Effects of Line-up and Role Assignment Processes on the Accuracy of Multi-perpetrator Eyewitness Testimonies

Carrie Allen

ACSENT Laboratory

Department of Psychology

University of Cape Town

Supervisor: Colin Tredoux

Co-supervisor: Alicia Nortjie

Word Count: 7949

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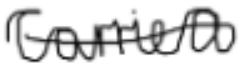
SIGNATURE: 

STUDENT NUMBER: ALLCAR007

Acknowledgements

I would like to extend my gratitude to the following people, all of whom have provided me with layers of invaluable support throughout the year:

Thank you to my co-supervisor, Alicia Nortje, for your hands-on assistance and for always making yourself available for advice. I have learned so much from you this year, not only academically, but from your work ethic which exemplifies dedication. Also, thank you for your kindness and patience with me at every stage of my thesis.

In addition, thank you to my supervisor, Professor Colin Tredoux, for your wisdom and insight over the last year. I appreciate your willingness to help and provide advice when needed.

Thank you to my friends who have been there for me. Your love has been immeasurably valuable. I appreciate all of the time you have given to help me with various tasks from building line-ups to reading drafts to listening to me complain. I am so grateful for each and every one of you.

Lastly, thank you to my family for your unfailing love throughout this year. Thank you to my parents for listening to me and greeting all my concerns with caring guidance. I will also be forever grateful to my sister and Basil for being a fundamental part of my support structure this year. Your constant and comforting presence in my life has meant everything to me.

Abstract

Eyewitness identifications serve as integral pieces of evidence in the conviction of perpetrators. However, the fallibility of such testimonies has been well-established in the literature. Witnesses' ability to identify multiple perpetrators and link each one to their criminal action is particularly poor. This study examined the effects of both line-up and role assignment processes on the accuracy of perpetrator identifications and perpetrator-role pairings. To test this, participants in the experimental groups ($N = 96$) viewed a video clip showing a staged, three-perpetrator crime. Two independent variables were manipulated. First, participants were asked to identify the three offenders from either one 18-person line-up or a series of three six-person line-ups. Second, they were asked to decide which role each offender played in the crime, either after each identification or once they had identified all three perpetrators. A control condition was included, whereby participants ($N = 24$) watched a video depicting a one-perpetrator crime and were asked to identify the offender from a six-person line-up. Within both the experimental and control group, target-present (TP) and target-absent (TA) parades were manipulated. Analyses suggested that the accuracy of perpetrator recognition differed as a function of line-up procedure as participants in the TA condition who viewed three smaller line-ups yielded a higher number of correct identifications. The accuracy of perpetrator-role pairings was not affected by role assignment procedures. Although limited by sample size, these findings suggest that there is scope for further research into the effects of line-up and role assignment procedures to prevent miscarriages of justice.

Effects of Line-up and Role Assignment Processes on the Accuracy of Multi-perpetrator Eyewitness Testimonies

Eyewitness identifications serve as integral pieces of evidence in the conviction of perpetrators (Hobson, Wilcock, & Valentine, 2012). However, scientific advances, such as DNA testing, have demonstrated that misidentifications are the leading contributors to wrongful sentencing (e.g., Innocence Project, 2017; Shepherd, 1983). In March 2017, five innocent South African men were exonerated after spending 14 years incarcerated following an investigation featuring weak line-up procedures (Raphaely, 2017). The phenomenon of misidentifications has piqued psychologists' interest resulting in a large corpus of eyewitness literature (e.g., Levine & Tapp, 1973). However, fewer than 20 studies have explicitly tested eyewitness memory for multiple perpetrators, which is incongruent with the documented rise in this type of crime (Clifford & Hollin, 1981; Hobson et al., 2012). In a study on the experiences of rape survivors, Maw (2013) noted the importance of including multi-perpetrator rape cases as these kinds of offences are so prevalent in South Africa. For example, Swart, Gilchrist, Butchart, Seedat, and Martin (2000) found that up to 27% of reported rape cases in Johannesburg involved multiple perpetrators. Other data suggest that this figure could approach 50% in the broader South African context (Horvath & Kelly, 2009). As well as identifying culprits, eyewitnesses of multi-perpetrator crimes are required to link each perpetrator to their criminal action. Therefore, there is an impetus for research into factors, specifically line-up and role assignment procedures, which affect the fallibility of these identification and pairing processes

Factors Affecting the Accuracy of Multi-perpetrator Eyewitness Identification

The factors that affect the validity of eyewitness identifications can be categorised as either estimator or system variables (Wells, 1978). Estimator variables are uncontrollable factors related to the crime itself, for example the accomplice's gender, while system variables, such as judicial guidelines, can be improved by researchers and the criminal justice system (Tredoux, Meissner, Malpass, & Zimmerman, 2004).

This study addressed two system variables that are directly related to multiple-perpetrator crimes, namely line-up and role assignment processes. Line-ups are a detection technique where witnesses are presented with known innocent individuals ("foils") and a suspect who may or may not have perpetrated the crime, before being asked to identify the

offender (Wells & Pozzulo, 2006). Simultaneous line-ups consist of one array containing a suspect and foils, whereas sequential line-ups present a succession of single individuals to witnesses (Lindsay & Wells, 1985). The former process relies on relative judgement strategies as witnesses can compare line-up members within an array (Wells, 1984). However, such evaluations are not available whilst viewing individuals one-at-a-time, meaning that sequential line-ups require absolute judgement strategies.

As well as identifying perpetrators, multi-perpetrator witnesses have to delineate the specific offence committed by each culprit (Wells & Pozzulo, 2006). Assigning roles to each offender is not implicit in standard identification processes as it is only applicable in multi-perpetrator investigations (Captain K. Speed, personal communication, South African Police Services, 18 September 2015). Therefore, there is a need for research that specifically focuses on perpetrator-role pairings. Such pairings are imbued with significance as they affect sentencing, determining eyewitness reliability and the steering of the direction of the investigation (Hobson et al., 2012).

Uncertainties regarding the most effective line-up and role assignment processes exist on both a theoretical and applied level. The practicality of the multi-perpetrator eyewitness problem necessitates the need for pragmatic guidelines; however, such instructions, in their present form, are vague. For example, Code D (2011) of the Police and Criminal Evidence Act (1983), issued by the Home Office in the U.K., and a commentary on South African investigation procedures by Du Toit, De Jager, Paizes, Skeen, and Van der Merwe (2011) state that there should be one line-up per perpetrator, unless two offenders look alike. In the latter case, both perpetrators should appear in the same array; however the criterion of 'similar appearance' is not quantified. Furthermore, there are hardly any protocols dictating how witnesses should link each perpetrator to their specific role, which could explain why police do not explicitly request such perpetrator-role pairings. However, Hobson and Wilcock (2011) found that asking witnesses to consider perpetrators' actions throughout the identification process results in more accurate pairings. The aforementioned research is particularly noteworthy as it is the only published study that tested the accuracy of role assignment for all offenders in the experiment (Hobson & Wilcock, 2011). Furthermore, Nortje, Tredoux, & Vredeveledt (in press) found that the accuracy of both perpetrator and role identifications decreases as the number of perpetrators increases. However, the process of asking witnesses to link each perpetrator to their respective roles is the most negatively affected (Nortje et al., in press). This highlights the need for research into perpetrator

identification and perpetrator-role pairing as both of these factors contribute to inaccurate testimonies.

Despite its importance, there is no consensus regarding the most effective line-up and role assignment processes. The uncertainties surrounding these procedures can be explained using the theories of perceptual overload, associative memory and source monitoring.

Perceptual Overload

Perceptual overload theory can be used to explain how the complexity of information associated with multi-perpetrators crimes could contribute to misidentifications. There is a limit to the amount of perceptual information individuals can attend to, perceive, encode and recall in order to recognise such details at a later stage (Cartwright-Finch & Lavie, 2006; Wall, 1965). Working memory theory supports this by purporting that individuals have the capacity to store up to seven items in their short-term memory (Baddeley, Thomson, & Buchanan, 1975). If the number of items exceeds this limit, their attention has to be divided resulting in impaired encoding (Baddeley et al., 1975). Similarly, if witnesses' perceptual load capacity is exceeded, their attention has to be divided between various concurrent details (Shapiro & Penrod, 1986; Vanderwal, 1996). Consequently, as attention diverges, distracting information interferes with the complete processing of relevant details which could result in erroneous recollections (Laldin, 1997; Mulligan, 1998; Megreya & Bindemann, 2011).

At the recognition stages, an influx of perceptual details could create a heavy "load at recognition" (Shapiro & Penrod, 1986, p.153), which would decrease eyewitness accuracy (Laldin, 1997; Wall, 1965). For example, research indicates that the number of foils viewed prior to perpetrator detections is inversely proportional to recognition accuracy (Egan, Pittner, & Goldstein, 1977). This could explain why Steblay, Dysart, Fulero, and Lindsay (2001) found that simultaneous line-ups have an advantage over sequential processes in perpetrator-present arrays as witnesses are not presented with a sequence of foils. In addition, holding on to crime-related perceptual information strains witnesses' working memory (Hope, Mullis, & Gabbert, 2013). This could suggest a practical possibility as to why making role assignments throughout identification processes would be beneficial, as witnesses would not have to retain this information until after viewing all of the line-ups (Hobson & Wilcock, 2011).

