WHAT CHANGE BLINDNESS CAN TEACH US ABOUT SKILLED OBSERVATION: A LAW ENFORCEMENT AND STUDENT COMPARISON

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WHAT CHANGE BLINDNESS CAN TEACH US ABOUT SKILLED OBSERVATION: A LAW ENFORCEMENT AND STUDENT COMPARISON

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ABSTRACT

WHAT CHANGE BLINDNESS CAN TEACH US ABOUT SKILLED OBSERVATION: A LAW ENFORCEMENT AND STUDENT COMPARISON

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Although it is often assumed that law enforcement officers possess acute observational skills due to their expertise and training, perhaps resulting in a reduction in attentional errors (e.g., change blindness), no prior research has compared officers with a lay sample on this phenomenon. In the current investigation, students and law enforcement agents participated in a change blindness task and attempted to identify the target(s) from four photo lineups. Law enforcement officers (n = 61) and college students (n = 40) viewed a videotaped, mock traffic stop in which the identity of the driver was changed. Officers and students were equally susceptible to change blindness regarding the switch in the target’s identity, but students were more likely than officers to detect changes in the target’s clothing. Students also performed better on the lineup task, overall, than officers. Additionally, whereas students’ confidence was positively correlated with identification accuracy under some circumstances, officers’ confidence was either uncorrelated or negatively correlated with accuracy. Years of experience in police work did not account for any differences in the law enforcement sample. This
comparison suggests that change blindness and mistaken identity are common attentional errors, perhaps even in situations involving specialized familiarity (i.e., a traffic stop is well within the professional domain of law enforcement officers). The findings of the current study also demonstrate the importance of continued research into law enforcement training and have practical implications for examinations of eyewitness identifications.
ACKNOWLEDGEMENTS

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I would also like to send my sincere gratitude to Dr. Dario Rodriguez. Without his knowledge and aid, I would still be without focus. I would also like to thank Deputy Matt Lunsford, Jacob Smart, and Zachary Smart for their time and assistance in filming the stimulus video. My deep appreciation also goes to Shaun Smart for his continued support and for allowing me to use his valuable class time to complete this thesis, and to Steven Bare for his assistance in data coding.
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CHAPTER 1
INTRODUCTION

When aspects of a visual scene have been altered, people often fail to recognize
the changes (Werner & Thies, 2000). The failure to visually detect and consciously
perceive these changes, whether large or small, is a phenomenon known as change
blindness. Investigations of change blindness and inattentional blindness (the failure to
recognize visual changes due to attention being engaged in another task) show that the
physical act of looking is not always equivalent to what is commonly referred to as
seeing. The routine malfunctioning of a visual system that is often assumed to be
rendered with precision runs counter to our belief that unusual or novel events will draw
our attention, and that any form of change within the visual field will lead to conscious
awareness (Simons & Ambinder, 2005). In addition, because we do recognize some
changes in our visual field, we assume all changes are noticed, for we do not become
aware of changes that we have no idea are in existence (Levin, Momen, Drivdahl, &
Simons, 2000). If “we see but we do not observe” (Sir Arthur Conan Doyle in A Scandal
in Bohemia) in everyday situations, the potential for attentional failures can have a
variety of implications, particularly in specialized areas where visual accuracy and
detailed observations are critical, such as law enforcement. Law enforcement
professionals are expected to be skilled observers publicly, departmentally, and legally
(Dahl, 1952) and must testify in court regarding what are assumed to be correct visual
experiences. In the current research, the change blindness phenomenon was used as a way to investigate the limitations of observation and attention for police officers of varying backgrounds and experiences. The law enforcement sample was then compared to that of a college sample to detect whether officers were more or less susceptible than a civilian population to these specific attentional errors.

Change blindness refers to the difficulties viewers face in detecting large changes in their perceptual environment (Levin et al., 2000). After several decades of study, the data indicate that we are astonishingly unaware of the details of our surroundings from one scene to the next. Coupled with this inability to detect large changes within the field, we often also do not even notice prominent objects that are physically present (inattentional blindness). Current findings indicate that accurate observation is based on focused attention, which allows us to perceive and remember objects and the details of our surroundings; however, research also suggests that we may still be blind to changes even when our representations are rendered with infinite precision (Simons & Ambinder, 2005). Successful change detection requires advanced processes in which people perceive the accurate visual representation and correctly compare the before and after scenes (Mitroff, Simons, & Levin, 2004).

Appearance of this phenomenon in the psychological literature began in the 1950’s when visual perceptual studies revealed participants failing to recognize changes to simple, sequentially presented arrays of dots or letters when separated by brief, blank intervals (Simons & Ambinder, 2005). Peak interest in this area began in the early 1990’s, exploring the assimilation of information across saccadic eye movements. Using flicker tasks, Rensink (e.g., 1997) and colleagues repeatedly found that the introduction
of brief, blank dividers severely masked the ability to detect the modifications of rapidly alternating original and changed images. Observers were generally aware that the image had been altered, yet changes remained either difficult to detect or imperceptible (Rensink, 1997).

By the mid-1990’s studies began illustrating the extent of change blindness to large modifications in real world scenes. This expanded the psychological application from the standard perceptual-cognitive areas to the social-psychological realm. Simons and Levin (1998) were the first to conduct a series of public street interactions in which research confederates asked for directions from an unsuspecting pedestrian. During the interaction, the attention of the direction giver (the pedestrian) was momentarily diverted by passing a large door between the individuals, during which the original confederate was replaced by another person. Despite the real world setting and the close personal contact, only 50% of the unsuspecting pedestrians noticed the change of identity. Since then, the phenomenon of change blindness has been the subject of rigorous cognitive and social research that has demonstrated failures in detecting environmental change to things such as lead actors in a film (Levin, & Simons., 1997), facial detection of other races (“other race effects:” Humphries, Hodson, & Campbell, 2005) and eyewitness identification of perpetrators in staged burglaries (Davies & Hine, 2007).

