in the existing lineups (Schmidt, 2010).

Presentation and Answering Materials

Surveys for the foil selection were created using MS word and were completed by participants in a hard copy format. Surveys for the lineup rating stage were created using the online survey creation software Qualtrics (Qualtrics, Provo, UT; https://www.qualtrics.com).

Procedure

Foil Selection

Ten participants were provided with a consent form (see Appendix D.ii) and then with the target stimuli from one of the above-mentioned videos. They were then instructed to select 20 individuals from the EYE database, who they felt most closely resembled the

provided photograph and description of the perpetrator, after which they were debriefed (see Appendix D.iii).

Lineup Construction

Lineups were constructed using the eight most frequently selected photographs of each perpetrator from the foil selection phase, in conjunction with the existing bookshop lineups (Schmidt, 2010; see Appendix D.iv). Two versions of each of the new lineups were created. The second version of each contained the same foils as the first version but in a different order, to control for order effects.

Single-Suspect Lineups. For both the target-absent and target-present conditions, one foil was selected at random and removed from the existing nine-person lineups, in keeping with the South African legal requirement of having seven foils accompanying a suspect in a lineup (SAPS, 2007). When creating a second target-absent lineup the eight most frequently selected photographs from the foil selection phase were placed in a lineup.

Multiple-Suspect Lineups. For the 14-foil target-present and target-absent lineups, two of the relevant single-suspect lineups were combined. The new target-absent and an existing target-present lineup were combined to form the target-present condition, and two target-absent lineups were combined to form the target-absent condition. To create the 10-foil target-absent lineup and target-present lineups, four foils were randomly selected and removed from each of the relevant 14-foil lineups.

Lineup Rating

The lineup rating began by obtaining informed consent from 181 participants (see Appendix D.v). Participants were provided with lineup instructions and asked to identify the person who was described in the modal description, from the newly created lineups. Thereafter, participants were debriefed (see Appendix D.vi).

Results

Lineup Rating

The new single-suspect lineups that were formed by removing a randomly selected foil from the existing nine-person lineups were not subjected to this stage. The results from the lineup rating section showed that the lineups that were created, were in fact not fair or unbiased. As there were multiple instances in which one lineup member was chosen more frequently than the others. For example, in one of the lineups that was created one of the foils was chosen by 68% of the participants who saw that lineup, whilst others in that lineup were not selected at all. According to Malpass et al. (2007), this would suggest that the lineups were not fair, as in order to be considered fair no one member of the lineup should be chosen more frequently than any of the others. Therefore, based on such uneven frequencies, without any additional statistical analysis it was concluded that these lineups were not suitable for use in the study and based on this a second attempt was made at lineup creation.

Construction of Lineups Second Attempt

This section details the second attempt that was made to create unbiased lineups for use in the experimental section of this study. In this attempt a different procedure was followed for foil selection than that which was used in the first attempt. However, the fairness of the lineups was still judged according to the suggestions made by Malpass et al. (2007).

Participants

No participants were recruited for the foil selection phase of this attempt, however, 272 friends, family members and classmates of the researchers (*N*=272) were recruited to participate in the lineup construction through convenience sampling. This increased the sample size that was used for the lineup rating in the first attempt so as to make the results more statistically significant. Convenience sampling was used to enable this part of the study

to be conducted during the mid-year vacation, so that data collection for the experimental section could begin early in the second semester.

Materials

Target Stimuli

Foil Selection. In the foil selection stage, the same target stimuli that were used in the first attempt at foil selection were used.

Lineup Rating. As was the case in the first attempt, in the lineup rating stage participants were provided with a lineup that was created from the foil selection phase. However, the modal descriptions that were used in this attempt differed from those that were used in the first attempt. The reason for this was that the researchers concluded that one of the reasons that the lineups were biased was that the model descriptions were too specific. Therefore, more general versions of these modal descriptions were used in this attempt (see Appendix D.vii).

Presentation and Answering Materials

No official survey was used in the foil selection phase of this attempt, however, surveys for the lineup rating stage were created using the online survey creation software Qualtrics (Qualtrics, Provo, UT; https://www.qualtrics.com).

Procedure

Foil Selection

In this stage the researchers selected 20 individuals from the EYE database, who they felt most closely resembled the provided photograph and description of the perpetrator. Whilst this is not the most highly recommended method of foil selection it is one that is often used (Malpass et al., 2007). This method was adopted in the interest of keeping the research on its scheduled timeline.

Lineup Construction

The lineups were constructed using the eight most frequently selected photographs of each perpetrator from the foil selection phase, in conjunction with the existing bookshop lineups (Schmidt, 2010; see Appendix D.iv). Two versions of each of the new lineups were created. The second version of each contained the same foils as the first version but in a different order, to control for order effects.

Single-Suspect Lineups. For both the target-absent and target-present conditions, one foil was selected at random and removed from the existing nine-person lineups, in keeping with the South African legal requirement of having seven foils accompanying a suspect in a lineup (SAPS, 2007). When creating a second target-absent lineup the eight most frequently selected photographs from the foil selection phase were placed in a lineup.

Multiple-Suspect Lineups. For the 14-foil target-present and target-absent lineups, two of the relevant single-suspect lineups were combined. The new target-absent and an existing target-present lineup were combined to form the target-present condition, and two target-absent lineups were combined to form the target-absent condition. To create the 10-foil target-absent and target-present lineups, four foils were selected at random and removed from each of the relevant 14-foil lineups.

Lineup Rating

The lineup rating began by obtaining informed consent from 272 participants (see Appendix D.v). Participants were provided with lineup instructions and asked to identify the person who was described in the modal description, from the newly created lineups. Thereafter, participants were debriefed (see Appendix D.vi).

Results

Lineup Rating

As was the case in the first attempt, the new single-suspect lineups, that were formed by removing a randomly selected foil from the existing nine-person lineups, were not subjected to this stage.

The results from the lineup rating section showed that the lineups that were created were largely fair and unbiased. This was established by examining how frequently each foil was selected from the lineup, and by looking at the effective size and the bias calculations from each lineup. The effective size (*E*) is a measure of how many of the lineup members can be considered plausible lineup members (Tredoux, 1998). In order to judge effective size, the effective size of each lineup was compared to the nominal size of each lineup. Effective sizes are considered good when they are close to the nominal size. As can be seen in Table D1 the majority of the lineups had good effective sizes, particularly when using the upper confidence interval to compare to the nominal size. The same can be said for bias, as whilst there was some variation this was largely considered acceptable. Based on this it was concluded that these lineups were suitable for inclusion in the experiment.

Table D**1**

Effective Size and Bias per Lineup

Lineup	Nominal Size	Effective Size (*E*)	Lower confidence interval *E*	Upper confidence interval *E*	Bias	Bias comparison
P1_SSLU_TA01	8	6.37	5.37	7.83	0.16	0.13
P1_MSLU10_TA01	12	3.92	3.25	4.93	0.26	0.08
P1_MSLU10_TP01	12	7.65	6.08	10.30	0.05	0.05
P1_MSLU14_TA01	16	5.29	3.83	8.53	0.19	0.06
P1_MSLU14_TP01	16	7.59	5.82	10.93	0.06	0.06
P2_SSLU_TA01	8	4.58	3.58	6.37	0.22	0.13
P2_MSLU10_TA01	12	6.75	5.61	8.48	0.14	0.08
P2_MSLU10_TP02	12	8.01	6.45	10.57	0.04	0.08
P2_MSLU14_TA01	16	7.54	5.78	10.84	0.13	0.06
P2_MSLU14_TP01	16	9	7.42	11.45	0.07	0.06

Note. E = effective size.

Appendix D.i

Frontal photographs and modal descriptions

Perpetrator 1

Short brown hair

Brown eyes

Round face

Perpetrator 2

(Light-)brown hair

Blue/green eyes

Long/oval-shaped face

Tanned skin

Appendix D.ii

Consent form for foil selection

Dear Participant,

Thank you for your interest in this study!

We, Katherine Hathorn and Kershen Govender, are currently working towards our Honours in Psychology at the University of Cape Town. This survey is part of the lineup creation section of the experiment that we are conducting for our Honours thesis.

Before completing this form please take the time to read the following information, which will provide you with information about this study, and your role in it, should you decide to participate. If you do not understand anything or would like more information, please contact us or our supervisor, Professor Colin Tredoux on the contact details below.

Purpose

The results of this survey will be used to create fair and unbiased lineups that will be used in the experimental section of this study. Please note that more information will be given to you at the end of the survey.

Procedure

If you agree to participate you will be required to take part in a 15-to-20-minute survey. You will be provided with a short description and a photograph of an individual and then required to make selections from a data base of photographs based on this.

Possible Risks

There are no anticipated psychological or physical risks associated with this study. This experiment is paper-based and non-intrusive, and you will not be exposed to any threatening stimuli. However, if you experience any emotional discomfort as a result of this study, please contact UCT's Student Wellness Centre at 021 650 1020, or the Lifeline National Counselling Line at 086 132 2322.

