2018

An Examination of Inattentional Blindness in Law Enforcement

Gregory Lee
Minnesota State University, Mankato

An Examination of Inattentional Blindness in Law Enforcement

By

Gregory Lee

A Thesis Submitted in Partial Fulfillment of the

Requirements for Degree of

Masters of Arts

In

Clinical Psychology

Minnesota State University, Mankato

Mankato, Minnesota

July 2018

AN EXAMINATION OF INATTENTIONAL BLINDNESS IN LAW ENFORCEMENT

July 30, 2018

An Examination of Inattentional Blindness in Law Enforcement

Gregory Lee

This thesis has been examined and approved by the following members of the student's committee.

Dr. Daniel Houlihan, Advisor

Dr. Jeffrey Buchanan, Committee Member

Dr. John O'Neill, Committee Member

Table of Contents

Abstract

Inattentional blindness, or the inability to visually detect an unexpected stimulus while attending to a task or situation, can have detrimental effects on those who are subject to the phenomenon. This may be particularly true for law enforcement officers, who are often engaged in cognitively demanding tasks that draw their attention away from potentially deadly hazards. This study aimed to look at the effects of inattentional blindness within a group of officers of varying degrees of experience and expertise. The officers were presented with a video-based scenario in which an unexpected stimulus was placed. The control group was asked to attend to a general task, while the experimental group was asked to attend to a specific and more demanding task. Within the context of an active shooter situation, the officers' ability to detect a large black suitcase in a hallway during the video was assessed. Overall rates of unexpected stimuli detection was consistent with existing literature, however detection of the scene-relevant stimulus was lower than expected.

Keywords: inattentional blindness, memory, law enforcement, police, active shooter

Introduction

Depending on where we focus our attention during a situation, we may be more apt to notice or miss particular elements of that scene. For instance, focusing on how many passes white-jerseyed players make in a basketball game results in many individuals failing to notice a gorilla walking amongst the players (Simons & Chabris, 1999). Likewise, students engaging in a cell phone conversation seemed to miss money hanging from a tree, even when they had to actively avoid running right into it (Hyman et al., 2014). What would cause a person to miss things that seem so obvious? An explanation may be found in the phenomenon known as "inattentional blindness."

Inattentional Blindness

Inattentional blindness is best described as the failure to detect an unexpected visual stimulus that may be relevant or irrelevant to the task or situation being attended to (Mack & Rock, 1998). This "blindness" can be explained by the *load theory of attention* (Lavie et al., 2004), which suggests that focusing on certain tasks is subject to an individual's ability to devote attentional resources. These attentional resources are finite and as an individual engages in more cognitively-demanding tasks, few attentional resources are left to process peripheral, usually irrelevant stimuli. Inattentional blindness is the result of an individual's inability to devote these attentional resources to other stimuli, resulting in the stimuli going unnoticed (Cartwright-Finch & Lavie, 2007).

As can be imagined, not all unnoticed stimuli are as irrelevant as a gorilla passing through a basketball game. Inattentional blindness in cognitively-demanding situations can result in serious consequences, such as surgeons not seeing misplaced surgical instruments (Hughes-Hallett et al., 2015), radiologists not noticing unusual spots in a lung cancer screening scan

(Drew et al., 2013), or security guards failing to see an unusual or suspicious individual on a security video feed (Nasholm et al., 2014). Inattentional blindness can result in distracted drivers not seeing a child about to enter traffic (Pammer et al., 2015), or an athlete not seeing an open teammate during a big game (Memmert & Furley, 2007).

Basic studies. Most studies of inattentional blindness have been relatively rudimentary, often involving participants focusing on a computer screen in which images or letters are flashed for fractions of a second (e.g., Most, 2013; Most et al., 2001; Richards et al., 2009). These studies, which test inattentional blindness in its most basic form, have found that inattentional blindness can be influenced by cognitive biases such as attentional sets and, perhaps more importantly, stimulus relevance (Eitam et al., 2013; Most, 2013).

Much like Simons and Chabris' (1999) study in which individuals focusing on white-jerseyed players were less likely to notice an all-black gorilla, Most (2013) found that when individuals focused on a group of letters, 66% of participants noticed an unexpected letter "E" enter and exit the screen. When individuals were instead focused on a set of numbers, only 39% noticed the letter "E" enter their field of view. As Most (2013) explains, this is due to individuals tuning their attention to the features of the category they were tasked to observe, in essence forming a set of relevant features to look out for.