From an evolutionary standpoint, change blindness can be seen as a productive, time saving creation of cognition that allows us to consciously attend only to relevant and meaningful visual observations while discarding less relevant or irrelevant information. According to this view, we extract the most important data from the visual world while sacrificing other information, including the majority of supporting features of the central
interest areas (Smith & Kosslyn, 2007). Not all changes need to be processed, nor do all visual stimuli require attention, thus reducing our cognitive load. According to Sampanes (2008), cognitive loads can be reduced by relying on the gist of a scene from one visual fixation to the next. As a result, images that affect the gist of the scene are more rapidly detected than individual scene features, suggesting that the overall picture is automatically encoded, whereas specific details are not (Sampanes, 2008). For example, in the case of the Simons and Levin (1998) door study, the gist of the scene for the pedestrian would actually be the task of giving directions to another person. Focused attention would be allotted to the directions themselves (the focused interest) and the confederate would be viewed as part of the overall scene, but not necessarily as a unique individual. Personal features of the confederate - a stranger one is unlikely to encounter again - are merely supporting features of the central interest, thus can cognitively be sacrificed. The pre-change and post-change scenes did not affect the gist of the information.

Mitroff, Simons, and Levin (2004) found that observers can sometimes encode and retain information from both pre-change and post-change scenes; however, they found that post-change scenes are relatively stronger in memory than pre-change representation. The authors conclude that change blindness can occur not because of a failure to represent the visual information, but because of a failure to successfully compare before and after scenes. Later research (Jenson, Yao, Street, & Simons, 2011) revealed that success in change detection is a multistep process. Change blindness can be induced in a multitude of ways, not limited to flicker tasks or brief divisions of pre- and post-change scenes (one-shot tasks). It can also occur naturally, when change happens...
very slowly and fails to capture our attention (gradual fades) or when the luminance signals (light that is transmitted from the object to the eye) that might capture attention, whether large or small, are masked by other luminance signals, which would impede locating the change. They conclude that successful change detection requires five steps, in which people direct attention to the change location; encode into memory what was at the target location pre-change; encode the contents of the target location post-change; compare the pre- and post-change representations; and lastly, consciously recognize the inconsistencies between two. They conclude that change blindness is the result of failure in one or more of these processes.

Change blindness has also been investigated regarding face perception. Face perception is the ability to understand and interpret faces and is perhaps the most important means of transmitting social information. There is evidence of an innate tendency to pay attention to faces from birth (beginning within several hours after birth) and face perception rapidly develops in infancy, undoubtedly due to the importance of its role in social interactions (Acerra, Burnod, & de Schonen, 1999). Faces that are familiar to us are easily detected and changes within prefamiliarized faces are readily noticed (Bruce et al., 1999). These findings are supported by event-related potential (ERP) studies indicating a larger amplitude and quicker onset of response to familiar faces than to unknown faces. Essentially, familiar faces produce a larger and quicker response by the brain than unfamiliar faces, suggesting that facial representations acquire specific properties through experience (Caharel et al., 2002). We become “experts” on faces with which we have experience.
In addition to familiarity, similarity may also be important for accurate facial representations. Numerous studies suggest that we are much better at discriminating the unknown faces of our ingroup members than of outgroup members (e.g., Humphries et al., 2005; Rhodes & Anastasi, 2012). “Ingroup” members would include persons in the same race, sex, or age cohorts. Simons and Levin (1998) found that failure to detect changes of targets in pedestrian interaction was more prominent when the participant belonged to a markedly different age group. In a change blindness task, Humphries et al. (2005) found that Caucasians respond more rapidly to changes in Caucasian faces, whereas Indian participants responded more quickly to changes in Indian faces. This suggests that differences in facial recognition may be partly responsible for the encoding of representations of “ingroup” members, which may be richer in representation than those of “outgroup” members (Humphries et al.).

The Role of Expertise

There is little doubt that there is truth to the saying “practice makes perfect.” As current cognitive and perceptual findings demonstrate, the encoding of relevant information is quicker and more efficient in those who have become experts in a domain (e.g., Degroot, 1946/1978). Werner and Thies (2000) explored the effects of change blindness and expertise for a specific domain using 24 football experts and 24 football novices. Using three related factors known to be involved in successful change detection (center of interest, attention to the altered aspects of images before and after the change occurs, and effortful encoding of the change), the authors hypothesized that change detection is a function of the physical attributes of the target scenes (such as unusual or varying colors) and individual characteristics of the observer, rather than the mental
representations of the scenes (i.e., the information stored between views). Thus, individual characteristics of the person may play a role in determining the meaning of, interest in, and attention paid to a visual scene. Similarly, veterinary students were more likely to detect the changes in radiograph images (Beck, Martin, Smitherman, & Gaschen, 2013), and expert chess players much more likely to detect change with chess-related stimuli than those who were novices in these areas, suggesting a perceptual advantage related to experience (Reingold, Charness, Pomplun, & Stampe, 2001). Expertise in a given domain may increase observer sensitivity; thus, perhaps mechanisms of attention and visual memory can be enhanced by knowledge, experience, and expectations. Expertise changes the way observers view and encode material that is relevant to the task (Werner & Thies).

Although expertise may reduce attentional errors, it does not necessarily protect against them completely. Drew, Võ, and Wolfe (2013) evaluated inattentional blindness with highly experienced radiologists. Twenty-four radiologists were given 3 minutes to evaluate 5 chest CT scans, searching for nodules (eye positions were also tracked). In the last case presented, a gorilla 48 times the size of an average nodule was inserted. Of those tested, 83% failed to notice the gorilla although eye tracking confirmed that the majority who missed this did look directly at its position. Gasper et al. (2013) found that general performance in a change blindness task improved in both time and accuracy with training. However, when performing different yet structurally similar tasks, those improved outcomes resulting from training did not transfer. Additionally, although Beck et al. (2013) found that veterinary students demonstrated better performance on domain specific effects, accumulated experience was not related to performance. This finding
suggested that plateaus are reached after several years and that ongoing experience may not necessarily lead to continued improvement in general.