Voluntary Participation

Participation in this experiment is voluntary, and you may at any stage, withdraw from the experiment without penalty.

Confidentiality

Your name, details, and responses will be kept strictly confidential. This consent form and your responses will be safely stored and will only be accessible to the researchers. Your consent form will not be linked to your responses.

Contact

If you have further questions, or would like a copy of this document in case of future queries, please contact the researchers, Kershen Govender, Katherine Hathorn or our supervisor Colin Tredoux directly on:

GVNKER018@myuct.ac.za, HTHKAT001@myuct.ac.za or **colin.tredoux@uct.ac.za.**

If you have any questions regarding the ethics of this experiment, or about your rights as a participant, you may contact the Research Ethics Committee, Department of Psychology, Cape Town on: **rosalind.adams@uct.ac.za**.

Before proceeding, please complete this form:

I, as a participant, have read the above information and am aware of the possible benefits and risks in this experiment. I have no further questions at this point. I hereby give consent to voluntarily participate in this experiment, knowing that my responses will be collected but will in no way be linked back to my personal details. I have been offered a copy of this document for future queries.

_____ _____

Name of Participant Participant Signature

_____

Date

Appendix D.iii

Foil selection debriefing form

Thank you for your participation. Below are details about this study that further explain its purpose and how your participation will contribute to our larger study.

In this survey you were provided with a photograph and description of a white male. You were also given a selection of white male faces from which to choose 20 photographs that you believe most closely resembled this initial description and photograph.

The aim of this section of our study is to build a selection of foils (individuals that we know have not committed a crime), to include in mock police lineups that will be used in the later sections of this study.

The aim of the experimental section of this study is to determine if using police lineups that consist of more than one suspect and a selection of foils (multiple-suspect lineups), allows for higher rates of perpetrator identifications than using police lineups that include only one suspect and a selection of foils (single-suspect lineup). Furthermore, this study aims to investigate whether using 10 or 14 foils in multiple-suspect lineups results in better identification accuracy. Finally, the study also aims to explore people's thought processes when making lineup identifications, to investigate if there are differences in self-reported meta-cognitive patterns in single-suspect and multiple-suspect lineups.

From this study we hope to show that multiple-suspect lineups are a viable alternative to single-suspect lineups. This research hopes to provide more information that could be used for the creation of legal guidelines surrounding the use of multiple-suspect lineups.

This is an important area of research, as much of the existing research focuses on single-suspect lineups at the peril of multiple-suspect lineups, despite multiple-suspect lineups having benefits that single-suspect lineups do not. Such benefits include avoiding repeated

exposure of a witness to a lineup, as this can have detrimental effects on the witness's ability to make an accurate identification.

Should you wish to gain more information about this field, some resources which you may find useful include "Eyewitness identification: The importance of lineup models" (Wells & Turtle, 1986) and "The Relationship Between Eyewitness Confidence and Identification Accuracy: A New Synthesis" (Wixted & Wells, 2017).

We would like to extend our most sincere thanks to you for participating in this study. Your participation makes a vital contribution to our ability to complete this study, which may provide valuable information which could be used in legal systems around the world.

Thank you.

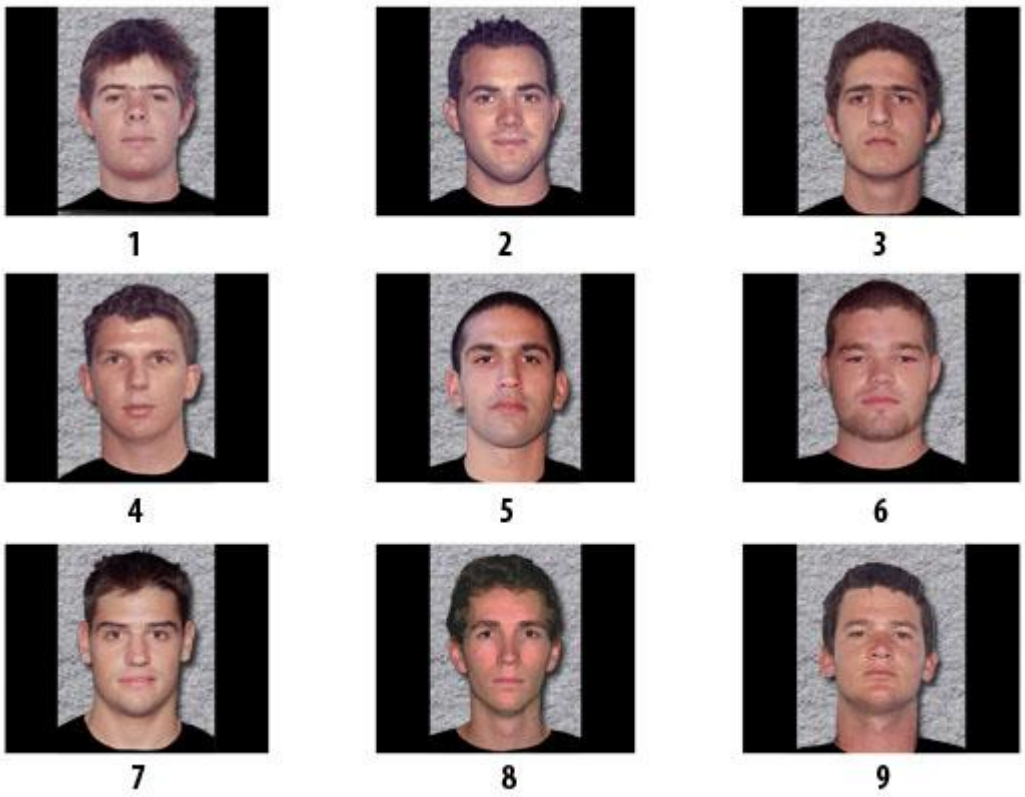
Kershen Govender

Katherine Hathorn.

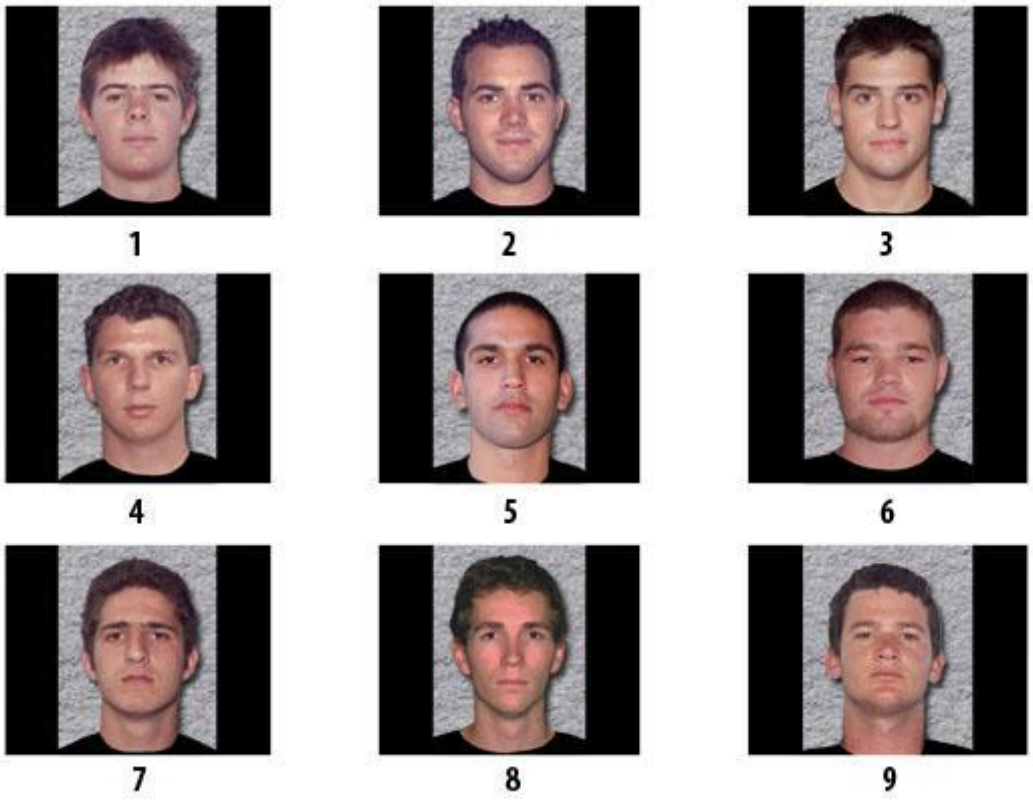
Appendix D.iv

Existing bookshop lineups from Schmidt (2010)