This relevance not only pertains to the features of the stimuli, but to the task being given to the individual as well, as demonstrated by Eitam, Yeshurun, and Hassan (2013). The study found that when individuals were presented with two circles of differing colors and asked to only attend to one, they were less likely to correctly identify the color of the unattended (i.e., irrelevant) circle. Interestingly, Eitam et al. (2013) also found that the duration of stimulus presentation did not affect rates of noticing, which suggests that inattentional blindness is a result of irrelevance rather than the amount of time a stimulus is presented.

Eitam et al.'s (2013) demonstration of the effects of stimulus relevance is particularly important due to the fact that their study did not place a large cognitive load on the participants, thus showing that the non-detection of stimuli may have been a result of irrelevance alone as opposed to a lack of attentional resources. As shown by Most (2013), Eitam et al. (2013) and others (e.g., Most et al., 2001; Simons & Chabris, 1999), stimulus irrelevance due to differing stimulus features (i.e., attentional sets), the demand placed on the individual (e.g., "pay attention to this, not that"), or more often a combination of the two, can result in the missed detection of an irrelevant stimulus that is not necessarily as obvious as a gorilla walking through the scene. In other words, any unattended stimulus can be irrelevant depending on the context in which it is presented, even if it shares many of the same features as the attended stimuli.

Dynamic scenarios and experience. Since many early studies looked at inattentional blindness using simple detection tasks, there has recently been a steady increase in research utilizing more dynamic and complex visual scenarios similar to Simons and Chabris' (1999) well-known gorilla video. In addition, more studies have begun to look at the effects that experience and expertise may have on the detection of unexpected stimuli. It is logical to assume that individuals who have experience with particular scenarios and situations may be better able to detect unexpected stimuli due to their familiarity with the task or situation. Their familiarity with the task or scenario results in less attentional resources being used, resulting in more attentional resources available for other peripheral stimuli.

Nasholm, Rohlfing, and Sauer (2014) looked at whether having experience watching closed-circuit television (CCTV) footage led to better detection of suspicious individuals and unusual individuals (i.e., relevant and irrelevant stimuli, respectively). They used a dynamic visual scenario that involved footage of multiple people interacting in an alleyway, during which either a suspicious person or an unusual person (a pirate) entered and exited the scene. Despite having experience with monitoring CCTV footage, active-duty infantry personnel did no better at detecting the pirate in the scene than university students. What was predictive of detection, however, was the relevance of the unexpected stimuli (the suspicious person) to the task of monitoring for suspicious activity. Put simply, experience did not lead to better detection of the pirate because the pirate was irrelevant to the task at hand (detecting suspicious people).

Contrary to what Nasholm et al. (2014) found, Greig, Higham, and Nobre's (2014) study of inattentional blindness in medical professionals found that experience did in fact have some influence on rates of detection. Their study, involving individuals with a range of experience in resuscitation, found that those with more experience were more likely to notice situation-relevant changes (e.g., an oxygen tube disconnection) in a video of a staged resuscitation of a patient. While the results of the study support the idea that experts may be less susceptible to inattentional blindness, it is important to note that it is difficult to discern whether the rate of detection was truly influenced by the experience of the individual or whether detection was instead influenced by the relevance of the stimuli.

In an attempt to further understand the effects of experience on stimulus detection, Laio and Chiang (2016) looked at Taiwanese construction workers and their ability to detect safety hazards placed throughout a construction scene. The results of their study indicate that experience did impact rates of detection. Specifically, the authors found that workers with more safety training and work experience were more likely to notice subtle safety hazards throughout the scene. Due to the fact that all of the stimuli in the scene were construction related, the results seem to indicate that experience may very well have some influence on detection rates, at least for task-relevant stimuli.

Inattentional Deafness Studies

It is clear that the ability to detect unexpected visual stimuli is most likely affected by the experience of the individual as well as the task relevance of the stimuli in question. The same holds true for auditory stimuli. For example, Koreimann, Gula, and Vitouch (2014) demonstrated that individuals with musical expertise and those familiar with the composition *Thus Spoke Zarathustra* were more likely to notice an unexpected guitar solo inserted into the piece. In addition, much like inattentional blindness, inattentional deafness has also been exhibited in dynamic auditory and multimodal scenes, demonstrating that stimulus relevance plays an important role in the detection of unexpected, irrelevant stimuli.