In summary, perceptual overload theory posits that, just as there are limits to our working memory, witnesses have the capacity to encode only a certain amount of crime-related information. If this limit is exceeded then accuracy of their memory, and in turn their testimony, decreases.

Associative Memory

In addition to perceptual overload theory, associative memory theory can explain how viewing one offender could prompt the recollection of other crime-related details. This theory purports that details of the same event are inherently interlinked, which is reflected in the complex way in which they are encoded (Wells & Pozzulo, 2006). In order to capitalise on these associations, cued recall techniques present one detail that prompts the memory of other information relating to the same stimulus (Gillund & Shiffrin, 1984). Consequently, this process facilitates the recollection of a network of complete memories as opposed to fragmented details (Gillund & Shiffrin, 1984). Therefore, perpetrators of the same crime are cues that prompt the recognition of other offenders.

Simultaneous line-ups could be considered a cued-recall method because one perpetrator could act as a signal for other offenders within the same array (Laldin, 1997). In support of this, Sobel (2007) suggests that associations between multiple perpetrators in simultaneous line-ups are likely predictors of identifications. In opposition to this assertion, Vanderwal (1996) found that presenting participants with succession of smaller line-ups, with one suspect per array, resulted in a higher rate of correct identifications than conducting one simultaneous line-up. This finding discredits the advantage of the cued-recall method. However, Jacob (1994) found that multi-perpetrator identification accuracy does not differ as a function of these two line-up procedures. In addition, the advantage of explicit role instructions suggested by Hobson and Wilcock (2011) could be explained by conceptualising these instructions as cues that could activate networks of other pertinent information.

Therefore, associative memory theory explains why information associated with the same crime could trigger witnesses' memory for other crime-related details.

Source Monitoring

Adding to the literature, source monitoring theory explains why the uniqueness of details could be instrumental in the way in which they are recollected. Information stemming from the same context is interlinked making it difficult to disentangle the source of each detail (Johnson, Hashtroudi, & Lindsay, 1993). The source monitoring theory proposes that details need to be unique in their origin in order to be precisely recalled (Johnson et al., 1993). Thus source monitoring errors are made if the detail's source is untraceable as individuals can only recall general, rather than context-specific information (Johnson et al., 1993). In multi-perpetrator crimes this is highly problematic as memories of all perpetrators arise from the same criminal event (Hobson & Wilcock, 2011). This results in overlapping and undifferentiated memories that prevent accurate detections (Jacob, 1994).

In multi-perpetrator line-ups, witnesses are presented with a larger number of faces, making them extremely vulnerable to source monitoring errors (Hobson & Wilcock, 2011). Role assignment could aid in elucidating the source of individual details. For example, requesting witnesses to link a role to an offender forces them to contextualise specific details resulting in more accurate testimonies (Hobson & Wilcock, 2011).

Therefore, source monitoring theory explains why role assignment could aid witnesses in isolating incriminating details from a web of interlinked information.

Rationale and Aims

It has been well-established in the literature that the accuracy of multi-perpetrator eyewitness testimonies is poor. In addition to detecting perpetrators from line-ups, witnesses have to link each offender to their criminal action which further strains their memory. However, there is no consensus regarding the most effective ways of conducting line-up and role assignment procedures in order to elicit the most accurate identifications. Hence, the following hypotheses were tested:

1) The accuracy of perpetrator identifications in both target-present and target-absent conditions will differ based on the number of perpetrators at recognition.
2) The accuracy of perpetrator-role pairings will differ based on when such pairings are requested.

Methods

Design and Setting

This experiment took on a 2 x 2 x 2 factorial design. All factors are between-subjects. The first variable was the type of line-up procedure used (one array vs. three smaller arrays). The second variable was the timing of role assignment instructions during the line-up procedure (throughout vs. at the end). The third variable was the presence of all perpetrators in each array (target-present [TP] vs. target-absent [TA]). The participants (N = 120) were each randomly assigned to one of the eight experimental groups (n = 12; see Appendix B). In addition, there were two comparison groups (n = 12) that viewed a single-perpetrator version of the crime and were asked to make identifications from a TP or TA line-up respectively. These two groups were included because they are often neglected from multi-perpetrator research. This is problematic because it means that there were no baseline levels when encoding demands were low, such as when viewing a single-perpetrator crime.

The three dependent variables were derived from participants' performance on various identification tasks. The first dependent variable was the accuracy of perpetrator recognitions. The second dependent variable was the accuracy of perpetrator-role pairings.

The study took place in the ACSENT and GCS labs in the Psychology department of the University of Cape Town (UCT).

Participants

The samples consisted of a total of 120 participants (N = 120), with 12 participants in each group (n = 12).

Sample characteristics. Of the participants that were recruited, 70% identified as being female and 30% as being male. The sample identified with different race groups as follows: 47.50% as white, 22.67% as black, 24.17% as coloured, 2.50% as Indian, .83% as Asian and 3.33% as 'Other'.

Using a convenience sampling technique, UCT Psychology students were recruited through the Psychology Department's Student Research Participation Programme (SRPP), which they need for DP purposes. The current study utilised this platform by placing an announcement (Appendix B) on the SRPP Vula site which invited students to participate in the experiment in return for 2 SRPP points.

There were no exclusion criteria for the study.

Materials

This study consisted of an encoding and a recognition stage, each of which required different materials.

Encoding stage.

Multi-perpetrator computer theft video. Participants viewed a video depicting either a single- or three-perpetrator computer theft taking place in the ACSENT lab in the Psychology department. Participants in the single-perpetrator group viewed a silent 15 second film showing one offender entering the lab and trying to open a locked door. Next he runs to a computer desk, places a keyboard into his backpack and grabs a screen before exiting the lab. His face is visible in a close-up shot for about three seconds. In the three-perpetrator clips, the main perpetrator performs the same role as described above, but is accompanied by two accomplices. The first accomplice films the crime with his phone and takes photographs with the other two perpetrators. The second accomplice rummages through a filing cabinet. All three of the perpetrators are visible, individually, in a three-second close-up, to allow for a good encoding opportunity of their faces. This version of the film was lengthened to 45 seconds (15 additional seconds for each additional perpetrator). This was done to control for

the effect of encoding under a restricted time period which could cause attention to divide thereby impacting recognition performance at a later stage. Two versions of the single- and three-perpetrator clips were filmed where the actors were replaced between versions to control for any form of distinctive perceptual qualities which could affect recognition.

Distracter task. Participants received an article on young offenders followed by a comprehension on the topic (Appendix F).

Recognition.

Line-up arrays. In the TA arrays, the target was replaced by a randomly assigned, unique foil from an originally-agreed upon selection. Foils are line-up members who are known to be innocent. The line-up arrays were built according to the procedure outlined and explained in Malpass, Tredoux, & McQuiston-Surrett (2007). In the one array conditions, the 15 foils and three perpetrators appeared in the same line-up (see Appendix H). In the three smaller array conditions, there were five foils and one perpetrator per each line-up (see Appendix I). Photographs of each perpetrator were used to construct the line-ups. A sample of seven individuals, who were not involved in the study, were briefly shown a photograph of each offender, and then asked to provide a physical description of that target. This was repeated until descriptions were generated for each perpetrator. These accounts were then averaged to generate one modal description per offender. This averaging process was repeated by another, independent rater. Thereafter, these modal descriptions were given to a second independent sample of six individuals whose task it was to choose nine photographs (from a database belonging to Professor Tredoux) which matched each of the modal descriptions for the perpertrators. Participants were instructed not to repeat foil selections for different targets. The most frequently chosen photographs for each target were used as foils. The photographs of the selected line-up members were edited using Photoshop to maintain consistency across clothing and lighting conditions and to remove any artefacts from the pictures. A TP and TA version of each line-up was created. The foils were not repeated across line-ups. In addition, the position of each line-up member within the array was randomly determined. Two line-up orders of each array were created, where the position of each perpetrator changed to control for placement effects. In addition, the size of the photograph of each person in the array was kept constant across line-up conditions.

Procedure

This study followed the ethical guidelines for psychological research as dictated by the Department of Psychology Research Ethics Committee. Ethical approval (Appendix A) was granted prior to the commencement of the experimental stage of the study.

Participants were greeted at the lab and asked to complete both a consent form (Appendix D) and a demographics form (Appendix E). Once they had given consent, they were randomly assigned to a condition and placed at an individual computer, all of which had the same size screen and screen resolution. Researchers then instructed participants to pay attention to the video they were about to watch. After viewing the clip, the researcher started the computer-based component of the experiment, which was administered using E-Prime 2.0 software (Psychology Software Tools, Pittsburgh, PA), on each of the computers. Once the programme had begun, participants were asked to complete a short filler task consisting of an essay on the pros and cons of imprisoning young offenders.