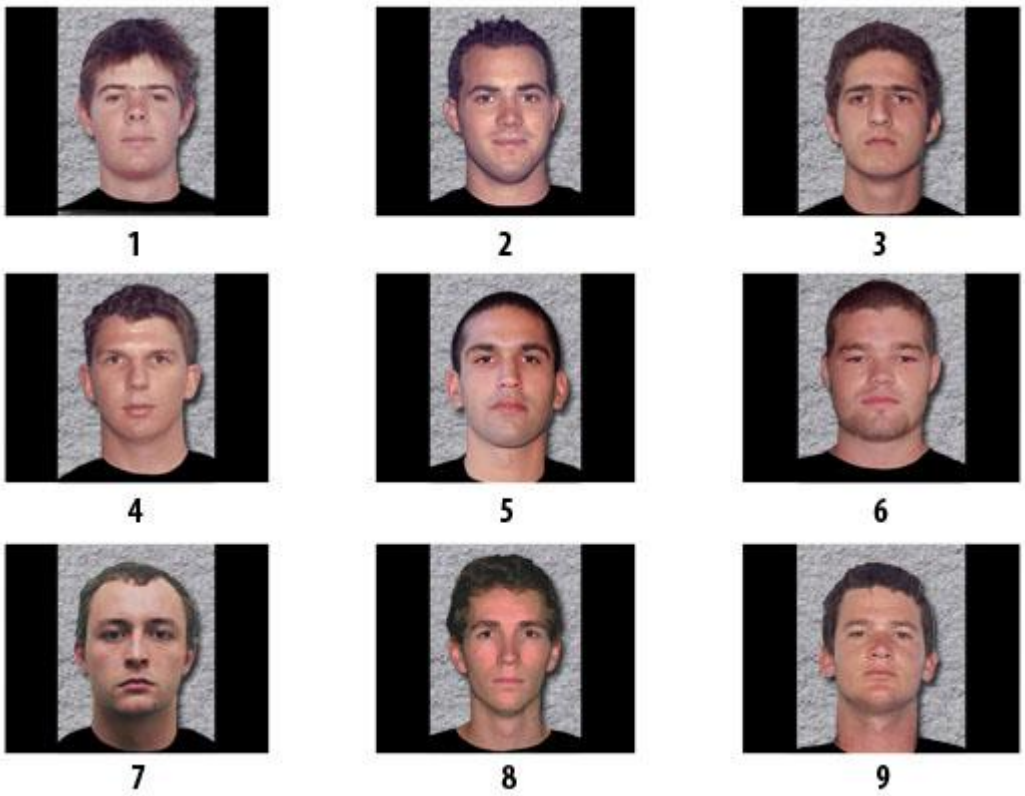
Video 1 Target-Absent Lineup 1 Version A



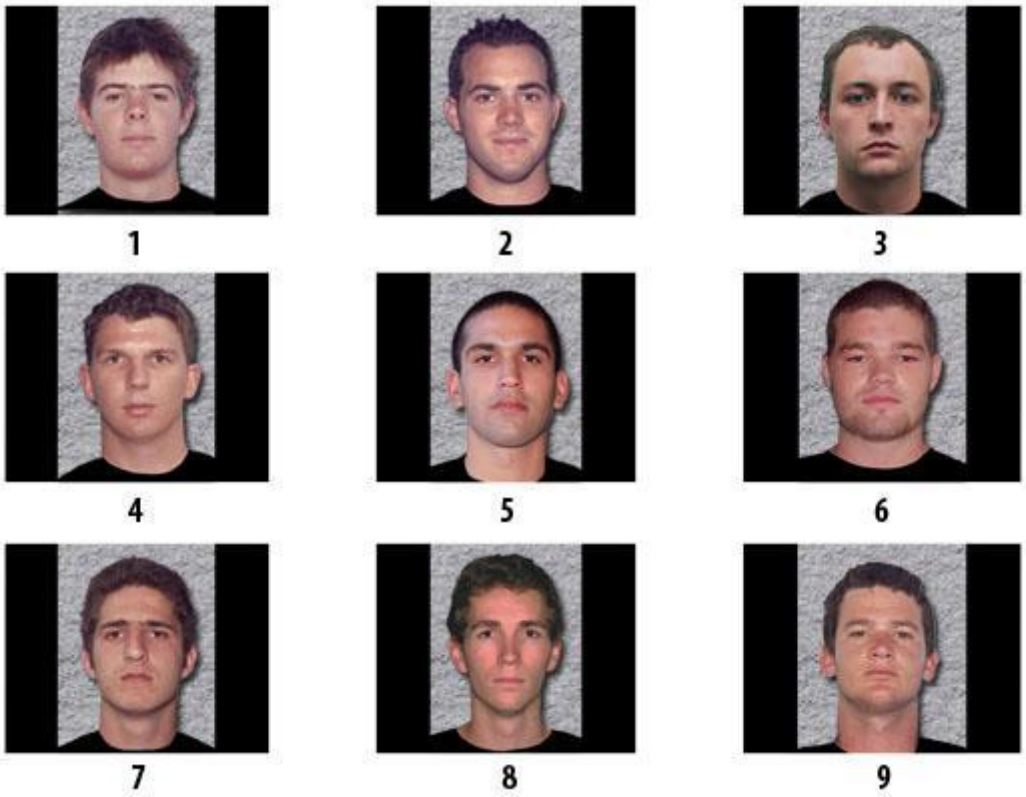
Video 1 Target-Absent Lineup 1 Version B