Detection of Change and Eyewitness Identifications

The processes involved in eyewitness memory, identification, and testimony have been explored in various research paradigms. However, the topics of identity detection and eyewitness decisions have received minimal acknowledgement in the change blindness literature and few researchers have attempted to combine these areas of study. Recognizing the potential for a forensic psychological application, Davies and Hine (2007) attempted to bridge the gap between eyewitness testimony and identity detection in a change blindness study using a mock burglary in which the perpetrator’s identity changed halfway through the film. In a community sample of 80 participants, only 39% noticed the change in identity, which is comparable to the results of other studies in the change blindness literature. When asked to identify the robber, there was a trend to identify Robber 1 more than Robber 2, although this did not reach significance. This could suggest a primacy effect or even a single “gist” of memory that placed the physical characteristics of Robber 1 as more memorable than Robber 2. There was also evidence for the “mixing” of physical attributes between the two burglars, which may suggest a blending of memories (as described by Loftus, 1977).

Nelson et al. (2011) expanded on the Davies and Hine study by examining whether severity of the crime would influence change detection. In a 2 (crime seriousness) X 2 (change vs. no change) design, participants were asked to view one of four videos: a video depicting a theft of $5, a video depicting a theft of $500, or the same two videos where the assailant is switched with another actor. Although the researchers
did find that participants were more likely to correctly identify the perpetrator for the more severe crime (the theft of $500), it did not influence change detection, with only 5% of participants noticing the switch of actors. Additionally, in the actor change condition, participants were as likely to pick actor B (the actor who did not steal the money) as actor A (the actual offender), and more likely to pick actor B than any other foil from the lineup. The results of this and the Davies and Hine’s (2007) research not only demonstrate how fallible eyewitness accounts can be, they also indicate the importance of further investigations into eyewitness reporting and the change blindness phenomenon.

**Trained vs. Lay Samples**

The issues of observation skill levels and identity detection are of mutual relevance, yet little research has been conducted on those who are professionals in criminal detection. Visual observation depends on attention, which is selective and tends to focus on novel features. As addressed in this report, those novel experiences may go undetected due to multiple reasons. There are several factors that may inhibit observation from the law enforcement agent or the eyewitness of a crime. Hindrances to accurate encoding and/or later retrieval can include such factors as: the brevity of an event can limit the attention it can receive (Menon, Hope, & Bull, 2003); memory gaps can be filled by additional information such as imagination, suggestion, or information gained later (Loftus, 2004); multiple targets (e.g., several culprits robbing a store) can confuse witnesses’ memory (Wells & Pozzulo, 2006); and violence or the threat of violence can cause stress and confusion in witnesses, thus reducing observation accuracy (Leinfelt, 2004).
The primary focus of this investigation was to test law enforcement agents’ observation of details relevant to face identification, and to compare their performance on a change blindness task with that of a civilian college student sample. The conceptual convergence between the detection of identity change and the accuracy of eyewitness identification (Davies & Hine, 2007; Nelson et al., 2011) is clear, as is the evidence that change blindness can affect eyewitness identification. Prior to the current study, however, this phenomenon had only been studied utilizing the lay population. One logical next step would be to examine if this can transcend to an existing population that fundamentally deals daily with witnessing crime and is required to examine, enforce, and then testify to correct visual occurrences. Because initial training in observational techniques is extensive and continued training in the law enforcement profession is required, one may be tempted to assume that skill level in detailed observation and facial recognition would be enhanced. That is, as Werner and Thies (2000) described, perhaps officers become experts in the way they view and encode material that is relevant to the task. However, no reliable literature can be found to date that examines this particular question with this population; thus, a clear, directional hypothesis cannot be formed. Rather, the current study focused on a fundamental research question: whether law enforcement officers differ from a civilian population in a change blindness task involving their professional domain.
CHAPTER TWO

METHOD

Participants

Two samples participated in this research. Forty-three psychology undergraduates from a private Midwestern university participated for extra course credit. Three students were removed from the dataset because they failed to respond to critical change-detection items. The final student sample \((n = 40)\) was mostly female (67.5%), ranged from 19 to 22 years of age \((M = 20.8, SD = .71)\), and self-reported as White (90%), Black (2.5%), or Asian (5%), or did not specify a race (2.5%).

Sixty-nine law enforcement agents from various city, county, and state agencies were recruited during a two-day criminal interdiction seminar that they were attending as part of their training. Seven participants were removed from the dataset because they failed to respond to critical change-detection items. One participant was removed because he knew the actors who appeared in the stimulus video. The final law enforcement sample \((n = 61)\) was mostly male (96.7%), ranged from 23 to 54 years of age \((M = 34.1, SD = 6.92)\), and indicated law enforcement experience ranging from 1 to 32 years \((M = 8.7, SD = 7.48)\). Most self-reported as White (98.4%), with the remainder declining to specify a race. Though participants reported earning a wide range of titles, the most commonly reported titles were Deputy (26.2%), Patrolman (19.7%), and Officer (16.4%).
Materials and Procedure

Student and law enforcement samples participated in separate group-testing sessions that followed the same procedure. After granting informed consent, participants in both groups were informed that they would watch a video and would be asked a series of questions regarding what they saw in the video. Participants then watched a brief (2 min, 44 s) video clip of a staged traffic stop filmed by a dashboard camera located in the officer’s vehicle. In the video, a Sheriff’s Deputy stops a car for speeding on a residential street. The driver (Driver 1) is ordered out of his vehicle and asked a series of routine questions, including the request for identification. Approximately halfway through the video the driver and deputy step out of camera range and Driver 1 is replaced by another person (Driver 2). The second actor is given both a verbal warning and a written warning, and then returns to his parked vehicle.