Following the filler task, participants were required to provide a brief statement about the crime that they had viewed in the film. Subsequently, they were asked to describe the role of each offender that they had seen in the video. These role descriptions were stored on the E-Prime 2.0 software. Participants were then given a second, unrelated filler task (Appendix F) in order to prevent them from mentally rehearsing what they had viewed in the video. This task lasted approximately 25 minutes.

Subsequent to completing the distracter task, the recognition phase begun, and was also administered using E-Prime 2.0 software. Participants received instructions congruent with their control or experimental group (Appendix G) and these instructions were kept similar across conditions.

Line-up identification. Participants were told that they would be presented with a line-up on their screen that may or may not contain the perpetrators who appeared in the video. Those in the control condition were informed that they would be required to make a single identification if possible. However, those in the three-perpetrator conditions were instructed that they could make up to three identification decisions if possible. They were then asked to rate, from 0-100, the likelihood that each line-up member was one of the perpetrators they saw commit a crime in the video clip. The instructions also stated that, if participants did not recognise anyone from the line-up, they could answer ‘not present’ or ‘do not know’. Participants were required to make their response by writing their ratings above each perpetrator’s face on the printed line-up array sheet (Appendix H; Appendix I) that they had been given. The sheets were labelled alphabetically so as to guide participants as to which array corresponded with which instruction. When participants were asked to refer to the line-up sheets, the arrays on those sheets were also displayed on their screens so they could view the line-up members whilst making their decisions. The line-ups remained on the screen until the participants pressed a button to move on to the next instruction.

Next, participants were told that they would be shown the same line-up, but they needed to decide on who, if anyone, they recognised as a perpetrator from the video. Again, they were instructed that they could select the 'don't know' or 'not present' options. For this task, participants were required to circle the number below the perpetrator's face that they had chosen on another printed line-up array sheet (Appendix H; Appendix I) that they had been given. These sheets were also labelled alphabetically and the corresponding line-ups also appeared on the screens and remained there until participants pressed a button to progress to the next set of tasks.

This procedure was repeated for participants in the three array group until they had viewed all of the line-ups.

Perpetrator-role pairing. After making their perpetrator identifications, only participants in the three-perpetrator conditions who identified perpetrator/s through a binary decision were required to complete a series of role pairing tasks. According to their condition, participants were required to make this role pairing either immediately after each identification or once all identifications had been made. Participants were instructed that the descriptions of the roles performed by the perpetrators that they had given at the beginning of the experiment would be presented on the screen so that they could view their descriptions whilst making their decisions. The instructions stated that they would be asked to make one perpetrator-role pairing per each line-up member they identified. Then, they were asked to rate, from 0-100, the likelihood that the first line-up member whom they identified performed each of the roles that they had described. The instructions also stated that they could answer 'don't know' if they were did not know, or could not decide, which role a certain line-up member played in the crime. To complete this task, they were asked to write the number of the first line-up member that they had selected in a block on the printed role response sheet (Appendix J). Participants were required to make their response by writing their ratings in three different boxes on the printed role response sheet, each of which represented one of the roles that they had described. The sheets were labelled alphabetically so as to guide participants as to which array corresponded with each instruction. When participants were asked to refer to the printed role response sheets, the three roles that they had recalled at the beginning of the experiment were also displayed on their screens. The roles remained on the screen until participants pressed a button to move on to the next instruction.

Following this, participants were told that they would be shown the three roles, but that they needed to decide which one was played by the first line-up member they had chosen. Again, they were instructed that they could select the 'don't know' option. For this

task, participant were required to circle the labels ‘role 1’, ‘role 2’ or ‘role 3’ that were below each of the three blocks on the printed role response sheet. These sheets were also labelled alphabetically and the recalled roles also appeared on the screens and remained there until participants pressed a button to progress to the next set of tasks. This procedure was repeated for participants until they had made one role decision per perpetrator they had identified.

After completing both the perpetrator identification and role pairing tasks, participants were thanked for their participation and given a debriefing form (Appendix K) as well as a proof of participation slip (Appendix L).

Statistical Analyses

SPSS version 24 was used to analyse the data. Following convention, .05 was set as the threshold for statistical significance.

Results

For this study, decisions were coded according to the control or experimental condition. In the TP groups, correct identifications stem from choosing the perpetrator/s from the line-up/s. If participants in this condition selected the ‘don’t know or ‘not present’ option their decision was scored as being incorrect. In contrast, in the TA groups, a rejection of the line-up/s, through selecting ‘don’t know’ or ‘not present’, would constitute a correct identification.

Accuracy Between Control and Experimental Groups

Three measures of accuracy were used to assess the accuracy of perpetrator identifications between the control and experimental conditions. First, participants were assigned a single binary measure of accuracy (0 or 1) depending on whether they had correctly identified the perpetrator/s or rejected the line-up/s. Participants in the experimental groups would only receive a score of 1 if they made *all* three correct identifications. Second, there was another binary measure of accuracy that assessed whether participants made *at least* one correct identification. This was done in an attempt to make accuracy equivalent between the control and experimental groups, otherwise it could appear as though the experimental groups are more accurate because they make three responses. Therefore, in order to make these values equivalent, accuracy needed to be reduced to a single value for the experimental groups. Participants in the experimental condition scored 1 along this measure if they correctly identified one, or more than one perpetrator. Those in the control condition were scored the same as they had been according to the measure of narrow accuracy. Third, a measure of weighted accuracy was used for participants in the experimental condition. The

number of correct identifications made by a participant was divided by three (the highest number of possible accurate decisions for their condition). Again, those in the control group were scored the same as they had been according to the measure of narrow accuracy.

Fisher's tests were used to measure the level of association between the number of perpetrators at encoding and accuracy the of identifications. This test was used because, although the assumption of independence of observations was upheld, there were expected frequencies below five. Six tests were run: Three for the different variants of accuracy, and two for the TP and TA line-ups, which were treated separately. The results from these tests are summarised in Table 2.

Table 2
Results of Fisher's Exact Test for Different Variants of Accuracy Between Control and Experimental Groups

	Narrow Accuracy		At Least One Correct		Weighted Accuracy	
	TP	TA	TP	TA	TP	TA
Result	(*n* = 60)	(*n* = 60)	(*n* = 60)	(*n* = 60)	(*n* = 60)	(*n* = 60)
p	.003**	.100	.707	.012**	.004**	.001**
Cramer's V	.48	.28	.11	.39	.57	.44
Frequencies (%)						
Control (*n* = 12)	7 (58.33%)	6 (50%)	7 (58.30)	6 (50%)		
Experimental (*n* = 48)	5 (10.42%)	10 (20.83%)	34 (70.83%)	33(%)		

Note. *TP* or *TA* refers to the groups in which the participants were split according to whether or not they viewed line-up/s containing the perpetrator/s. *Frequencies* refers to the percentage of accurate identifications made in each group.
** indicates significant p-value

Overall, the results from Table 2 suggest that there were conflicting findings regarding whether there was a significant association between the number of perpetrators at encoding and the different measures of accuracy. However, when measuring the weighted accuracy, there was a consensus across the TA and TP conditions that suggested that viewing one perpetrator, rather than three, yields a higher number of correct identifications. For example, in the control TA condition 50% of the participants correctly identified the perpetrator. For the TA experimental condition 27.08% of participants correctly identified two of the three perpetrators.

Accuracy Between Experimental Groups

There were two measures of accuracy used to assess the dependent variables between the experimental conditions. Firstly, a binary measure of narrow accuracy was used. This

measure is similar to the binary measurement used above. This measure was also applied to the perpetrator-role pairing data as participants were assigned a single binary measure of accuracy (0 or 1) depending on whether they had correctly linked the offenders to their actions. Participants would only receive a score of 1 if they made *all* three correct perpetrator-role pairings. If participants selected the 'don't know' option when attempting to link a perpetrator to their role, they were scored as being incorrect. Secondly, a measure of scaled accuracy was included to detect the sensitivities in participants' decisions for each perpetrator. For this measure, participants were assessed along a scale ranging from 0-3 as their scores for each identification or pairing could be correct or incorrect. The latter measure is important as most eyewitness research only tests the accuracy of perpetrator-role pairing for the main offender of the crime. This is problematic because it means that participants' accuracy across all of their responses is not examined, thereby precluding a full analysis of their overall reliability as a witness. In addition, data was partitioned into TP and TA parades to determine whether the pattern of results differed according to the line-up type. The accuracy of the perpetrator-role pairings was assessed by two independent raters yielding an inter-reliability rating of $\kappa = .84$.

Perpetrator identification accuracy. Table 6 below presents a summary of the comparison of the accuracy of perpetrator identification between the control, one array and three array conditions.