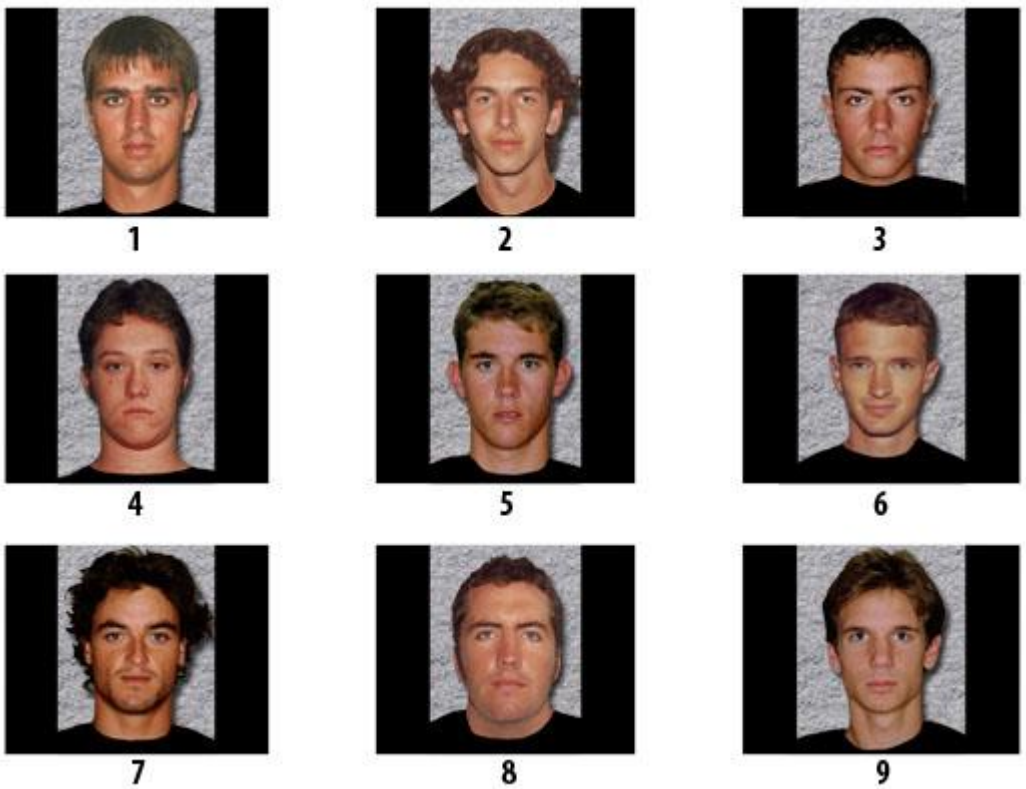
Video 1 Target-Present Lineup Version A



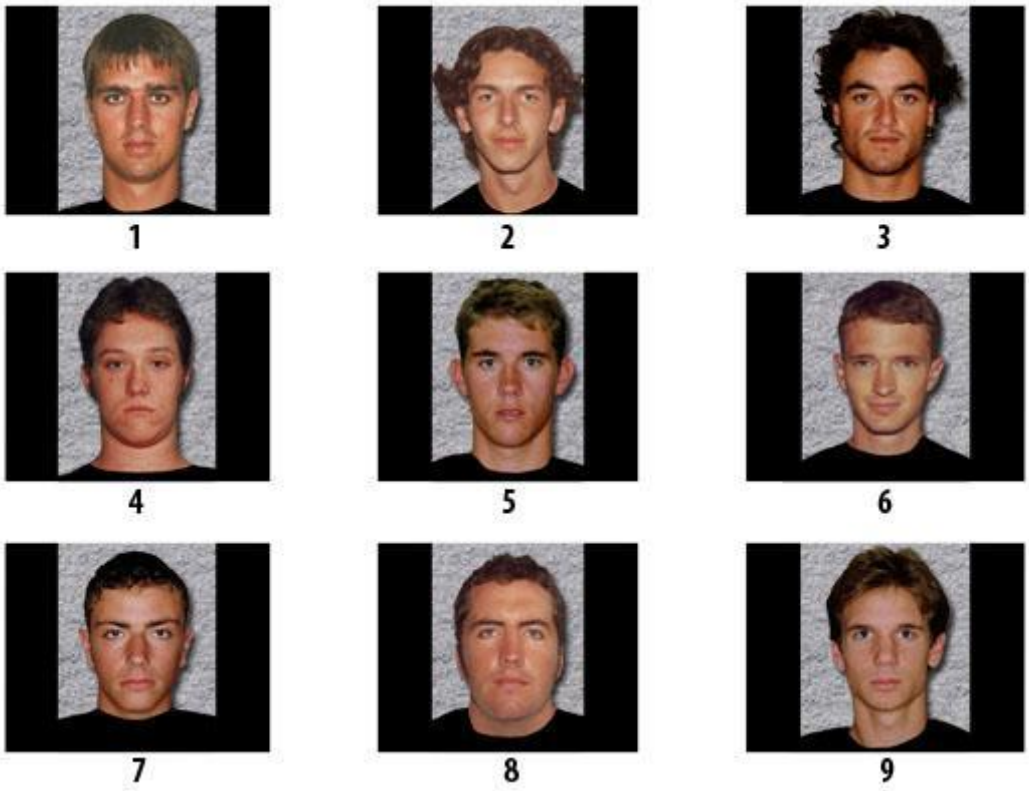
Video 1 Target-Present Lineup Version B



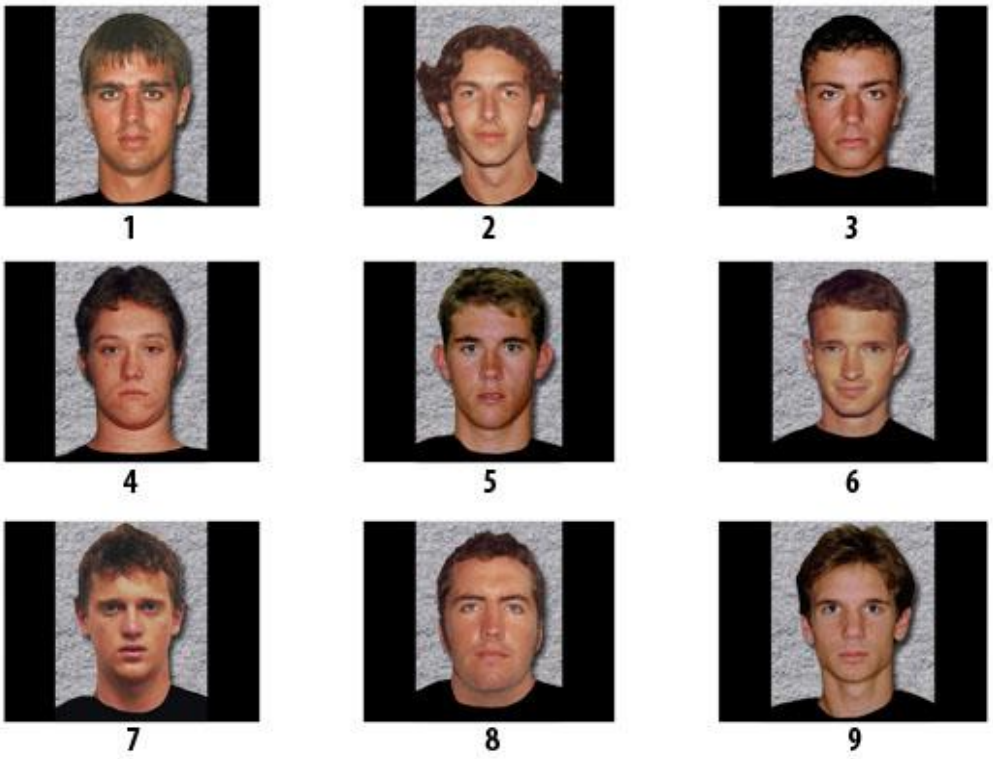
Video 2 Target-Absent Lineup 1 Version A



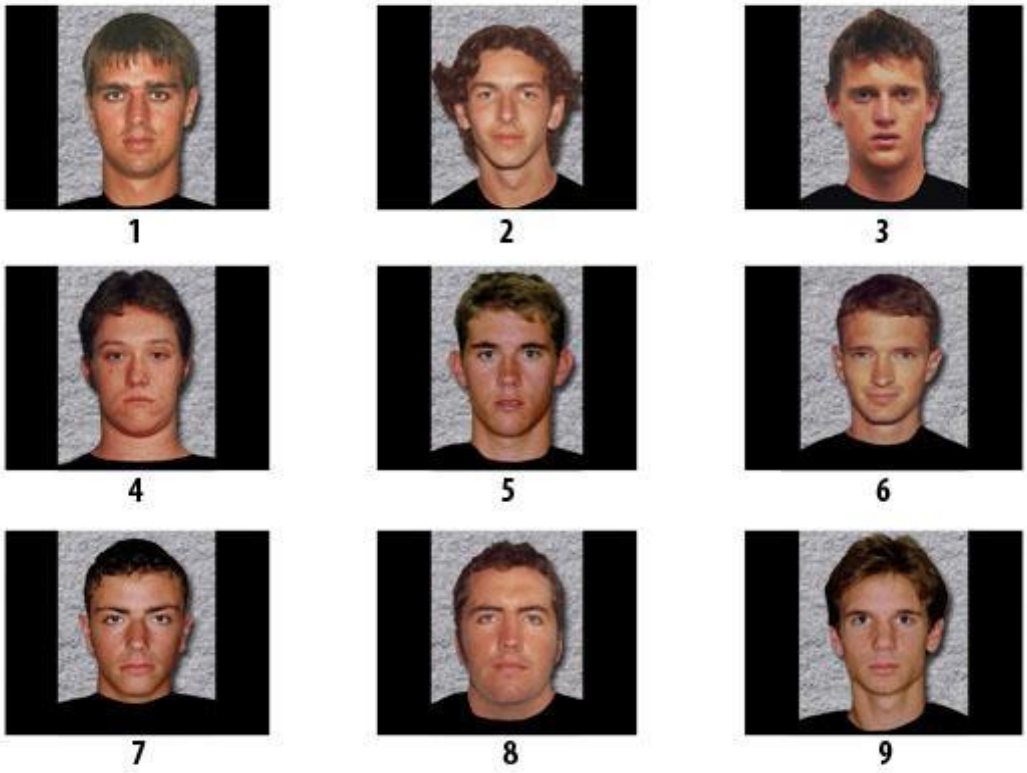
Video 2 Target-Absent Lineup 1 Version B



Video 2 Target-Present Lineup Version A



Video 2 Target-Present Lineup Version B



Appendix D.v

Consent form for lineup rating

Dear Participant,

Thank you for your interest in this study!

We, Katherine Hathorn and Kershen Govender, are currently working towards our Honours in Psychology at the University of Cape Town. This survey is part of the lineup creation section of the experiment that we are conducting for our Honours thesis.

Before completing this form, please take the time to read the following information, which will provide you with information about this study, and your role in it, should you decide to participate. If you do not understand anything or would like more information, please contact us or our supervisor, Professor Colin Tredoux on the contact details below.

Purpose

The results of this study will be used to determine if the lineups that were created in the previous section of the study are fair and unbiased, in order to establish if they are suitable for use in the experimental section of this study. Please note that more information will be given to you at the end of the survey.

Procedure

If you agree to participate you will be invited to take part in a 10-minute computer-based survey. You will be provided with a short description and then asked to identify individuals, based on this description, from a lineup of photographs that will be provided to you.

Possible Risks

There are no anticipated psychological or physical risks associated with this study. The experiment is computer-based, non-intrusive, and you will not be exposed to any threatening stimuli. However, if you experience any emotional discomfort as a result of this study, please contact UCT's Student Wellness Centre at 021 650 1020, the South African Depression and

Anxiety Group UCT Student Careline on 0800 24 25 26 or SMS 31393 for a callback, alternatively you can contact the Lifeline National Counselling Line at 086 132 2322.

Voluntary Participation

Participation in this experiment is voluntary, and you may at any stage, withdraw from the experiment or skip a question without any penalty.

Confidentiality

Your name, details, and responses will be kept strictly confidential. This consent form and, and the computer files will be encrypted. Your consent form will not be linked to your responses.

Contact

If you have further questions, or would like a copy of this document in case of future queries, please contact the researchers, Kershen Govender, Katherine Hathorn or our supervisor Colin Tredoux directly on: GVNKER018@myuct.ac.za, HTHKAT001@myuct.ac.za or colin.tredoux@uct.ac.za.