The two actors are noticeably different in appearance. Driver 1 is 18 years old, 6 feet 2 inches tall, and weighs 125 lbs. He has shoulder length, light brown curly hair, an elongated face, and a goatee. He is wearing blue jeans, a black cap (with hair visibly protruding from the bottom), a black jacket, and a light blue shirt. Driver 2 is 20 years old, 5 feet 9 inches tall, and weighs 135 lbs. He has a round face and no facial hair. He is wearing blue jeans, a black cap (he has a crew cut, with no hair visible), a black jacket, and a green shirt.

After viewing the film, all participants were asked to respond to a questionnaire packet (see Appendix A). First, participants responded to a series of open-ended items assessing their change detection. These questions asked participants to describe the traffic stop and other details about the video, as well as to provide a description of the
people in the video. They also asked participants to describe anything unusual they noticed about the vehicle, the driver, and the video overall. Participants also answered 10 multiple-choice items about the contents of the video (see Table 1). The subsequent pages contained questions regarding the four 6-person lineups, from which participants were instructed to “identify anyone [they] saw in the video.” They were permitted to identify as many lineup members as they wished. Each simultaneous lineup (Lindsay & Wells, 1985) was shown on projection screens, one at a time, with two rows of three color photographs depicting a frontal view of the individuals’ head and shoulders (see Appendix B). The first and fourth lineups were target-absent (i.e., they did not contain a person seen in the video); the second lineup contained Driver 2, and the third lineup contained Driver 1. For each lineup, participants indicated their degree of confidence in their identification decision on a 7-point scale (1 = not at all confident, 7 = completely confident). Lineups were presented in the same order for all participants, and participants completed them at their own pace. Lastly, they completed a brief demographic questionnaire. Participants were then thanked and debriefed.
CHAPTER THREE

RESULTS

Change Detection

Two independent coders examined participants’ responses to the open-ended items to determine whether participants detected the change in the driver’s identity, clothing, both, or neither. Agreement between the coders was 100%. These data are presented in Table 1. Law enforcement officers (49.2%) and students (62.5%) did not differ in their rates of detecting a change in the video (i.e., either the person change or the clothing change), \( \chi^2 (1, N = 101) = 1.728, p = .189, \phi = .13, 95\% \text{ CI } [-.06, .29] \). I then compared student and law enforcement samples for each level of change detection: person detection, clothing detection, and both. Law enforcement officers and students did not differ in their rates of person change detection, \( \chi^2 (1, N = 101) = .063, p = .802, \phi = .03, 95\% \text{ CI } [-.14, .19] \). However, students were significantly more likely than law enforcement officers to detect the change of clothing, \( \chi^2 (1, N = 101) = 22.243, p < .001, \phi = .47, 95\% \text{ CI } [.33, .59] \) and more likely to detect both the driver change and the clothing change, \( \chi^2 (1, N = 101) = 11.785, p = .001, \phi = .34, 95\% \text{ CI } [.19, .48] \).

---

1 Any indication that participants had suspected a change was coded as change detection (e.g., person: “may have been a different person”; clothing: “shirt looked different at end of video”).
Table 1

*Change Detection Rates for Students and Officers*

<table>
<thead>
<tr>
<th>Change detection</th>
<th>Students</th>
<th>Officers</th>
</tr>
</thead>
<tbody>
<tr>
<td>No change detected</td>
<td>37.5%</td>
<td>50.8%</td>
</tr>
<tr>
<td>Person change detected</td>
<td>45%</td>
<td>47.5%</td>
</tr>
<tr>
<td>Clothing change detected*</td>
<td>40%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Both changes detected*</td>
<td>22.5%</td>
<td>1.6%</td>
</tr>
</tbody>
</table>

*Note. Participants in Both changes detected category are also represented in Person and Clothing change detected categories.*

* Change detection rates differ significantly, $p < .05$
A comparison between student and law enforcement samples on their general observational skills regarding the video (see Table 2) was also performed by calculating the total number of multiple choice items each participant answered correctly. A 2 (Sample: Student vs. Law Enforcement) × 2 (Change Detection: Any vs. None) analysis of variance (ANOVA) revealed that students and law enforcement officers did not differ in the average number of correct observations, $F(1, 97) = 1.034, p = .312, \eta^2_p = .011, 95\% \text{ CI} [.00, .08]$ (students: $M = 6.65, SD = 146$; officers: $M = 6.89, SD = 1.32$). Neither the main effect of Change Detection, nor the interaction term was significant, $Fs < 2.44, ps > .05$. 
Table 2

Percent of Students and Officers Who Responded Correctly to Multiple-Choice Items

<table>
<thead>
<tr>
<th>Item</th>
<th>Students</th>
<th>Officers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What was the color of the uniform the officer was wearing?</td>
<td>62.5%</td>
<td>37.7%</td>
</tr>
<tr>
<td>2. The officer stopped the vehicle for which of the following reasons?</td>
<td>100%</td>
<td>98.4%</td>
</tr>
<tr>
<td>3. What was the color of the jacket the driver was wearing?</td>
<td>42.5%</td>
<td>52.5%</td>
</tr>
<tr>
<td>4. What was the color of the hat the driver was wearing?</td>
<td>45%</td>
<td>60.7%</td>
</tr>
<tr>
<td>5. What was the color of the pants the driver was wearing?</td>
<td>87.5%</td>
<td>93.4%</td>
</tr>
<tr>
<td>6. What was the color of the vehicle that was stopped by the officer?</td>
<td>95%</td>
<td>93.4%</td>
</tr>
<tr>
<td>7. What type of vehicle was stopped by the officer?</td>
<td>55%</td>
<td>90.2%</td>
</tr>
<tr>
<td>8. Besides the police cruiser and the vehicle that was stopped by the officer, how many other parked vehicles can be seen in the video?</td>
<td>37.5%</td>
<td>39.3%</td>
</tr>
<tr>
<td>9. In the background of the video, there was a …</td>
<td>70%</td>
<td>54.1%</td>
</tr>
<tr>
<td>10. The officer handed the driver a …</td>
<td>70%</td>
<td>67.2%</td>
</tr>
</tbody>
</table>