Narrow identification accuracy. To determine the effect of line-up type on the narrow accuracy of participants' identifications, three tests for categorical data were conducted. For the first analysis on the overall accuracy data from both the TP and TA conditions, a Chi-square test for contingency was used as the assumptions of independence of observations and observed frequencies greater than five were met. The results suggested that there was no significant association between whether a participant viewed one or three arrays at recognition and their identification accuracy, $x^2(1) = .08$, $p = .779$, Cramer's V = .03. Fisher's exact test examined the potential for this effect in the TP condition because 50% of the expected frequencies were below five. The results suggested that there was no significant association between the variables, $p = .236$, Cramer's V = .15. Lastly, a Chi-square test for contingency was used to examine the potential for this effect in the TA condition because the assumptions of independence of observations and observed frequencies greater than five were met. The analysis found no significant association between the number of perpetrators at recognition and the identification accuracy, $x^2(1) = .205$, $p = .153$, Cramer's V = .19.

Scaled identification accuracy. Three analyses were also conducted to test whether the scaled accuracy of perpetrator identifications differed as a function of line-up type. A Chi-square test of contingency examined whether there was a significant association between the number of perpetrators correctly identified and whether participants viewed one or three arrays. The assumptions of independence of observations and frequencies greater than five were upheld. Results suggested that there was no significant association between scaled accuracy and line-up type, $x^2(3) = 7.03$, $p = .071$, Cramer's V = .27. Two further tests were conducted to test whether this effect was consistent across both the TP and TA conditions. Firstly, for analysing the TP groups, a Fisher's exact test was conducted. This was because, although the assumption of independence of observations was upheld, 25% of the expected frequencies were below five. The results from the first analysis detected that there was no significant association between the type of line-up viewed at recognition and the accuracy of identification decisions in the TP group, $p = .916$, Cramer's V = .10. A Chi-square test of contingency then examined the potential for the association between line-up type and identification accuracy in the TA conditions. Findings indicated that there was a significant association between identification accuracy with regards to line-up type for the TA condition, $x^2(3) = .12.43$, $p = .006$, Cramer's V = .51. Specifically, participants in the TA conditions achieved 45.83% accuracy for two of the identifications when they were presented with three arrays, whereas those who viewed a single array only achieved 8.33%.

Thus, these results do not confirm the hypothesis that the accuracy of perpetrator identifications differs as a function of line-up type in the TP condition. However, for the TA condition, this hypothesis was supported. Specifically, participants who viewed three smaller arrays were more accurate than those who viewed one large array.

Perpetrator-role pairing accuracy. Table 7 summarises the differences in the accuracy of perpetrator-role pairings according to whether participants were asked to link perpetrators to their roles after each identification or once all identifications had been made.

Narrow perpetrator-role pairing accuracy. Regarding the narrow accuracy of perpetrator-role pairings according to the timing of role instructions, a Chi-square test of contingency was conducted to examine the between-group differences. Both the assumptions of independence of observations and expected frequencies greater than five were upheld. The results suggested that there was no significant association between the narrow accuracy of perpetrator-role pairings and whether they were requested throughout, or at the end of, the identification process, $x^2(1) = .47$, $p = .492$, Cramer's V = .12.

Scaled perpetrator-role pairing accuracy. A Fisher's exact test was conducted to test whether the scaled accuracy of perpetrator-role pairings differed as a function of the timing of role instructions. This test was run because, although the assumption of independence of observations was upheld, 40% of the expected frequencies were below five. The analysis detected no significant association between the accuracy of perpetrator-role pairings and whether participants were asked to link each offender to their action throughout or at the end of the identification process, $p = .631$, Cramer's $V = .23$.

Overall, these results do not confirm the hypothesis that the accuracy of perpetrator-role pairings differs based on when such pairings are requested.

Table 7

Accuracy of Perpetrator Identifications

	Control			1 Array			3 Arrays		
% Accuracy	Overall (n = 24)	TP (n = 12)	TA (n = 12)	Overall (n = 48)	TP (n = 24)	TA (n = 24)	Overall (n = 48)	TP (n = 24)	TA (n = 24)
Average Narrow Accuracy									
0 correct (%)	45.83	41.67	50.00	83.33	91.67	75.00	85.42	87.50	83.33
All correct (%)	54.17	58.33	50.00	16.67	8.33	25.00	14.58	12.50	16.67
Average Scaled Accuracy									
0 correct (%)				39.58	29.17	50.00	20.83	29.17	12.50
1 correct (%)				29.17	41.67	16.67	29.17	33.33	25.00
2 correct (%)				14.58	20.83	8.33	35.42	25.00	45.83
3 correct (%)				16.67	8.33	25.00	14.58	12.50	16.67

Note. Overall refers to the groups in which TA/TP conditions were collapsed across the participants. *TP* or *TA* refers to the groups in which the participants were split according to whether or not they viewed line-up/s containing the perpetrator/s.

Table 8

Accuracy of Perpetrator-Role Pairings

	Throughout (TP)	End (TP)
% Accuracy	(n = 17)	(n = 17)
Average Narrow Accuracy		
0 correct (%)	58.82	47.06
All correct (%)	41.18	52.94
Average Scaled Accuracy		
0 correct (%)	29.41	29.41
1 correct (%)	52.94	47.06
2 correct (%)	11.77	23.53
3 correct (%)	5.88	0

Note. The data in this table are from groups in which participants viewed line-ups containing all perpetrators.

Discussion

The main aim of the current research was to investigate the effects of line-up and role assignment procedures on the accuracy of perpetrator identifications and perpetrator-role pairings, two key components of multi-perpetrator eyewitness testimonies. This was done by testing two specific hypotheses. In this section, the findings in relation to these hypotheses, as well to the relevant literature in the field, will be discussed. Thereafter, the limitations of this study and suggestions for future research on this topic will be addressed.

Although not included in the hypotheses, this study tested whether the number of offenders that were present at encoding impacted the accuracy of perpetrator identifications. The results from the analyses were conflicting across different measures of accuracy for both the TP and TA conditions. However, in this section weighted accuracy will be discussed first as it comprises of a proportion of each of an individual's identification decisions. This means that this measure most approximates real-world contexts in which the police would assess the veracity of each of a witnesses' identifications independently from one another. When using this measure, there was a consensus across both TP and TA conditions that participants who viewed one perpetrator in the video yielded a higher number of correct identifications than those who saw three.

This result is consistent with multi-perpetrator eyewitness research as it is well-established that, as the number of perpetrators increases, the accuracy of identifications decreases (e.g., Clifford & Hollin, 1981). The perceptual overload and working memory theories can be used to explain this finding. According to the former theory, viewing a larger number of perpetrators at encoding would present participants with a lot of perceptual information including, for example, the sound of the perpetrators' voices and the colour of their clothing (Cartwright-Finch & Lavie, 2006). Thus, these different sources of information would compete for an individual's limited attentional resources (Mulligan, 1998). Specifically, the working memory theory purports that individuals can only process seven pieces of information simultaneously (Baddeley et al., 1975). Therefore, as the number of perpetrators increases, the influx of crime-related details is more likely to exceed an individuals' working memory capacity meaning that certain details will not be retained (Cartwright-Finch & Lavie, 2006). In addition, the details that are encoded may be irrelevant to the identification process (Levine & Tapp, 1973). For example, participants may focus on an object that could be necessary for their survival, rather than the perpetrator's face. Sporer (2001) confirmed this by finding that, when there is a weapon present, witnesses tend to

focus on this object at the expense of attending to other details, a phenomenon known as the 'Weapon-Focus Effect'. Furthermore, the details that are retained may overlap between the perpetrators making it difficult to extract offender-specific information (Megreya & Bindemann, 2011). Therefore, viewing three perpetrators, rather than one, could result in a lack of memory for pertinent details, transference of characteristics between offenders, and the encoding of irrelevant information. Combined, these factors could contribute to the difficulty of being tasked with making multiple decisions which would explain the higher number of incorrect identifications provided by participants in the experimental groups.

Regarding the conflicting findings from the other measures of accuracy, the source monitoring theory could explain the non-significant results by proposing the advantage of viewing three perpetrators at encoding. This stems from the assertion that comparisons between offenders, which are available for the experimental groups, allows for the encoding of distinguishable perpetrator-specific details (Megreya & Bindemann, 2011). For example, participants who viewed the three-perpetrator crime would have been able to compare facial features across the offenders and, if one feature was perceptually unique, they would remember this in relation to the other faces (Megreya & Bindemann, 2011). Thus, according to source monitoring theory, this single detail could be used to trigger a memory of a particular perpetrator, rather than a recollection of the entire criminal event (Johnson et al., 1993). This would allow for a subsequent recollection of a unique characteristic relating to a single offender that would be indispensable to a potential identification which is premised on inter-perpetrator differences (Megreya & Bindemann, 2011).

Perpetrator Identification

The first major aim of the study was to address whether there was a difference in the accuracy of perpetrator identification, in both TP and TA conditions, based on line-up procedure. This was done by testing the hypothesis that accuracy would differ according to whether participant viewed three smaller arrays or one larger array at recognition. There were two variants of accuracy used to measure this, namely narrow and scaled accuracy. Only scaled accuracy will be discussed because, as with weighted accuracy, this measure better approximates real-world appraisals of multi-perpetrator eyewitness testimonies. Results suggested that, for the TA condition, identification differed as a function of line-up procedure. Specifically, participants who viewed three smaller arrays yielded a higher number of accurate identifications than those who viewed one larger array. However, this finding was not consistent across the TP condition.