If you have any questions regarding the ethics of this experiment, or about your rights as a participant, you may contact the Research Ethics Committee, Department of Psychology, Cape Town on: 021 650 3417 or rosalind.adams@uct.ac.za

Before proceeding, please complete this form:

I, as a participant, have read the above information and am aware of the possible benefits and risks in this experiment. I have been offered a copy of this document for future queries and I have no further questions at this point. I hereby give consent to voluntarily participate in this experiment, knowing that my responses will be collected but will in no way be linked back to my personal details.

_____ _____

Name of Participant Participant Signature

_____

Date

Appendix D.vi

Participant debriefing form for lineup rating

Thank you for your participation. Below are details about this study that further explain its purpose and how your participation will contribute to our larger study.

In this survey you were provided with a description of a white male, and a lineup of photographs.

The aim of this section of this study is to ensure that the lineups that were created, using the foils (innocent individuals) that were most frequently selected in the foil selection stage of the study, are fair and unbiased. If fair and unbiased these lineups will be used in the experimental section of our study.

The aim of the experimental section of this study is to determine if using police lineups that consist of more than one suspect and a selection of foils (multiple-suspect lineups), allows for higher rates of perpetrator identifications than using police lineups that include only one suspect and a selection of foils (single-suspect lineup). Furthermore, this study aims to investigate whether using 10 or 14 foils in multiple-suspect lineups results in better identification accuracy. Finally, the study also aims to explore people's thought processes when making lineup identifications, to investigate if there are differences in self-reported meta-cognitive patterns in single-suspect and multiple-suspect lineups.

From this study we hope to show that multiple-suspect lineups are a viable alternative to single-suspect lineups. This research hopes to provide more information that could be used for the creation of legal guidelines surrounding the use of multiple-suspect lineups.

This is an important area of research, as much of the existing research focuses on single-suspect lineups at the peril of multiple-suspect lineups, despite multiple-suspect lineups having benefits that single-suspect lineups do not. Such benefits include avoiding repeated exposure of a witness to a lineup, as this can have detrimental effects on the witness's ability

to make an accurate identification.

Should you wish to gain more information about this field, some resources which you may find useful include “Eyewitness identification: The importance of lineup models” (Wells & Turtle, 1986) and “The Relationship Between Eyewitness Confidence and Identification Accuracy: A New Synthesis” (Wixted & Wells, 2017).

We would like to extend our most sincere thanks to you for participating in this study. Your participation makes a vital contribution to our ability to complete this study, which may provide valuable information that can be used in legal systems around the world.

Thank you.

Kershen Govender

Katherine Hathorn.

Appendix D.vii

Lineup construction second attempt modal descriptions

Perpetrator 1

White male

Brown hair

Perpetrator 2

White male

Brown hair

Long/ oval face

Appendix E

Anagram distractor tasks

The following questions consist of a number of short anagram tasks. Anagrams are phrases or words that are made by rearranging a selection of letters. Please try your best to complete these tasks.

1. Change the word **beard** into something you can eat
2. Create a new word using the letters from the word **nails**
3. Create a new word using the letters from the word **low**
4. Change the word **chain** into the name of a country
5. Change the word **flog** into a sport
6. Change word **tea** into a verb (something you do)
7. Create a new word using the letters from the word **heart**
8. Create a new word using the letters from the word **steal**
9. Create a new word using the letters from the word **won**
10. Create a new word using the letters from the word **brag**
11. Create a new word using the letters from the word **slip**
12. Create a new word using the letters from the word **care**
13. Create a new word using the letters from the word **ape**
14. Create a new word using the letters from the word **sink**
15. Create a new word using the letters from the word **meals**
16. Create a new word using the letters from the word **team**
17. Create a new word using the letters from the word **cat**
18. Create a new word using the letters from the word **blow**
19. Create a new word using the letters from the word **last**
20. Create a new word using the letters from the word **won**

Appendix F

Attention question

Please look at the following sequence of numbers carefully and after you have done so move to the next page, using the arrow at the bottom of the page.

2 4 6 8

In the box below, please type in the sequence of numbers you saw on the previous page.

Appendix G

Questionnaire

Please rate how well the following apply to you on a scale of 1-6, where ‘1’ – strongly disagree, ‘2’ – somewhat disagree, ‘3’ – neither agree nor disagree, ‘4’ – somewhat agree , ‘5’ – strongly agree, ‘6’ – not applicable,

1. I inspected the faces of the people in the lineup, and I concluded that they were all unlike the kind of face the perpetrator had.
2. I had no feeling of familiarity when I looked at the lineup, and I knew that I ought to have a feeling of familiarity if one of the lineup members was the perpetrator.
3. I did not get a good look at the perpetrator’s face, so I could not recognise it later.
4. I compared the lineup members to each other, especially their facial features, looking for ways in which they were dissimilar. This helped me make my decision.
5. When I inspected the photographs, I immediately noticed that no face matched the culprit.
6. Because the faces were quite similar to each other, it was difficult to make a decision.
7. I immediately recognized the perpetrator, but I cannot explain why.
8. When I viewed the lineup, I immediately recognized the perpetrator, because his face jumped out at me.
9. I eliminated the photos, one by one, based on how much they looked like the perpetrator, and chose the remaining one.
10. I compared the photographs with each other to make my choice.
11. The person whom I identified was the closest match to my memory of the perpetrator, but not exactly.
12. I had to think carefully in order to arrive at my decision.

13. I compared the faces from the photographs with my memory of the face of the perpetrator to help me make my decision.

Appendix H

Informed consent form for the experiment SRPP recruitment

Dear Participant,

Thank you for your interest in this study!

We, Katherine Hathorn and Kershen Govender, are currently working towards our Honours in Psychology at the University of Cape Town. This experiment forms the data collection section of our Honours thesis.

Please take the time to read the following information before completing the informed consent form. This will provide you with information about our study and what your role in it will be, if you agree to participate. If you do not understand anything or would like more information, please contact us or our supervisor, Professor Colin Tredoux on the contact details below.

Purpose

The aim of this study is to investigate what students consider to be socially acceptable behaviour.

Procedure

If you agree to participate you will be invited to take part in a 30-minute computer-based survey. In this survey will watch a short video clip, that depicts a student's behavior on campus. You will then be asked questions about your thoughts on what you saw in this video.

Possible Risks

There are no anticipated psychological or physical risks associated with this study. The experiment is computer-based, non-intrusive, and you will not be exposed to any threatening

stimuli. However, if you experience any emotional discomfort as a result of this study, please contact UCT's Student Wellness Centre on 021 650 1020, the South African Depression and Anxiety Group UCT Student Careline on 0800 24 25 26 or SMS 31393 for a callback, or alternatively you can contact the Lifeline National Counselling Line on 086 132 2322.

Benefits

You will be awarded 1 SRPP point for completing the **full** experiment.

Voluntary Participation

Participation in this experiment is voluntary, and you may at any stage, withdraw from the experiment or skip a question without any penalty.

Confidentiality

Your name, details, and responses will be kept strictly confidential. This consent form and the computer files will be encrypted. Your consent form will not be linked to your responses, these details will only be used for the purposes of allocating SRPP points.

Contact

You will be debriefed at the end of the study and given more information. If you have any further questions, or would like a copy of this document in case of future queries, you may contact the researchers, Kershen Govender, Katherine Hathorn, or our supervisor Colin Tredoux

at: **GVNKER018@myuct.ac.za** or **HTHKAT001@myuct.ac.za** or **colin.tredoux@uct.ac.za.**

If you have any questions regarding the ethics of this experiment, or about your rights as a participant, you may contact the Research Ethics Committee, Department of Psychology, Cape Town on: **021 650 3417** or **rosalind.adams@uct.ac.za.**

Before proceeding, please complete this form:

I, as a participant, have read the above information and am aware of the possible benefits and risks in this experiment. I have been offered a copy of this document for future queries and I have no further questions at this point. I hereby give consent to voluntarily participate in this experiment, knowing that my responses will be collected but will in no way be linked back to my personal details.

_____ _____

Participant Name Participant Surname

_____ _____

Date Student Number

_____

Course Code for SRPP Points (e.g. PSY1004F)

Appendix I

Informed consent form for the experiment social media recruitment

Dear Participant,

Thank you for your interest in this study!

We, Katherine Hathorn and Kershen Govender, are currently working towards our Honours in Psychology at the University of Cape Town. This experiment forms the data collection section of our Honours thesis.

Please take the time to read the following information before completing the informed consent form. This will provide you with information about our study and what your role in it will be, if you agree to participate. If you do not understand anything or would like more information, please contact us or our supervisor, Professor Colin Tredoux on the contact details below.

Purpose

The aim of this study is to investigate what students consider to be socially acceptable behaviour.