Average Correct 66.5% 68.9%
Lineup Identification Accuracy

I compared students and law enforcement officers on identification accuracy for each of the four lineups. These data are presented in Table 3. Students were significantly more likely than law enforcement officers to correctly reject lineup 1, $\chi^2 (1, N = 101) = 6.888, p = .009, \phi = .26, 95\% \text{ CI } [.10, .41]$, but not lineup 4, $\chi^2 (1, N = 101) = 1.127, p = .288, \phi = .11, 95\% \text{ CI } [-.06, .27]$. Law enforcement officers and students did not differ in their correct identification rates for either lineup 2 (which contained Driver 2), $\chi^2 (1, N = 101) = .107, p = .744, \phi = .03, 95\% \text{ CI } [-.14, .19]$, or lineup 3 (which contained Driver 1), $\chi^2 (1, N = 101) = 1.191, p = .275, \phi = .11, 95\% \text{ CI } [-.06, .27]$. 
### Table 3

*Lineup Performance and Confidence-Accuracy Correlations for Students and Officers*

<table>
<thead>
<tr>
<th>Lineup outcome</th>
<th>Students</th>
<th>Officers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lineup 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Correct rejections</td>
<td>50.0&lt;sub&gt;a&lt;/sub&gt;</td>
<td>24.6&lt;sub&gt;b&lt;/sub&gt;</td>
</tr>
<tr>
<td>Confidence-accuracy correlation</td>
<td>.374&lt;sub&gt;a&lt;/sub&gt;*</td>
<td>.045&lt;sub&gt;a&lt;/sub&gt;</td>
</tr>
<tr>
<td>Lineup 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Suspect IDs</td>
<td>27.5&lt;sub&gt;a&lt;/sub&gt;</td>
<td>24.6&lt;sub&gt;a&lt;/sub&gt;</td>
</tr>
<tr>
<td>Confidence-accuracy correlation</td>
<td>-.059&lt;sub&gt;a&lt;/sub&gt;</td>
<td>.072&lt;sub&gt;a&lt;/sub&gt;</td>
</tr>
<tr>
<td>Lineup 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Suspect IDs</td>
<td>40.0&lt;sub&gt;a&lt;/sub&gt;</td>
<td>29.5&lt;sub&gt;a&lt;/sub&gt;</td>
</tr>
<tr>
<td>Confidence-accuracy correlation</td>
<td>-.148&lt;sub&gt;a&lt;/sub&gt;</td>
<td>-.337&lt;sub&gt;a&lt;/sub&gt;*</td>
</tr>
<tr>
<td>Lineup 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Correct rejections</td>
<td>72.5&lt;sub&gt;a&lt;/sub&gt;</td>
<td>62.3&lt;sub&gt;a&lt;/sub&gt;</td>
</tr>
<tr>
<td>Confidence-accuracy correlation</td>
<td>.443&lt;sub&gt;a&lt;/sub&gt;*</td>
<td>.059&lt;sub&gt;b&lt;/sub&gt;</td>
</tr>
</tbody>
</table>

*Note. Confidence-accuracy correlations were computed using Pearson’s r. Asterisks indicate the correlation is significantly different from zero. Differing subscripts for a given row indicate that students’ and officers’ performance differed significantly, p < .05.*
I then compared students and law enforcement officers on their overall identification decisions across all four lineups. Specifically, I computed the total number of accurate identifications and filler identifications for each participant. These data are displayed in Table 4. Unsurprisingly, a 2 (Sample: Student vs. Law Enforcement) × 2 (Person Change Detection: Yes vs. No) ANOVA on accurate identifications revealed that, on average, participants who detected the person change ($M = .81, SD = .61$) made more accurate identifications than those who did not detect the person change ($M = .41, SD = .57$), $F (1, 97) = 12.155, p = .001, \eta^2_p = .11, 95\% \text{ CI} [.02, .23]$. However, students ($M = .68, SD = .69$) and law enforcement officers ($M = .54, SD = .57$) did not differ in the average number of suspects they correctly identified, $F (1, 97) = 1.552, p = .216, \eta^2_p = .016, 95\% \text{ CI} [.00, .09]$, and the interaction was not significant, $F (1, 97) = .342, p = .560, \eta^2_p = .004, 95\% \text{ CI} [.00, .06]$. An additional 2 × 2 ANOVA on the total number of fillers identified revealed no significant differences, $Fs (1, 97) < 3.00, ps > .05$: Students and officers identified fillers at comparable rates.
<table>
<thead>
<tr>
<th>Sample</th>
<th>Suspect IDs</th>
<th>Filler IDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person change detected</td>
<td>.94 (.64)</td>
<td>1.56 (1.29)</td>
</tr>
<tr>
<td>Person change not detected</td>
<td>.45 (.67)</td>
<td>1.00 (1.20)</td>
</tr>
<tr>
<td>Law enforcement officers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person change detected</td>
<td>.72 (.59)</td>
<td>1.69 (1.11)</td>
</tr>
<tr>
<td>Person change not detected</td>
<td>.38 (.49)</td>
<td>1.41 (1.19)</td>
</tr>
</tbody>
</table>

*Note.* Identification rates reflect the average number of identifications made per participant, across all four lineups.
Confidence-Accuracy Correlations

I computed point-biserial confidence-accuracy correlations for student and law enforcement samples for each of the four lineups and then compared these correlations using Fisher’s r-to-z transformation to examine whether confidence was more predictive of accuracy for one of the samples. These confidence-accuracy correlations are displayed in Table 3. For target-absent lineups (i.e., lineups 1 and 4), confidence was significantly and positively correlated with accuracy for students, but not for law enforcement officers. The difference between the two samples’ confidence-accuracy correlations was significant for lineup 4, $Z = 1.98, p = .048$, but fell short of significance for lineup 1, $Z = 1.65, p = .099$. For lineup 2 (which contained Driver 2), confidence-accuracy correlations for both samples were comparably weak, $Z = -.062, p = .535$. For lineup 3 (which contained Driver 1), confidence was significantly inversely related to accuracy for law enforcement officers, and not significantly correlated for students. These confidence-accuracy correlations, however, were not significantly different from each other, $Z = .96, p = .337$.