Multi-perpetrator eyewitness literature is equivocal about the advantage of administering smaller, sequential line-ups (e.g., Steblay et al., 2001). The findings of the current research mirrors this lack of consensus with the inconsistencies between the TP and TA groups. Again, theories of perceptual overload and working memory can be used to explain why there may have been fewer incorrect identification decisions in TA groups in which participants were presented with three smaller line-ups. As well as providing a stimulus-overload at encoding, viewing a large number of faces at the recognition stage could overburden an individual's working memory (Baddeley et al., 1975). For example, participants in the one array condition were presented with 18 line-up members and had to divide their attention between these individuals to make their identification decisions. In contrast, those who viewed a six-person array would have less of a cognitive load, thereby elevating the strain on their working memory. Therefore, because identifications from smaller arrays require fewer relative judgements, they could demand less working memory thereby increasing accuracy as a larger proportion of relevant information could be attended to at one time.

The theory of associative memory could explain why the sequential advantage was only observed in the TA condition. According to this theory, details from the same crime would be encoded at the same time, creating links between crime-related memory traces (Gillund & Shiffrin, 1984). Thus, a recollection of one detail could trigger a memory of another piece of information from the same crime (Gillund & Shiffrin, 1984). In order to capitalise on these associations, Laldin (1997) proposed that perpetrators of the same crime could act as memory cues for one another, especially if they were featured in the same line-up. Therefore, having multiple perpetrators in the same line-up could facilitate cued-recall methods in which offenders act as prompts for one another (Laldin, 1997). This is supported by a meta-analysis conducted by Steblay et al. (2001) who found that simultaneous line-ups were beneficial to sequential line-ups in TP conditions. However, this potential benefit is not available in TA line-ups as the perpetrators are not present, therefore, they are unable to trigger the memory of another perpetrator. It is also not clear as to why participants in the TA groups rejected the line-up as they could have selected the 'don't know' or 'not present option'.

Perpetrator-role Pairing

The second aim of the study was to investigate the potential for an association between the accuracy of perpetrator-role pairings and whether participants were required to make such pairings throughout, or at the end of, the identification procedure. To examine

this, the hypothesis that the accuracy of such pairings will differ according to the timing of role requests was tested. To assess this, measures of narrow and scaled accuracy were used. Overall, the results suggested that the accuracy of perpetrator-role pairings did not differ as a function of when roles were requested.

This result was also found in a study on role instructions conducted by Hobson and Wilcock (2011). The authors proposed that source monitoring could provide a rationale for requesting participants to link a role to each identified offender immediately after they had been selected from the line-up (Hobson & Wilcock, 2011). They argue that, by asking a witness to reflect on a perpetrator's role, it would force them to recount information that was unique to each offender, namely their criminal action (Hobson & Wilcock, 2011). This would exemplify the source monitoring phenomenon as witnesses would attend to the differentiating feature of the perpetrator rather than trying to divide their attention between all of the perceptual information presented in the line-up (Hobson & Wilcock, 2011). This strategy would then reduce the effect of perceptual overload by encouraging a focus on details that would enable discrimination between line-up members (Hobson & Wilcock, 2011). However, in their study, Hobson and Wilcock (2011) found that the timing of role requests did not increase perpetrator-role pairings. The authors suggested that this could have been because the roles played by each of the perpetrators were not distinct enough from one another (Hobson & Wilcock, 2011). Consequently, the premise of source monitoring is not met as, even if a witness was asked to focus on a perpetrator's action, this detail would still have commonalities with memories of other roles in the crime. In the video used in the current study, all of the perpetrators were in the same room at the same time and their roles did overlap. For example, two of the three perpetrators looked in the filing cabinet and, therefore, this recollection would not be unique to only one offender. Thus, the explanation Hobson and Wilcock (2011) provided for their non-significant finding could elucidate upon the results found in this research, which suggests that the timing of perpetrator-role pairings do not affect participants' aptitude for perpetrator-role pairings.

Limitations and Recommendations for Further Research

The generalisability and interpretation of the results from the current research may have been limited by a relatively small sample size. This limitation is especially pertinent to the perpetrator-role pairing data as only participants from the experimental, TP conditions who correctly identified perpetrator/s could be included in the analysis. Consequently, this amounted to a very small group of participants (n=34). Furthermore, these participants had to be divided according to the when they received the role assignment instructions, thereby

further reducing the sample to two groups (n = 17). In future research, this could be resolved by increasing the sample size. However, it would be difficult to increase the sample size for the perpetrator-role pairing analyses as the accuracy of multiple perpetrator identifications has been shown to be poor. Therefore, the number of people who met the criterion of making a correct identification/s, that would enable them to be included in the perpetrator-role comparisons, may still be limited.

In addition, the effect of race was not examined in the study. The sample characteristics data showed that there were unequal numbers of participants who identified as being part of one of the racial group options provided. Although this demographic data was captured, race was not a factor in the design. However, research has shown that individuals of the same race are better at identifying one another than identifying members of a different race group, a phenomenon known as own-race bias (Bothwell, Brigham, & Malpass, 1989), but now known as the in-group or own-group bias (Sporer, 2001). Future research could avoid this potentially confounding variable by testing for an effect of race on identification and pairing accuracy at various intervals throughout the study. If significant between-group differences were found, researchers could consider how this would impact their analyses.

Furthermore, the procedure could be simplified by removing the likelihood rating component as this would reduce the cognitive load placed on participants during the experiment. This exclusion is justified in this study as the rating data was skewed by extreme scores to the extent that it could not be meaningfully analysed. Therefore, only participants' binary decisions would be coded and used to conducted statistical tests.

Lastly, it is challenging to conceptualise methods to create a single accuracy value that represents all three of a participant's identification or pairing decisions. However, this is often done as a way to compare multiple decisions to a control group's responses. Possible ways to improve the process of formulating one value for the experimental groups could be addressed in future research to increase the accuracy of the analyses.

Conclusion

There have been fewer than 20 published studies to date that have explicitly tested eyewitness memory for multiple perpetrators, despite the veritable rise in this type of crime. However, within this literature, it has been well-established that multi-perpetrator eyewitness testimonies, including perpetrator identifications and perpetrator-role pairings, are of questionable merit. This study contributes to an even smaller corpus of research on the effects of both line-up and role assignment procedures on the ability of a witness to correctly identify

a perpetrator and link them to their criminal activity. Investigations into these processes are paramount as they have the potential to influence police guidelines in order to elicit more accurate multi-perpetrator eyewitness testimonies. In this study, participants in the TA conditions yielded a higher number of accurate identifications when they viewed three smaller arrays rather than one larger array at recognition. Furthermore, the accuracy of perpetrator-role pairings was not affected by whether participants were required to link each offender to their action immediately after each identification or once all the identifications had been made. The relatively small sample size may have limited the interpretability and generalisability of the results, thereby precluding conclusive recommendations for the most effective role assignment procedures. However, this study has shown that perpetrator identification may be improved by manipulating the array style. Therefore, this indicates that there is scope for line-up procedures to be altered to prevent the miscarriages of justice, which stem from misidentifications.

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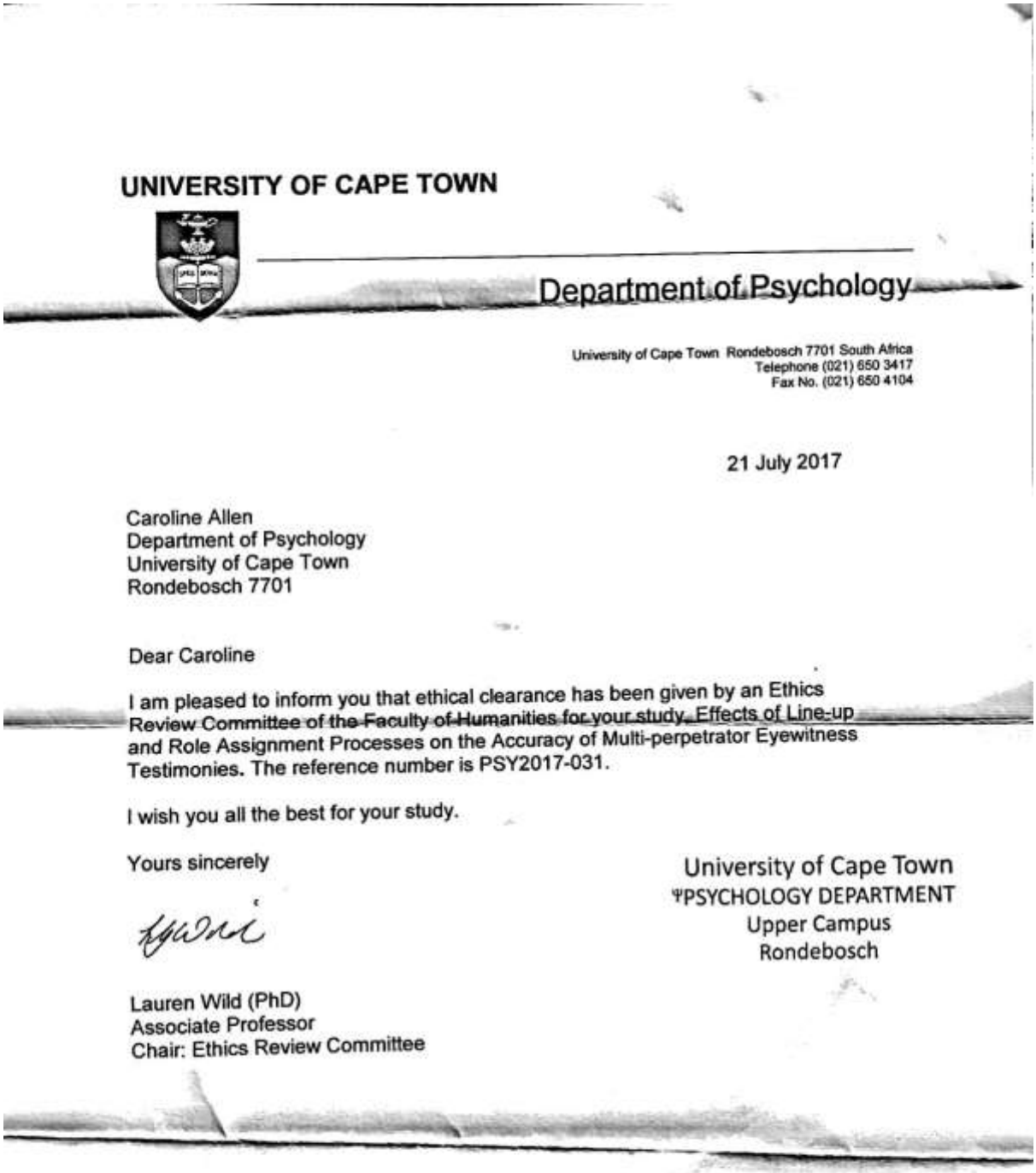
Appendix A