Procedure

If you agree to participate you will be invited to take part in a 30-minute computer-based survey. In this survey will watch a short video clip, that depicts a student's behavior on campus. You will then be asked questions about your thoughts on what you saw in this video.

Possible Risks

There are no anticipated psychological or physical risks associated with this study. The experiment is computer-based, non-intrusive, and you will not be exposed to any threatening stimuli. However, if you experience any emotional discomfort as a result of this study, please contact UCT's Student Wellness Centre on 021 650 1020, the South African Depression and Anxiety Group UCT Student Careline on 0800 24 25 26 or SMS 31393 for a callback, or alternatively you can contact the Lifeline National Counselling Line on 086 132 2322.

Benefits

For those participants recruited through social media or DSA you will be entered into a raffle and stand a chance to win an R500 or one of two R250 Takealot vouchers for completing the **full** survey.

Voluntary Participation

Participation in this experiment is voluntary, and you may at any stage, withdraw from the experiment or skip a question without any penalty.

Confidentiality

Your name, details, and responses will be kept strictly confidential. This consent form and, and the computer files will be encrypted. Your consent form will not be linked to your responses, these details will only be used for allocating SRPP points or raffle purposes.

Contact

You will be debriefed at the end of the study and given more information. If you have any further questions, or would like a copy of this document in case of future queries, you may

contact the researchers, Kershen Govender, Katherine Hathorn, or our supervisor Colin Tredoux

at: **GVNKER018@myuct.ac.za** or **HTHKAT001@myuct.ac.za** or **colin.tredoux@uct.ac.za.**

If you have any questions regarding the ethics of this experiment, or about your rights as a participant, you may contact the Research Ethics Committee, Department of Psychology, Cape Town on: **021 650 3417** or **rosalind.adams@uct.ac.za.**

Before proceeding, please complete this form:

I, as a participant, have read the above information and am aware of the possible benefits and risks in this experiment. I have been offered a copy of this document for future queries and I have no further questions at this point. I hereby give consent to voluntarily participate in this experiment, knowing that my responses will be collected but will in no way be linked back to my personal details.

_____ _____

Participant Name Participant Surname

_____ _____

Recruitment via (“DSA ”Social media”) Email Address

_____

Date

Appendix J

Consent form telling the participants of their true role in the study SRPP recruitment

Dear Participant,

Deception

At this stage of the study you may have realized that the study will not be asking you about your thoughts on student's behavior on campus. This study will instead invite you to view mock police lineups, in an attempt to investigate the rates of correct identifications of perpetrators, in different types of police lineups. You will be presented with a selection of photographs and asked to indicate if the person who you saw commit the crime, in the video that you watched, is present in any of these photographs. (You will be awarded 1 SRPP point for completing the full experiment)

Exclusion Criteria

If this is not the first time you have seen the video that you watched at the beginning of this survey, or you recognized the person in the video, you will not be able to continue this study. We apologize for any inconvenience this may have caused you.

Thank you.

Kershen Govender & Katherine Hathorn.

Do you want to continue?

- Yes
- No

Appendix K

Consent form telling the participants of their true role in the study social media recruitment

Dear Participant,

Deception

At this stage of the study you may have realized that the study will not be asking you about your thoughts on student's behavior on campus. This study will instead invite you to view mock police lineups, in an attempt to investigate the rates of correct identifications of perpetrators, in different types of police lineups. You will be presented with a selection of photographs and asked to indicate if the person who you saw commit the crime, in the video that you watched, is present in any of these photographs. (You will be entered into the raffle for completing the full experiment)

Exclusion Criteria

If this is not the first time you have seen the video that you watched at the beginning of this survey, or you recognized the person in the video, you will not be able to continue this study. We apologize for any inconvenience this may have caused you.

Thank you.

Kershen Govender & Katherine Hathorn.

Do you want to continue?

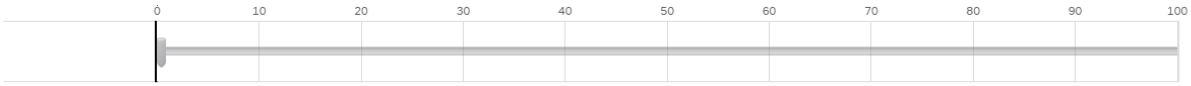
- Yes
- No

Appendix L

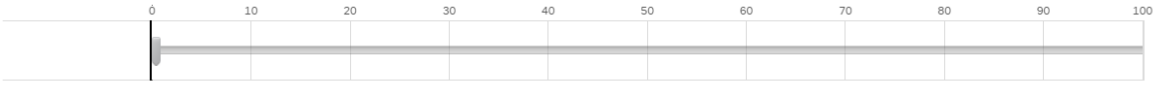
Pre-lineup and post-lineup confidence questions

Pre-Lineup Confidence Question for Each Lineup Condition

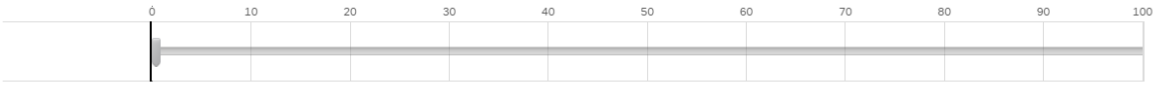
How confident are you that you would be able to recognize the man who stole the book if you were to see his photograph amongst photographs of 7 men that looked reasonably similar to him?



How confident are you that you would be able to recognize the man who stole the book if you were to see his photograph amongst photographs of 11 men that looked reasonably similar to him?

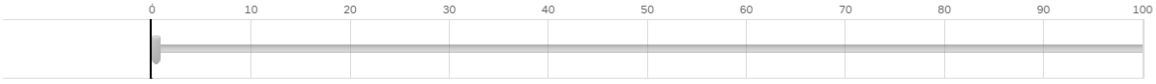


How confident are you that you would be able to recognize the man who stole the book if you were to see his photograph amongst photographs of 15 men that looked reasonably similar to him?



Post Lineup Confidence Question

Please indicate how confident you are that the decision that you made is correct.



Appendix M

Lineup instructions per lineup condition

'After Viewing All Lineups' Condition

Using the description that you provided of the perpetrator, the police were able to identify the person that they think is responsible for the crime. However, they do not know if they have apprehended the right person. In the following question you will be presented with 2 lineups of individuals and asked to indicate if the person you witnessed stealing the book is present in either of these lineups.

You will view these lineups one after another. After viewing **each** lineup please make a note of your choice for that lineup (e.g. Lineup 1- Number 9 or Lineup 2 - Number 9) before moving on to the next page. After viewing both lineups you will be asked to make **one** final choice. This will require you to select only one individual, from the individuals that you saw in both lineups, that you think is the perpetrator of the crime.

Please note that the perpetrator may or may not be present in either of these lineups. If you believe that the perpetrator is not present, then please select the "0= Target absent" option.

Lineup 1 Instruction

Please look at the lineup below and make a note of who you believe to be the perpetrator. Make a note if you think they are present (e.g. Lineup 1- Number 9) or take note of the target-absent option. When you are ready please proceed to the next page using the next arrow at the bottom of the page.

Lineup 2 Instruction

Please look at the lineup below, and after you have made a note of your decision proceed to the next page, where you will indicate your final decision.

Decision instruction- Please make your final decision. To do so select the option that reflects the lineup number (lineup 1 or 2) and the number of the photograph (1-8) of the individual that you believe to be responsible for the bookshop theft.

If you do not believe that the perpetrator was present in either of the lineups that you viewed please select the target absent choice. Please do not take any notice of the labels in the brackets, these are simply there to enable your answer to be encoded for analysis.

'After Viewing Each Lineup - Stop' condition

Using the description that you provided of the perpetrator, the police were able to identify the person that they think is responsible for the crime. However, they do not know if they have apprehended the right person. In the following question you will be presented with a lineup of individuals and asked to indicate if the person who you witnessed stealing the book is present in the lineup.

Please note that the perpetrator may or may not be present in this lineup. If you believe that the perpetrator is not present, then please select the "0= Target Absent" option.

Lineup 1 Instruction

Please look at the lineup below and if you think the perpetrator of the crime is present click on their photograph. The photograph should then show a green box surrounding it. If you feel the perpetrator is not present in this lineup then please select the "0 = Target Absent" option. When you have done this please proceed to the next page by clicking the next arrow at the bottom of the page.

Lineup 2 Instruction

Please indicate if the person that you saw steal the book is present in this lineup, by clicking on the photograph of the individual you believe to be the perpetrator. A green box should then surround this photograph.

Please note that the perpetrator may or may not be present in this lineup. If you believe that the perpetrator is not present, then please select the “0= Target Absent” option.

‘After Viewing Each Lineup – Change’ Condition

Using the description that you provided of the perpetrator, the police were able to identify the person that they think is responsible for the crime. However, they do not know if they have apprehended the right person. In the following question you will be presented with a lineup of individuals and asked to indicate if the person who you witnessed stealing the book is present in the lineup.