Law Enforcement Experience

Lastly, I examined the degree to which law enforcement experience might predict officers’ performance on these tasks. Specifically, I was interested to see if officers’ self-reported years of experience correlated with the number of correct responses to the multiple choice questionnaire, change detection accuracy, identification accuracy, and/or filler identifications. These data are displayed in Table 5. Although a small number of unsurprising correlations attained statistical significance, law enforcement experience was not significantly correlated with any measure of task performance.
Table 5

*Correlations Among Law Enforcement Experience and Performance Variables*

<table>
<thead>
<tr>
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<th>8</th>
<th>9</th>
<th>10</th>
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</thead>
<tbody>
<tr>
<td>1. Years in Law Enforcement</td>
<td></td>
<td></td>
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<tr>
<td>2. Total Multiple-Choice Questions Correct</td>
<td>- .196</td>
<td></td>
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<tr>
<td>3. Person Detected</td>
<td>- .272</td>
<td>.209</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td>4. Clothes Detected</td>
<td>- .030</td>
<td>.089</td>
<td>.009</td>
<td></td>
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<tr>
<td>5. Person &amp; Clothes Detected</td>
<td>- .082</td>
<td>.209</td>
<td>.136</td>
<td>.701*</td>
<td></td>
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<tr>
<td>6. Lineup 1 Correct Rejection</td>
<td>.012</td>
<td>.079</td>
<td>.142</td>
<td>.109</td>
<td>- .074</td>
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<tr>
<td>7. Lineup 2 Suspect Identification</td>
<td>- .203</td>
<td>.371</td>
<td>.447*</td>
<td>.109</td>
<td>.226</td>
<td>.204</td>
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<tr>
<td>8. Lineup 3 Suspect Identification</td>
<td>- .250</td>
<td>.249</td>
<td>- .040</td>
<td>.083</td>
<td>.200</td>
<td>- .203</td>
<td>- .203</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Total Number of Filler Identifications</td>
<td>- .111</td>
<td>.031</td>
<td>.124</td>
<td>- .007</td>
<td>.052</td>
<td>- .472*</td>
<td>.197</td>
<td>.040</td>
<td>- .581*</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Change detection variables and lineup outcome variables coded as 0 = no, 1 = yes. Correlations marked with an asterisk are significant using Holm’s sequential Bonferroni procedure to control for Type I error inflation.
CHAPTER FOUR

DISCUSSION

Despite the faith that the legal system, lay people, and law enforcement itself place in officers’ observational skills, relatively little research has directly compared law enforcement to lay samples on police-relevant tasks, and none has specifically compared these samples with respect to attentional errors. The current data address this issue, and suggest that law enforcement officers may not actually possess change detection and facial identification skills superior to the general population. Several of these findings warrant discussion.

First, the change detection rates obtained in the present study are consistent with those found in similar examinations of change blindness (e.g., Simons & Levin, 1998), suggesting that the difficulty of this stimulus video is on par with others used in the field. Second, law enforcement officers were not better at change detection than students. In fact, officers were less likely than students to notice the change in the drivers’ clothing, and were less likely to notice both changes in clothing and identity. Additionally, law enforcement officers and students scored equally on the multiple choice observational test. These findings are consistent with those from examinations of expertise on attentional errors in other domains (e.g., Gaspar et al., 2013; Jaeggi, Buschkuehl, Jonides, & Perrig 2008). Although the observational training officers receive may be effective in reducing attentional errors for that particular task (an issue that deserves research
attention), officers are tasked with being attentive to large amounts of information in myriad, complex social contexts. The demands of the job may not be amenable to the transfer of observational skills beyond the specific situations in which officers receive training.

Third, law enforcement officers were less accurate on the identification task than students. They were not more likely than students to correctly identify the actors in the film, and were actually more likely than students to incorrectly identify innocent individuals from target-absent lineups. These findings are consistent with the eyewitness literature, which has shown that law enforcement officers do not necessarily surpass the lay population in eyewitness identification accuracy (Christianson, Karlsson, & Persson, 1998; Stanny & Johnson, 2000). Additionally, whereas among students confidence was positively associated with accuracy under some circumstances (i.e., target-absent lineups), among law enforcement officers, confidence was not positively associated with accuracy and, for one lineup, was actually significantly inversely related to accuracy. These results fit with those obtained in investigations of the influence of training on other law enforcement-relevant judgments. For example, training in common deception detection techniques (e.g., the Behavior Analysis Interview of the Reid Technique of interviewing and interrogations: John E. Reid and Associates, 1991) has been shown to increase evaluators’ confidence in their deception detection judgments, but also lower their actual accuracy, relative to untrained control groups (Kassin & Fong, 1999). Thus, law enforcement training in any domain may be counterproductive insofar as it teaches decision strategies that are not diagnostic of accuracy (e.g., feature-based facial processing: Woodhead, Baddeley, & Simmonds, 1979).
Qualitative examinations of participants’ open-ended responses to the questionnaire suggest that differences in allocations of cognitive resources, or “scene assessment,” may also account for law enforcement officers’ relatively poor performance in this study. In response to the question “Did you see anything unusual about the video overall?” several officers noted something about the driver’s behavior, such as “driver appeared to be nervous and looked like he was getting ready to run,” and “appeared to be in flight or fight mode, looking for an exit.” It is possible (even likely: Kassin et al., 2007) that law enforcement training might predispose officers toward noting and assessing nervous behaviors among target individuals, particularly as they may be related to officer safety. Perhaps law enforcement officers in the present study focused their attention on the generally anxious behavior of the driver, resulting in fewer cognitive resources available to encode other task-relevant details of the scene (e.g., the driver’s face). Regardless, officers are often called to testify about the identities of individuals they encounter; the (appropriate) diversion of cognitive resources toward the broader monitoring of a situation may come at the price of reduced resolution of memory for details and facial identification accuracy. Additional research is necessary to investigate these possibilities.