UNIVERSITY OF CAPE TOWN

Department of Psychology

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

21 July 2017

Caroline Allen
Department of Psychology
University of Cape Town
Rondebosch 7701

Dear Caroline

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, Effects of Line-up and Role Assignment Processes on the Accuracy of Multi-perpetrator Eyewitness Testimonies. The reference number is PSY2017-031.

I wish you all the best for your study.

Yours sincerely

University of Cape Town
PSYCHOLOGY DEPARTMENT
Upper Campus
Rondebosch

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

Appendix B

Table 1

Experimental Groups (*n* = 12)

Line-up	Role instructions	
	Throughout	End
1 x array	TPTPTP	TPTPTP
	TATATA	TATATA
3 x arrays	TPTPTP	TPTPTP
	TATATA	TATATA

Appendix C

Dear students,

We would like to invite you to participate in a study investigating theft amongst young offenders. Involvement will include viewing a video clip depicting a theft and completing various tasks based on what you have watched.

All students are welcome to participate as there are no exclusion criteria! This study will take place during September and October and various timeslots will be made available on Vula so that you can sign-up for a time that suits you. The whole study will take 1 hour and in return for your much-appreciated involvement, you will receive 2 SRPP points. After completing the experiment we will debrief you fully so that you can learn a little bit about this interesting field of research.

The venues for this study is the GCS lab in the Psychology department.

If you have any questions please contact:

allcar007@myuct.ac.za

alicia.nortje@gmail.com

Appendix D

Consent to participate in a research study

Dear student,

Study Aim

You are being invited to take part in a study being done by researchers from the University of Cape Town's Psychology department. The aim of this study is to learn more about theft amongst young offenders.

Study Procedures

If you choose to participate in this study you will have to watch a short video clip of a theft and do various activities based on what you have viewed. The study will take 1 hour in total.

Possible Risks

The only risk involved in participating in this study is the loss of confidentiality when filling out SRPP and consent forms that ask for details such as names, student numbers and demographics. In addition, the video of the theft might be distressing to some; however, this has never been the case when the clip has been used in the past.

Possible Benefits

You will receive 2 SRPP points for completing this study.

Costs

The only cost involved is the time that you will give up in order to take part in the study.

Voluntary Participation

Your participation in this study is completely your choice. There will be no consequences if you decide not to take part in this experiment or if you decide not to answer a certain question. You are also free to leave the study at any time.

Confidentiality

Information that you provide during this study will be kept privately. Your identifying details, such as your name and student number, will only appear on the consent and SRPP form which will be kept privately by the researchers in a secure location. Only the researchers

will be able to trace your performance back to you, but this information will also be kept privately and securely.

Questions

If you have any questions or comments relating to the study you should contact the following researchers:

Alicia Nortje	alicia.nortje@gmail.com
Carrie Allen	allcar007@myuct.ac.za
Rosalind Adams	rosalind.adams@uct.ac.za

By signing below you are acknowledging the following:

I have understood what participating in this study will involve. I am aware of the risks and benefits. I have no further questions about the study and voluntarily consent to participate.

Signature of participant ……...

Date ……...

Name:

Student number:

Course code: PSY1004F PSY1006F PSY1005S PSY1007S PSY2006F PSY2009F PSY2010S PSY2011F PSY3007S PSY3008F PSY3009F PSY3010S PSY3011S

Appendix E

For the experimenter to complete:

Participant number: _____

Date: _____

Demographics and Other Participant Information

It is common practice to ask for demographic information in these kinds of studies. This is because South Africa is extremely diverse compared to other countries. Therefore, researchers need this information to find out whether findings from other places are relevant to the South African population.

Gender: Male Female Other

Race White Black Coloured Indian Asian Other

Are you a South African citizen? Yes No

Appendix F

Juvenile delinquency on the increase in SA

South Africa | 7 August 2006, 12:25pm

By Janine du Plessis

Juvenile delinquency is a growing trend in the country, with South Africa ill-equipped to appropriately deal with children who are in trouble with the law.

Children awaiting trial, in detention, used by adults to commit crime, involved in organised armed violence and the sentencing of children to life remain a major challenge for the judicial system as South Africa has no concrete laws for dealing with child offenders.

Last year 30 000 South African children were successfully taken out of the legal system and diverted into educational and life skills programmes instead of serving a sentence or awaiting trial at a correctional facility. Children receive no schooling while awaiting trial.

However, at present a decision on the future of a child offender depends almost entirely on the goodwill of the prosecutor.

These were the concerns raised during a conference on child justice held in Pretoria last week.

Calls were made for Parliament to tighten up legislation on child offenders and implement the Child Justice Bill.

The United Nations Committee on the Rights of the Child (UNCROC) chairman Professor Jaap Doek told the conference there was a real concern in many countries over the "juvenile delinquency phenomenon".

"Crimes (committed by child offenders) are increasing, becoming more violent and are happening at an earlier age. On the one hand there is a call for being tougher on crime, where heavier penalties and longer sentences are being encouraged.

"On the other hand children's rights must be kept in mind when holding them responsible for their crimes," said Doek.

He said from the age of 12 children were criminally responsible. "Most of the crimes are petty offences such as assault on property and people. Most child offenders were not repeat offenders."He said it was costly and ineffective to put a child in jail.

"They should be diverted to community service, apologise to those involved or repair what was damaged. The child should be diverted from the traditional ways of dealing with criminals in this way.

"Armed robbery, murder and other violent crimes committed by children is a category which needs to be dealt with to ensure the child becomes a constructive member of society."

Addressing the conference, Judge Yvonne Mokgoro of the Constitutional Court said: "No matter how heinous and no matter how vile their actions, children always have the right to be treated as children."

Currently children in conflict with the law are dealt with in terms of the Criminal Procedure Act, which does not adequately provide procedural protection measures for juvenile offenders, according to the Open Society Foundation SA and the Child Justice Alliance. However, children's rights were protected in the Constitution.

In a statement the organisations said: "The Child Justice Bill has not been revisited since it was debated in Parliament in 2003, even though the government departments involved all support it and the implementation of the legislation has already been planned for and budgeted.

"It is now awaiting final adoption by parliament."

Child rights advocates, the department of justice, the National Prosecuting Authority, the Civil Society Prison Reform Initiative, the University of Pretoria's Centre for Child Law, judges, the SAPS, international agencies like the United Nations and other stakeholders were represented at the conference to address the "urgent need for change" in the South African justice system.

Doek said the root causes needed to be addressed. He felt the lack of education, poor socio-economic circumstances and children with little to lose were most at risk of getting involved in crime.

He called for the standardisation of diversion policies which are purpose-made counselling, and educational and life skills programmes which deal with the child offender in an efficient and appropriate way.

"There are many opportunities where the young offender can be diverted out of the legal system back into their family and community or special diversion programmes, such as during the child's interaction with the police, the prosecutor and even with judicial officers who can recommend alternative measures to detention in a correctional facility.

"It is important not to overreact to the first petty offence," said Doek. He said the objective was to limit the number of children prosecuted and sentenced in court.