After viewing the first lineup you will be given an option to change your decision in the following lineup. If you select an individual from both lineups please note that your decision from the second lineup will be considered your final choice.

Please note that the perpetrator may or may not be present in either of these lineups. If you believe that the perpetrator is not present, then please select the “0= Target Absent” option.

Lineup 1 Instruction

Please look at the lineup below and indicate if you think the perpetrator of the crime is present, by clicking on their photograph. The photograph should then show a green box surrounding it. If you feel the perpetrator is not present in this lineup then please select the "0 = Target Absent" option. When you have done this, please proceed to the next page by clicking the next arrow at the bottom of the page.

Lineup 2 Instruction

Please look at the lineup below and indicate if you think the perpetrator of the crime is present by clicking on their photograph. The photograph should then show a green box surrounding it. If you feel the perpetrator is not present in this lineup then please select the "0 = Target Absent" option.

Please note, if you selected an individual in the previous lineup and you select someone in this lineup, your decision from this lineup will be considered your **final choice.**

Multiple-Suspect Lineup Condition - 10-foil

Using the description that you provided of the perpetrator, the police were able to identify the person that they think is responsible for the crime. However, they do not know if they have apprehended the right person. In the following question you will be presented with a photo lineup and asked to indicate if the person who you witnessed stealing the book is present in it.

To select an individual, click on their photograph, the photograph should then show a green box surrounding it. Please note that the perpetrator may or may not be present in either of these lineups. If you believe that the perpetrator is not present, then please select the "0= Target Absent" option.

Multiple-Suspect Lineup Condition - 14-foil:

Using the description that you provided of the perpetrator, the police were able to identify the person that they think is responsible for the crime. However, they do not know if they have apprehended the right person. In the following question you will be presented with a photo lineup and asked to indicate if the person who you witnessed stealing the book is present in it.

To select an individual, click on their photograph, the photograph should then show a green box surrounding it. Please note that the perpetrator may or may not be present in either of these lineups. If you believe that the perpetrator is not present, then please select the "0= Target Absent" option.

Appendix N

Experimental debrief form

At the start of this experiment, you were informed that this experiment would entail you answering questions about students' behaviour on campus. We felt it necessary to withhold the true nature of the experiment from you until after you viewed the crime video, as had the true purpose of the experiment been explained to you at the start, you would have been well aware that you needed to pay attention to the face in the video in order to identify it in the subsequent lineup task. This would have threatened the validity of the experiment, which in turn would have affected the strength of the study and its results. As, in real life circumstances, you would not be warned that you were about to witness a crime and that you should pay attention to the face and characteristics of the perpetrator, as you will later have to identify them from a lineup.

The aim of this study is to determine if using multiple-suspect lineups provides a viable alternative to using single-suspect lineups. Furthermore, this study aims to investigate whether using 10 or 14 foils (innocent individuals) in multiple-suspect lineups results in better identification accuracy. Finally, the study also aims to explore people's thought processes when making lineup identifications, to investigate if there are differences in self-reported decision patterns in single-suspect and multiple-suspect lineups conditions.

This study as a whole was comprised of a single-suspect lineup condition and a multiple-suspect lineup condition. In the single-suspect conditions, you would have been exposed to two different lineups, which may or may not have contained the perpetrator from the simulated crime video that you watched.

In the multiple-suspect conditions, you would have been exposed to one larger lineup, which may or may not have contained the perpetrator from the simulated crime video that you watched.

From this study we hope to determine whether multiple-suspect lineups are a viable alternative to single-suspect lineups. We also hope to show that in addition to being a viable alternative, multiple-suspect lineups may result in better rates of eyewitness identification accuracy than single-suspect lineups do. We also hope to discover more information that could be used for the creation of legal guidelines for the use of multiple-suspect lineups. This is an important area of research as much of the existing research focuses on single-suspect lineups at the peril of multiple-suspect lineups, despite multiple-suspect lineups having benefits that single-suspect lineups do not. Such benefits include avoiding repeated exposure of a witness to a lineup, as this can have detrimental effects on the witness's ability to make an accurate identification.

Should you wish to gain more information about this field, some resources which you may find useful include "Eyewitness identification: The importance of lineup models" (Wells & Turtle, 1986) and "The Relationship Between Eyewitness Confidence and Identification Accuracy: A New Synthesis" (Wixted & Wells, 2017). The names of these resources will be included in the debrief form that will be emailed to you.

The research team would like to extend our most sincere thanks to you for participating in this study. Your participation makes a vital contribution to our ability to complete this study, which may provide valuable information that can be used in legal systems around the world. If you would like a copy of this debrief form emailed to you, please enter your email address in the text box below.

Thank you.

Kershen Govender

Katherine Hathorn

Appendix O

Ethical approval

UNIVERSITY OF CAPE TOWN

Department of Psychology

University of Cape Town Rondebosch 7701 South Africa
Telephone (021) 650 3417
Fax No. (021) 650 4104

29 July 2021

Kershen Govender and Katherine Hathorn
Department of Psychology
University of Cape Town
Rondebosch 7701

Dear Kershen and Katherine

I am pleased to inform you that ethical clearance has been given by an Ethics Review Committee of the Faculty of Humanities for your study, *Better Together: Multiple and Single-suspect Line-up Accuracy, Confidence and Repeated Exposure*. The reference number is PSY2021-032.

I wish you all the best for your study.

Yours sincerely

Lauren Wild (PhD)
Associate Professor
Chair: Ethics Review Committee

Appendix P

Ethical approval after amendments

UNIVERSITY OF CAPE TOWN

Department of Psychology

University of Cape Town Rondebosch 7701 South Africa
Telephone (021) 650 3417
Fax No. (021) 650 4104

15 September 2021

Kershen Govender and Katherine Hathorn
Department of Psychology
University of Cape Town
Rondebosch 7701

Dear Kershen and Katherine

I am pleased to inform you that ethical clearance has been given by an Ethics Review Committee of the Faculty of Humanities for the amendments to your study, *A Comparison of Multiple and Single-suspect Line-up Accuracy, Confidence and Repeated Exposure*. The reference number remains PSY2021-032.

I wish you all the best for your study.

Yours sincerely

Lauren Wild (PhD)
Associate Professor
Chair: Ethics Review Committee

Appendix Q

Coding for final perpetrator-presence

Perpetrator-presence	Final perpetrator-presence
After viewing each lineup – stop	
TA|TA	Target-absent
TP|TA	Target-present
TA|TP	Target-present
TP|NA	Target-present
TA|NA	Target-absent
After viewing each lineup – change and after viewing all lineups	
TA|TA	Target-absent
TA|TP	Target-present
TP|TA	Target-present
TP|TA	Perpetrator
Multiple-suspect lineups	
TA	Target-absent
TP	Target-absent

Note. Perpetrator-presence represents the perpetrator-presence of lineup 1 and lineup 2

[a] 'TA' = Target-Absent and 'TP' = Target-Present

[b] 'NA' = not applicable. This shows that a second lineup was not seen.

Appendix R

Coding for final accuracy

Perpetrator-presence	Decision 1	Decision 2	Accuracy
After viewing each lineup - stop			
TA|TA	Target-absent	Target-absent	Accurate
TA|TP	Target-absent	Perpetrator	Accurate
TP|TA	Perpetrator	NA	Accurate
After viewing each lineup - change			
TA|TA	Target-absent	Target-absent	Accurate
TA|TP	Target-absent	Perpetrator	Accurate
TA|TP	Foil	Perpetrator	Accurate
TP|TA	Perpetrator	Target-absent	Accurate
Multiple-suspect and after viewing all lineups			
TA	Target absent		Accurate
TP	Target Present		Accurate

Note 'TA' = Target-Absent, and 'TP' = Target-Present

[a] 'NA' = not applicable. This shows that a second lineup was not seen.

Appendix S

Proportion of final accuracy across lineup choice conditions

Lineup condition	Accurate	Inaccurate
	Average Score (%)	Average Score (%)
Single-suspect lineups		
After viewing all	59.40	40.60
	(5.63)	(6.81)
After viewing each - change	43.00	57.00
	(6.34)	(5.50)
After viewing each - stop	41.80	59.20
	(6.32)	(5.35)
Multiple-suspect lineups		
10 foils	42.10	57.90
	(6.91)	(5.90)
14 foils	46.00	54.00
	(6.91)	(6.38)

Note. Average score reflects the proportion of final accuracy.

Appendix T

Logistic regression model results

Model Name	Model Details	df	χ^2	p
Model 1	final_accuracy~ final_lineup_choice * line_m_s_sub	9	80.13	<.001
Model 2	final_accuracy~ final_lineup_choice * line_m_s	1	62.06	<.001

Note. 'Model Details' indicates the syntax for each model. The tilde symbol (~) denotes prediction. The star (*) denotes an interaction.