Limitations

These change detection comparisons between the police and student samples must be interpreted with caution. Although first attempts were made to evaluate differences in change detection and facial recognition between such groups (i.e. those actively involved in a profession requiring those skills, and those who are not), the dissimilarities between the two populations must be addressed.
Age and gender have been linked to facial recognition and perceptual abilities, and may have played a role in the current findings. Some studies have shown an inverse relationship between age and facial identification (Searcy, Bartlett, & Memon, 1999), and Rhodes and Anastasi (2012) found superiority in memory for faces in one’s age cohort, suggesting an own-age bias. The two groups utilized in the current design showed dissimilar variance in age, with a wider range of ages in the police sample than in the student sample, and the age cohort for the student sample more closely matched the actor’s ages than did the police participants. Additionally, some research has shown superiority in females for facial identification abilities (e.g. Hofmann, Suvak, & Litz, 2006). Given that law enforcement is an occupation dominated primarily by males, the female population in that group was extremely limited compared to that of the student group, in which females dramatically outnumbered males.

A possible explanation for years of service being uncorrelated with correct identifications is the aspect of rank. Typically, as one gains more years of experience in this field, opportunities for promotion become more prevalent. The higher the rank the more administrative the position becomes: thus, routine traffic stops and unpredictable and dangerous duties (Chopko, Palmieri, & Facemire, 2013) become sparse or even absent once an officer obtains an administrative position. Such a position would decrease the daily need for witness identification. Because the law enforcement officers who participated came from a variety of departments whose ranks and responsibilities varied, it was not possible to analyze rank as a factor. Future research should address whether the law enforcement agent identifies his/her position as either more administrative or applied field work, which may be revealing.
Conclusion

The results of the present study fit with those of previous investigations of change blindness and eyewitness identification (Davies & Hine, 2007; Nelson et al., 2011). Further, they indicate that, despite their training, law enforcement officers may still commit attentional errors, perhaps even as frequently as the lay population. These issues are of practical concern to law enforcement officers and the broader legal system, and continued research regarding officers’ observation abilities and the efficacy of observation training is sorely needed.
REFERENCES


APPENDIX A

QUESIONNAIRE: POLICE SAMPLE

Please respond to the following items. You are under no obligation to answer any question that you find objectionable. However, we would appreciate your answering as many questions as possible. All responses will be kept confidential.

Please describe the traffic stop and any other details you recall about the video.

Please provide a brief physical description of the driver.

Did you notice anything unusual about the vehicle? If so, please describe.

Did you notice anything unusual about the driver during the video? If so, please describe.

Did you notice anything unusual about the video overall? If so, please describe.
1. What was the color of the uniform the officer was wearing?

- Black
- Blue
- Brown
- White

2. The officer stopped the vehicle for which of the following?

- Busted taillight
- No license plate
- Speeding
- Expired tags

3. What was the color of the jacket the driver was wearing?

- White
- Blue
- Grey
- Black

4. What was the color of the hat the driver was wearing?

- White
- Blue
- Grey
- Black

5. What was the color of the pants the driver was wearing?

- White
- Blue
- Grey
- Black

6. What was the color of the vehicle that was stopped by the officer?

- White
- Blue
- Grey
- Black
7. What type of vehicle was stopped by the officer?

- Toyota Camry
- Pontiac Grand Am
- Dodge Intrepid
- Ford Mustang

8. Besides the police cruiser and the vehicle that was stopped by the officer, how many other parked vehicles can be seen in the video?

- 0
- 1
- 2
- 3

9. In the background of the video, there is a ____________.

- Barn
- Building
- Playground
- Gas Station

10. The officer handed the driver a ____________?

- Ticket
- Warning
- Summons
- Nothing—the officer did not hand anything to the driver
You will now be presented with a series of photo lineups on the screen. Please circle “YES” or “NO” for each photo, indicating who, if anyone, from each lineup that you saw in the video. Circling “YES” indicates you saw the person in the video; circling “NO” indicates you did not see the person in the video.

**Lineup #1:**

- Photo 1: YES  NO
- Photo 2: YES  NO
- Photo 3: YES  NO
- Photo 4: YES  NO
- Photo 5: YES  NO
- Photo 6: YES  NO

Please indicate how confident you are in your performance on this identification task regarding Lineup #1 using the following 7-point scale.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at All</td>
<td>Completely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Confident</td>
<td>Confident</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
Lineup #2:

Photo 1: YES NO
Photo 2: YES NO
Photo 3: YES NO
Photo 4: YES NO
Photo 5: YES NO
Photo 6: YES NO

Please indicate how confident you are in your performance on this identification task regarding Lineup #2 using the following 7-point scale.

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<tr>
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<th>4</th>
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<th>6</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Not at All</td>
<td>Completely</td>
<td></td>
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<tr>
<td>All Confident</td>
<td>Confident</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Lineup #3:

Photo 1: YES NO
Photo 2: YES NO
Photo 3: YES NO
Photo 4: YES NO
Photo 5: YES NO
Photo 6: YES NO

Please indicate how confident you are in your performance on this identification task regarding Lineup #3 using the following 7-point scale.