Young Offenders Questionnaire

1. What role does Professor Jaap Doek play within the United Nations?

2. According to Doek, from what age are children criminally responsible?

3. The article states that children awaiting trial do not receive any schooling. What do you think about this?

4. What are some of the factors that Doek considers the root causes of juvenile delinquency?

5. Can you think of any other contributors to criminal activity amongst young offenders?

6. Describe the kinds of living environments that you associate with young offenders.

7. What forms of punishment do you think would best reduce violence amongst youths?

8. What are some of the things Doek suggests as alternatives to placing juvenile delinquents in jail?

9. What kinds of prevention strategies do you think would best reduce incidents of youth violence?

10. What kind of laws do you think the criminal justice system should implement to ensure that children's rights remain protected?

Appendix G

Table 3

Instructions for Identification Likelihood Ratings

Condition	Instruction
1-perp, 1 array	For the next task, you will be presented with a line-up that may or may not contain the perpetrator who appeared in the video. This line-up will consist of six people. Your task is to rate how likely you think it is that each of the line-up members was the perpetrator in the crime on a scale from 0 - 100. For example, if you have no doubt that one of the line-up members is the perpetrator you would give them a rating of 100. Alternatively, if you are convinced that the line-up member was not the perpetrator then you would give them a score of 0. You will make your responses on the piece of paper labelled B - this paper has the same image of the line-up that will appear on the next screen. Please write this likelihood rating above each of the line-up members on paper B. At the end of this task you should have six ratings, one per line-up member. Before you begin, please press 'SPACEBAR' to see the same line-up on the screen.
3-perps, 3 x arrays	For the next task, you will be presented with a line-up that may or may not contain one of the perpetrators who appeared in the video. This line-up will consist of six people, and you will view three line-ups like this in total. Your task is to rate how likely you think it is that each of the line-up members was one of the perpetrators in the crime on a scale from 0 - 100. For example, if you have no doubt that one of the line-up members is one of the perpetrators you would give them a rating of 100.

	Alternatively, if you are convinced that the line-up member was not the perpetrator then you would give them a score of 0. You will make your responses on the piece of paper labelled B - this paper has the same image of the line-up that will appear on the next screen. Please write this likelihood rating above each of the line-up members on paper B. At the end of this task you should have six ratings, one per line-up member. Before you begin, please press 'SPACEBAR' to see the same line-up on the screen.
3-perps, 1 x array	For the next task, you will be presented with a line-up that may or may not contain one of the perpetrators who appeared in the video. This line-up will consist of eighteen people. Your task is to rate how likely you think it is that each of the line-up members was one of the perpetrators in the crime on a scale from 0 - 100. For example, if you have no doubt that one of the line-up members is one of the perpetrators you would give them a rating of 100. Alternatively, if you are convinced that the line-up member was not the perpetrator then you would give them a score of 0. You will make your responses on the piece of paper labelled B - this paper has the same image of the line-up that will appear on the next screen. Please write this likelihood rating above each of the line-up members on paper B. At the end of this task you should have eighteen ratings, one per line-up member. Before you begin, please press 'SPACEBAR' to see the same line-up on the screen.

Table 4

Instructions for Identification Binary Decisions

Condition	Instruction
1-perp, 1 x array	Now, for the next task, you will be shown the same line-up, but you need to decide who - if anyone - you recognise as the perpetrator from the video. You will also complete this task on paper B. To do this, please circle the number below the line-up member whom you recognise. If you do not recognise any of the line-up members, then circle the 'not present' option. Alternatively, if you do not know if the perpetrator is present or not and you cannot make a decision, then circle 'do not know'. Remember that you are not being forced to make an identification. Therefore if you do not recognise anyone from the line-up, you may answer 'not present' or 'do not know'. Please press SPACEBAR so that the line-up is presented on the screen.
3-perps, 3 x arrays	Now, for the next task, you will be shown the same line-up, but you need to decide who - if anyone - you recognise as one of the perpetrators from the video. You will also complete this task on paper B. To do this, please circle the number below the line-up member whom you recognise. If you do not recognise any of the line-up members, then circle the 'not present' option. Alternatively, if you do not know if one of the perpetrators is present or not and you cannot make a decision, then circle 'do not know'. Remember that you are not being forced to make an identification. Therefore if you do not recognise anyone from the line-up, you may answer 'not present' or 'do not know'. Please press SPACEBAR so that the line-up is presented on the screen.

3-perps, 1 x array	Now, for the next task, you will be shown the same line-up, but you need to decide who - if anyone - you recognise as the perpetrators from the video. You can make up to three identifications, one for each perpetrator. You will also complete this task on paper B. To do this, please circle the number below the line-up member whom you recognise. If you do not recognise any of the line-up members, then circle the 'not present' option. Alternatively, if you do not know if one of the perpetrators is present or not and you cannot make a decision, then circle 'do not know'. Remember that you are not being forced to make an identification. Therefore if you do not recognise anyone from the line-up, you may answer 'not present' or 'do not know'. Please press SPACEBAR so that the line-up is presented on the screen.

Table 5

Instructions for Role Likelihood Ratings

Condition	Instruction
3-perps, immediate	Keep paper B in front of you for the next part of the experiment. Please turn over the paper labelled B-2. For the next task, your descriptions of the roles performed by the perpetrators will be presented on the screen. First, write down the line-up member whom you identified on paper B in the block in the top right corner on paper B-2. There are three blocks on paper B-2. Each block corresponds with a role presented on the screen. Your task is to rate the likelihood that this line-up member (whom you identified) performed the roles that you described. For example, if you have no doubt that this line-up member performed a

	particular role, then you would give this role a rating of 100. Alternatively, if you are convinced that this line-up member did not perform a particular role, then you would give this role a rating of 0. You must rate the likelihood that this line-up member performed each of the three roles. Please press 'SPACEBAR' to see the three roles.
3-perps, end	Please go back to paper B where you made your line-up decision for the first line-up. Keep paper B in front of you for the next part of the experiment. Please turn over the paper labelled B-2. For the next task, your descriptions of the roles performed by the perpetrators will be presented on the screen. First, write down the line-up member whom you identified on paper B in the block in the top right corner on paper B-2. There are three blocks on paper B-2. Each block corresponds with a role presented on the screen. Your task is to rate the likelihood that this line-up member (whom you identified) performed the roles that you described. For example, if you have no doubt that this line-up member performed a particular role, then you would give this role a rating of 100. Alternatively, if you are convinced that this line-up member did not perform a particular role, then you would give this role a rating of 0. You must rate the likelihood that this line-up member performed each of the three roles. Please press 'SPACEBAR' to see the three roles.