[a] final_accuracy denotes the transformed final accuracy score

[b] 'final_lineup_choice denotes the perpetrator-presence in a lineup

[c] line_m_s_sub denotes the lineup choice conditions

[d] 'line_m_s denotes the lineup conditions

[e] df denotes the degrees of freedom

[f] χ^2 denotes the Chi-squared statistic

[g] *p* denotes the probability value

Appendix U

Final confidence coding

Lineup decisions	Final confidence score		
	First confidence rating	Second confidence rating	Average of first and second confidence score
After each - change			
Reject | Identification		X	
Identification | Reject	X		
Identification | Identification		X	
Reject | Reject			X
After each lineup – stop			
Reject | Identification		X	
Identification | NA	X		
Reject | Reject			X
Multiple-suspect and after viewing all lineups			
Identification	X		
Reject	X		

Note. 'Lineup decisions' depicts the choices in the first and second lineup participants saw

[a] The 'final confidence' columns represent which confidence rating was considered final confidence based on the lineup decisions.

[b] 'Identification' represents a foil or a perpetrator identification.

Appendix V

Average confidence for accurate and inaccurate identifications in choice and foil conditions

Lineup condition	Accurate	Inaccurate
	Average confidence (%)	Average confidence (%)
Single-suspect lineups		
After viewing all	66.45 (23.03)	56.12 (24.62)
After viewing each-change	74.63 (20.78)	60.75 (24.60)
After viewing each- stop	71.05 (22.12)	63.81 (25.72)
Multiple-suspect lineups		
10 foils	63.18 (21.54)	58.09 (28.60)
14 foils	60.81 (25.22)	53.70 (24.20)

Note. Figures in brackets denote the standard error for each condition

Appendix W

Factor analysis additional information

A principal factor analysis was run on the 13-item questionnaire that was used in this study to determine if the questions explained common variance and thus, had an underlying structure. Upon running a correlation plot on the questionnaire, items 7 and 8 had the highest correlation of .78, with all other correlations being low to moderate, and ranging from -.37 to .54. Preliminary tests showed that this data was suitable for factor analysis.

A Kaiser-Meyer-Olkin factor adequacy test was run to determine if the data was suitable for factor analysis. This showed that 7/13 values were over 0.7 with the overall Measure of Sampling Adequacy = 0.74. This falls within the acceptable range, indicating the data was suitable for factor analysis.

The parallel analysis scree plot (see Figure W1) indicated that 4 factors fell above the resampled data line, with an additional factor falling on the line itself. In light of this, a four-factor structure was investigated.

Figure W1

Parallel Analysis Scree plot to determine Factors

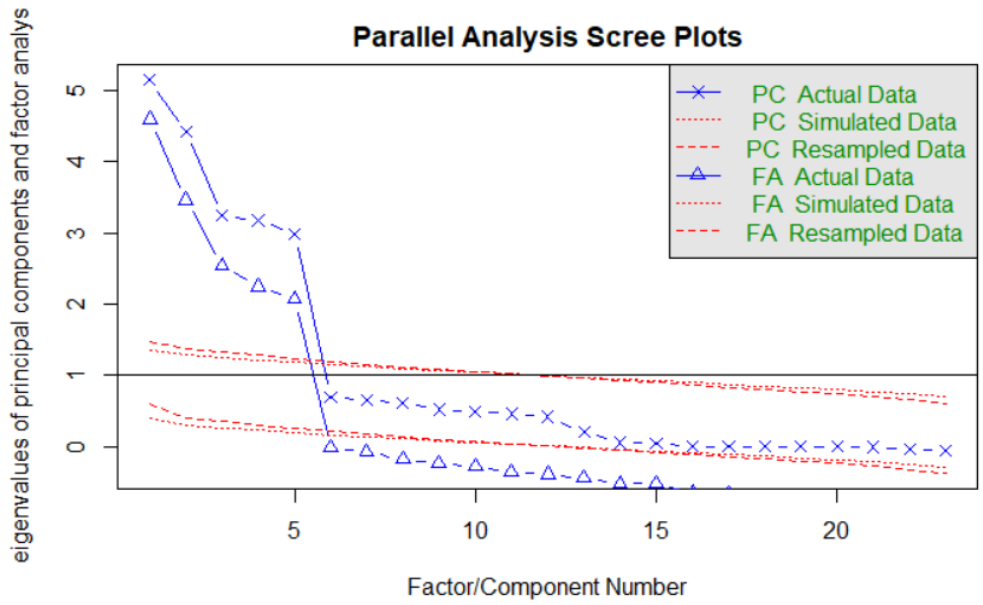


Figure W2 above shows that not all of the items loaded well onto a four-factor model, as items 9 and 12 did not load well onto any of the factors. Additionally, weak factor loadings were evident in items 7 and 8. In light of this, a five-factor model was considered to assess if this would provide a better factor loading structure for the items.

Figure W2

Factor Loading Table for Four-Factor Structure

	Factor 1	Factor 5	Factor 3	Factor 4
I inspected the faces of the people in the lineup, and I concluded that they were all unlike the kind of face the perpetrator had.	.75	.15	-.14	
I had no feeling of familiarity when I looked at the lineup, and I knew that I ought to have a feeling of familiarity if one of the lineup members was the perpetrator.	.75	.14		
I did not get a good look at the perpetrator's face, so I could not recognise it later.		.10	.76	.
I compared the lineup members to each other, especially their facial features, looking for ways in which they were dissimilar. This helped me make my decision.		.76		
When I inspected the photographs, I immediately noticed that no face matched the culprit..	.77			
Because the faces were quite similar to each other, it was difficult to make a decision.	-.10	.22	.69	
I immediately recognized the perpetrator, but I cannot explain why	-.65	.34	-.38	-.23
When I viewed the lineup, I immediately recognized the perpetrator, because his face jumped out at me..	-.66	.32	-.45	-.23
I eliminated the photos, one by one, based on how much they looked like the perpetrator, and chose the remaining one.	-.27	.37	.18	.48
I compared the photographs with each other to make my choice.		.74	.19	.25
The person whom I identified was the closest match to my memory of the perpetrator, but not exactly	-.60	.24	.24.	.30
I had to think carefully in order to arrive at my decision.	.13	.25	.29	.64
I compared the faces from the photographs with my memory of the face of the perpetrator to help me make my decision.			-.25	.81

A five-factor model which had been rotated using a varimax rotation, was adopted as the items loaded more evenly onto this model than they did on a four-factor model. This was the final factor structure that was used throughout the analysis.

The factors in this model were named as follows: ‘Lack of Familiarity’ which was when the witnesses did not have any feeling of familiarity when looking at the lineup (Wittwer et al, n.d.). ‘Elimination Strategies’ were when witnesses eliminated lineup members systematically to arrive at their decision (Wittwer et al, n.d.). ‘Feeling of Task Difficulty’ represents those who experienced difficulty completing the identification task (Wittwer et al, n.d.). ‘Automatic Recognition’ was when the participant immediately recognised the lineup member (Wittwer et al, n.d.). And ‘Relevant Judgement’ entailed participants choosing the lineup member who most closely resembled their memory of the perpetrator (McAdoo & Gronlund, 2016).

Appendix X

Five-factor factor analysis item loading table

	Factor 1 Lack of Familiarity	Factor 5 Automatic Recognition	Factor 3 Feeling of task difficulty	Factor 4 Relative judgement	Factor 2 Elimination Strategies
I inspected the faces of the people in the lineup, and I concluded that they were all unlike the kind of face the perpetrator had.	**.82**	-.11			
I had no feeling of familiarity when I looked at the lineup, and I knew that I ought to have a feeling of familiarity if one of the lineup members was the perpetrator.	**.81**	-.18			
When I inspected the photographs, I immediately noticed that no face matched the culprit.	**.78**	-.22		.	
I immediately recognized the perpetrator, but I cannot explain why	-.23	**.88**			
When I viewed the lineup, I immediately recognized the perpetrator, because his face jumped out at me.	-.31	**.82**	-.20		
The person whom I identified was the closest match to my memory of the perpetrator, but not exactly.	-.32	**.45**	.41	.42	
I did not get a good look at the perpetrator's face, so I could not recognise it later.			**.81**		
Because the faces were quite similar to each other, it was difficult to make a decision.	-.16	-.16	**.65**	.10	.27
I eliminated the photos, one by one, based on how much they looked like the perpetrator, and chose the remaining one.		.34	.34	**.59**	.12
I had to think carefully in order to arrive at my decision.	.11	-.18	.24	**.64**	.24
I compared the faces from the photographs with my memory of the face of the perpetrator to help me make my decision.		-.18	-.34.	**.77**	
I compared the lineup members to each other, especially their facial features, looking for ways in which they were dissimilar. This helped me make my decision.					**.91**
I compared the photographs with each other to make my choice.			.18	.27	**.75**