1 2 3 4 5 6 7
Not at All Completely
All Confident Confident
Lineup #4:

Photo 1: YES NO
Photo 2: YES NO
Photo 3: YES NO
Photo 4: YES NO
Photo 5: YES NO
Photo 6: YES NO

Please indicate how confident you are in your performance on this identification task regarding Lineup #4 using the following 7-point scale.

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<tr>
<th>1</th>
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<tr>
<td>Not at All</td>
<td>Completely</td>
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<tr>
<td>All Confident</td>
<td>Confident</td>
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</table>
Please help us understand our participants better by responding to the following items. You are under no obligation to answer any question that you find objectionable. However, we would appreciate your answering as many questions as possible. All responses will be kept confidential.

1. What is your current age? __________

2. Date of Birth: _________________

3. What is your sex?
   □ male
   □ female

4. How long have you been in law enforcement?
   ____________ years

5. What is your current rank/title/position?
   _______________________________________

6. What is your marital status?
   □ Single  □ Separated  □ Widowed  □ Married  □ Divorced

7. With which ethnic/racial group do you most identify? (please check one)
   □ Asian/Asian-American/Pacific Islander
   □ Black/African/African-American
   □ Hispanic or Latino/a
   □ Native American
   □ White/Caucasian
   □ Other
QUESTIONNAIRE: STUDENT SAMPLE

Please respond to the following items. You are under no obligation to answer any question that you find objectionable. However, we would appreciate your answering as many questions as possible. All responses will be kept confidential.

Please describe the traffic stop and any other details you recall about the video.

Please provide a brief physical description of the driver.

Did you notice anything unusual about the vehicle? If so, please describe.

Did you notice anything unusual about the driver during the video? If so, please describe.

Did you notice anything unusual about the video overall? If so, please describe.
1. What was the color of the pants the driver was wearing?
   □ White
   □ Blue
   □ Grey
   □ Black

2. What was the color of the vehicle that was stopped by the officer?
   □ White
   □ Blue
   □ Grey
   □ Black

3. What type of vehicle was stopped by the officer?
   □ Toyota Camry
   □ Pontiac Grand Am
   □ Dodge Intrepid
   □ Ford Mustang

4. Besides the police cruiser and the vehicle that was stopped by the officer, how many other parked vehicles can be seen in the video?
   □ 0
   □ 1
   □ 2
   □ 3

5. In the background of the video, there is a___________.
   □ Barn
   □ Building
   □ Playground
   □ Gas Station

6. The officer handed the driver a______________?
   □ Ticket
   □ Warning
   □ Summons
   □ Nothing—the officer did not hand anything to the driver
7. What type of vehicle was stopped by the officer?

- Toyota Camry
- Pontiac Grand Am
- Dodge Intrepid
- Ford Mustang

8. Besides the police cruiser and the vehicle that was stopped by the officer, how many other parked vehicles can be seen in the video?

- 0
- 1
- 2
- 3

9. In the background of the video, there is a ____________.

- Barn
- Building
- Playground
- Gas Station

10. The officer handed the driver a ____________?

- Ticket
- Warning
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- Nothing—the officer did not hand anything to the driver
You will now be presented with a series of photo lineups on the screen. Please circle “YES” or “NO” for each photo, indicating who, if anyone, from each lineup that you saw in the video. Circling “YES” indicates you saw the person in the video; circling “NO” indicates you did not see the person in the video.

**Lineup #1:**

- Photo 1: YES NO
- Photo 2: YES NO
- Photo 3: YES NO
- Photo 4: YES NO
- Photo 5: YES NO
- Photo 6: YES NO

Please indicate how confident you are that your identifications are correct by circling the corresponding number on a 7-point scale ranging from *not at all confident* to *completely confident*.

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Lineup #2:

<table>
<thead>
<tr>
<th>Photo</th>
<th>YES</th>
<th>NO</th>
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<tbody>
<tr>
<td>Photo 1:</td>
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<td>Photo 2:</td>
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<td>Photo 3:</td>
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<td>Photo 4:</td>
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<tr>
<td>Photo 5:</td>
<td>YES</td>
<td>NO</td>
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<tr>
<td>Photo 6:</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>

Please indicate how confident you are that your identifications are correct by circling the corresponding number on a 7-point scale ranging from *not at all confident* to *completely confident*.

1  2  3  4  5  6  7

Not at  Completely
All Confident  Confident
Lineup #3:

<table>
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<tr>
<th>Photo</th>
<th>YES</th>
<th>NO</th>
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Please indicate how confident you are that your identifications are correct by circling the corresponding number on a 7-point scale ranging from *not at all confident* to *completely confident*.

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</table>

*Not at All Confident*  
*Completely Confident*
Lineup #4:

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<th>Photo</th>
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<th>NO</th>
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</table>

Please indicate how confident you are that your identifications are correct by circling the corresponding number on a 7-point scale ranging from *not at all confident* to *completely confident*.

<table>
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<td>Confident</td>
<td>Completely</td>
<td>Confident</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Please help us understand our participants better by responding to the following items. You are under no obligation to answer any question that you find objectionable. However, we would appreciate your answering as many questions as possible. All responses will be kept confidential.

1. What is your current age?___________

2. Date of Birth:__________________

3. What is your sex?
   □ male
   □ female

4. What is your current year in school?
   □ First Year
   □ Sophomore
   □ Junior
   □ Senior
   □ Other (Please explain) _______________

5. What is your current approximate GPA? _____________

6. With which ethnic/racial group do you most identify yourself? (please check one)
   □ Asian/Asian-American/Pacific Islander
   □ Black/African/African-American
   □ Hispanic or Latino/a
   □ Native American
   □ White/Caucasian
   □ Other
APPENDIX B

SERIES OF PHOTO LINEUPS

Figure 1. Photo Lineup 1 (Target Absent)

Figure 2. Photo Lineup 2 (Target Present- Person 2, Second Driver)
Figure 3. Photo Lineup 3 (Target Present- Person 5, First Driver)

Figure 4. Photo Lineup 4 (Target Absent)