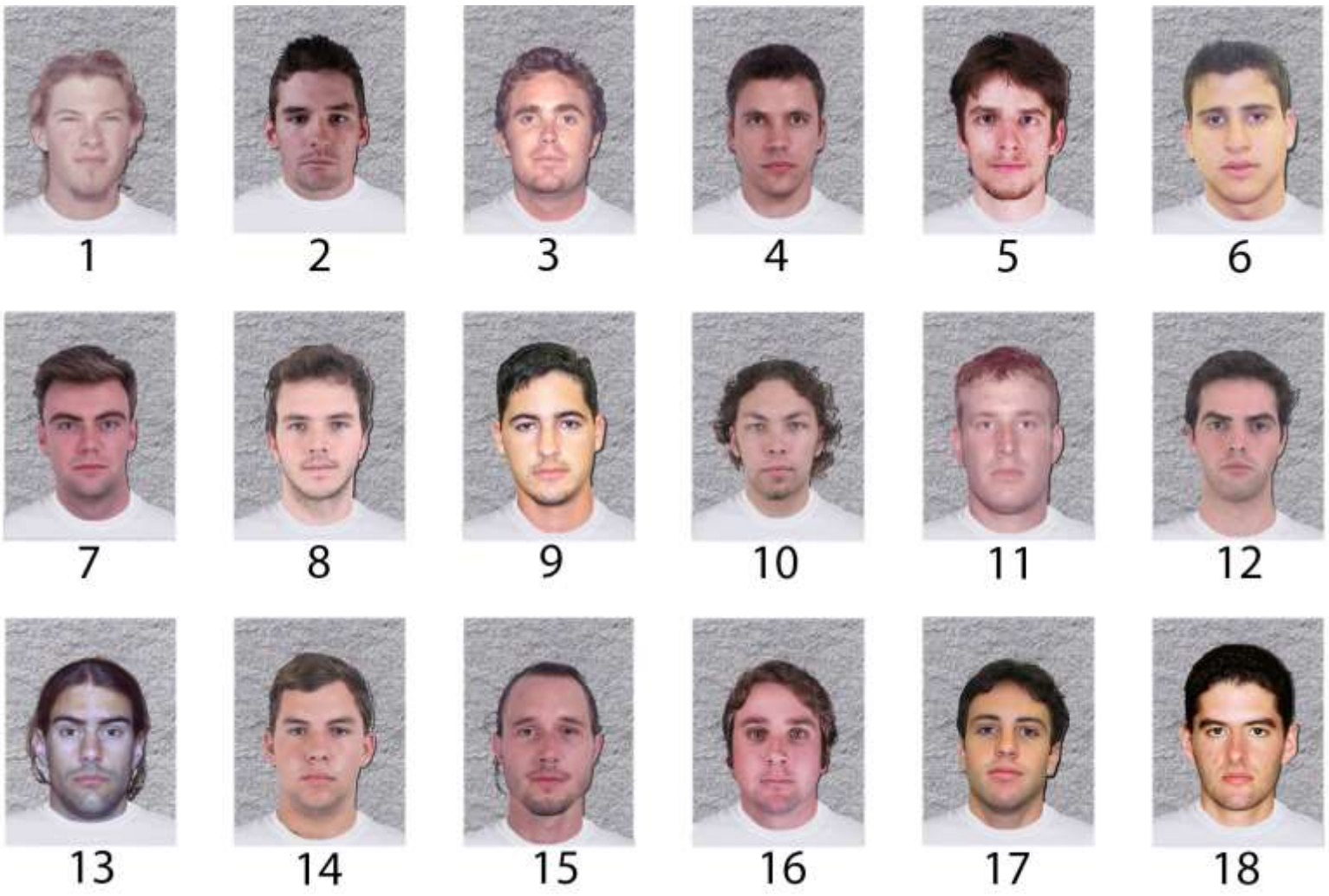
Table 6

Instructions for Role Binary Decisions

Condition	Instruction
3-perps, immediate; 3-perps, end	Now, for the next task, you must make a decision about which role you think the line-up member whom you selected played in the video. You will also complete this task on paper B-2. To make your choice, please circle the role number that corresponds with the role that this perpetrator performed. Remember, you are not being forced to choose a role. Therefore, if you do not know which role this line-up member played or you cannot decide, then circle ‘do not know’. Please press 'SPACEBAR' to see the three roles.

Appendix H

For experimenter only:



Appendix I

For experimenter only:

1

2

3

4

5

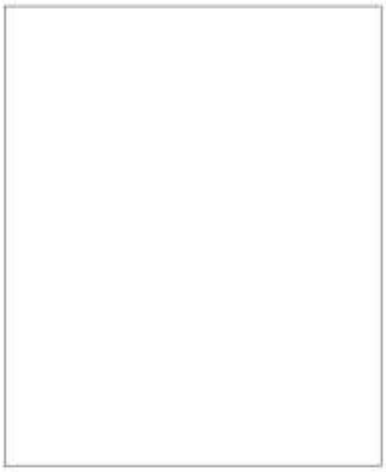
6

Not present/Don't know

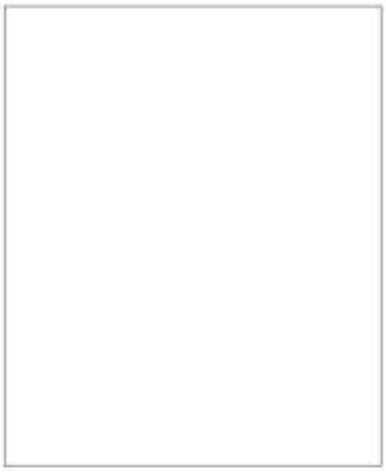
Appendix J

For experimenter only:

Line-up member number:



Role 1



Role 2

Role 3

Don't know

Appendix K

Thank you for giving up your time to participate in our study, it is greatly appreciated!

Our research aims to explore the factors that impact the accuracy of eyewitnesses who have viewed a crime committed by more than one perpetrator. It has been well-established that multi-perpetrator eyewitnesses' memory is poor and this could result in dire consequences such as misidentifications and false convictions. Wrongful sentencing can lead to innocent individuals spending years in jail while the guilty parties remain at liberty to offend again! In South Africa, this topic is extremely relevant as the rates of multi-perpetrator crimes are alarmingly high. However, despite the seriousness of this situation, there has been little research into the aspects that make the identifications of multiple perpetrators so inaccurate. In particular, there have been fewer than 20 studies that have focused on the multi-perpetrator problem! In light of this, your participation has contributed to filling a research gap that has real-life relevance.

In this study we are interested in finding out how two specific factors influence multi-perpetrator eyewitness testimonies:

1) Line-up procedures: this refers to an identification technique where witnesses are presented with known innocent individuals ("foils") and a suspect who may or may not have perpetrated the crime, before being asked to identify the offender.

2) Role assignment: this refers to the process in which witnesses are asked to link a specific action to each perpetrator they have identified.

Having highlighted the practical problems this research is aiming to address, we would like to explain why we had to use deception in order for our findings to remain applicable to multi-perpetrator scenarios:

In our SRPP announcement we said that our study was about theft among young offenders instead of explicitly stating that it was a study on multi-perpetrator eyewitness accuracy. This was necessary to create conditions that most mimic real-life situations. In reality, eyewitnesses would not be notified before viewing a crime as such events are unexpected which is partly why they are difficult to remember. Therefore, in order to investigate the kind of spontaneous learning that would occur in real-life situations, we could not tell you what

you would be doing in our study. If we had told you, you would no doubt have looked out for identifying features of the perpetrators and paid close attention to what each one was doing. In addition, you had to complete the distracter task to create some delay between viewing the crime and making identifications. This is because, after viewing a crime, witnesses have to hold onto that information until they are required to make identifications which does not happen immediately after the incident. Overall, we believe that the risk of deception was outweighed by the benefits that could come from the results of this research. Such results include determining the best ways to conduct line-up and role assignment processes to ensure that innocent individuals are not wrongfully sentenced.

You may have noticed that many of you had different experiences of the study as not everyone viewed the same video and was asked to complete the same tasks. This is because you were randomly assigned to different groups. Each of these groups was asked to do tasks under different conditions in order to test how accurate you were at making different kinds of identifications. We hope that your participation in the study has given you some insight into the complex and interesting nature of experimental designs.

We have also tried to keep the video you watched as least distressing as possible by depicting a staged, victimless, non-violent crime.

In addition, all of the forms containing any of your identifying details will be kept privately and safely by the researchers.

We hope that this experience has shed some light on the nature of experimental research and the processes it entails. The following interesting articles highlight the importance of the research to which you have just contributed:

Hobson, Z. J., & Wilcock, R. (2011). Eyewitness identification of multiple perpetrators. *International Journal of Police Science and Management, 13*(4), 286-296. doi: 10.1350/ijps.2011.13.4.253

Wells, E. C., & Pozzulo, J. D. (2006). Accuracy of eyewitnesses with a two-culprit

crime: Testing a new identification procedure. *Psychology, Crime & Law*, *12*(4), 417-427. doi: 10.1080/1068316050005066

Below we have listed the contact details of the Student Wellness Service in case you would like to seek help for any distress that may have been caused by this study. In addition, we have listed the details of CPS in the event that you feel unsafe on campus or witness any criminal event:

The Student Wellness Service
Ivan Toms Building
28 Rhodes Ave
Mowbray 7700
Tel: 021 650 1020 / 1017

CPS Management
Tel: 021 650 4654 or 021 650 4525

CPS Crime Prevention
Tel: 021 650 4653

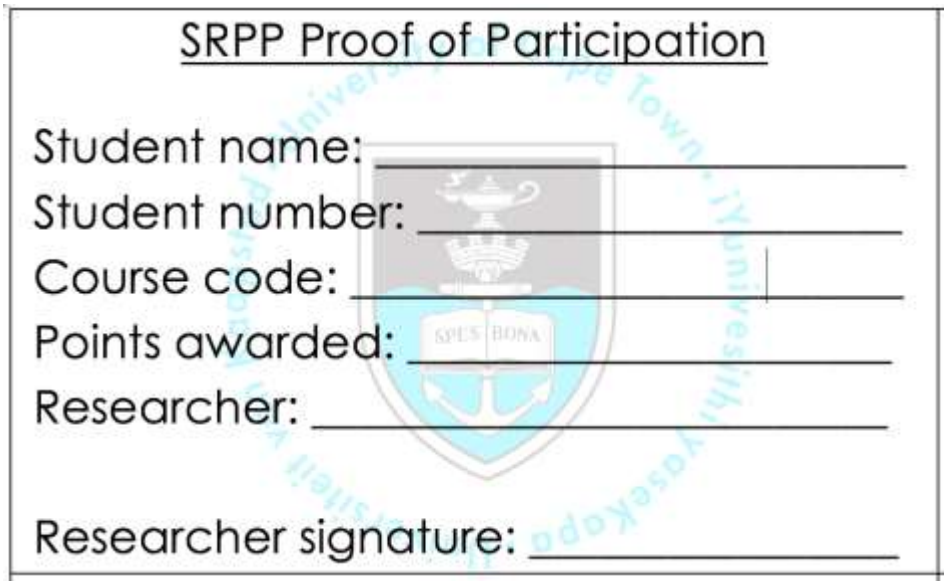
If you have any questions, comments or complaints regarding this study do not hesitate to contact us:

alicia.nortje@gmail.com

allcar007@myuct.ac.za

rosalind.adams@uct.ac.za

Appendix L



SRPP Proof of Participation

Student name: _____

Student number: _____

Course code: _____

Points awarded: _____

Researcher: _____

Researcher signature: _____