A study by Dalton and Fraenkel (2012) involved a 3-dimensional auditory scene that consisted of conversations between two men and two women. Participants were asked to attend to one of these conversations, unaware that a man would enter the scene unexpectedly and walk around the scene stating, "I am a gorilla." 90% of participants who were asked to listen to the male conversation noticed the "gorilla," while only 30% of individuals noticed the man when listening to the conversation between women.

Wayand, Levin, and Varkin (2005) created a multimodal video scenario similar to Simons and Chabris' (1999) video of a group of people passing basketballs around. In this scenario however, rather than a gorilla entering the scene, a woman enters and scratches her nails on a chalkboard that is in the center of the room. Participants were tasked with counting basketball passes, and despite having both visual and auditory cues, nearly 60% of participants failed to both see and hear the woman.

Change Blindness

Similar to inattentional blindness and inattentional deafness, most individuals are also subject to a phenomenon known as “change blindness.” Much like inattentional blindness, change blindness is the inability to detect generally large, obvious changes in a scene (Rensink et al., 1997). This “blindness” is also a result of attentional focus, however the mechanisms behind it are different from inattentional blindness and deafness. Rather than suffering from a lack of attentional resources to devote to unexpected changes and stimuli, in change blindness the inability to detect changes is due to a failure to remember and compare information from one moment to the next (Simons & Rensink, 2005). Thus, unlike inattentional blindness, attention may be placed on an object and changes to the object may go unnoticed if the changes aren’t pertinent to the information needed at that moment.

Basic studies. Not unlike inattentional blindness, initial change blindness studies utilized relatively basic methods to assess the phenomenon. Early studies established the existence of change blindness by testing for participants’ ability to detect differences between certain dot patterns (French, 1953), letter patterns (Pashler, 1988), and pictures (Friedman, 1979; Gur & Hilgard, 1975). These studies typically presented two images separated by a blank screen distractor for fractions of a second, with participants asked to find subtle differences between the two images.

More recent studies have recreated these early findings, incorporating different methods to serve as the distractor that masks the change. These distractors range from using the participant’s own eye movements (Rensink, 1997) to mudsplashes that only cover a portion of the changing image (O’Regan, Rensink, & Clark, 1999).

Dynamic scenarios. Studies have even transitioned to examining change blindness in more dynamic scenarios such as movies (e.g., Levin & Simons, 1997). These studies, often mimicking the continuity errors seen in motion pictures, have changes that occur during a camera pan or cut. In Levin and Simons' (1997) study, a short video segment of a conversation between two people was created and shown to participants. During the video, objects placed in the scene (e.g., plates on a table) changed colors or disappeared entirely as the scene cut from one angle to another. Overall, nine changes occurred throughout the film, yet only one in ten participants noticed any of the changes.

Simons and Levin (1998) further pushed the bounds of dynamic scenarios by conducting a study in which changes occurred during real life personal interactions. Participants on a college campus were approached by an experimenter asking for directions. During their conversation, the two would be interrupted and separated by a group of people carrying a door, during which time the experimenter switched positions with one of the individuals carrying the door. Despite the differences in voice and appearance of the new person talking to the participant, two-thirds to half of participants failed to realize that they were talking to an entirely new person.

Effect of expertise. Like inattentional blindness and deafness, studies have also begun to assess the degree to which expertise factors into change blindness. Werner and Thies (2000) addressed this by comparing rates of change detection in a football scene between football experts and novices. The football experts, who had familiarity with and expectations of football scenes, were hypothesized to better detect changes in images of a football game than the novice group who had no experience playing or watching football. The researchers found that the experts noticed changes in the images faster than the novices, particularly when these changes held some semantic meaning (e.g., the addition or removal of a football). This suggests that the experts encoded and processed relevant visual stimuli more efficiently and effectively than the novices, allowing the experts to detect changes in 92% of trials compared to the novices' 82% detection rate.

Inattentional Blindness and Law Enforcement

Since experts may be susceptible to inattentional blindness, deafness, and possibly change blindness, it is important that more research be conducted with professionals in fields that involve high cognitive loads. One such profession is that of the law enforcement officer (LEO). LEOs are regularly subjected to situations involving high amounts of stress (Violanti et al., 2016) and attentional demand (Anderson et al., 2005) and are routinely depended upon to provide information and testimony from memory. With such demands continually placed on an officer, it is not illogical to assume that they may be susceptible to inattentional blindness and deafness. However, law enforcement officers are trained to perceive and react to situations in a particular way, sometimes relying upon hypervigilance and an expectation of danger. It is possible that LEO training may have an effect on inattentional blindness and deafness such that officers are less likely to miss unexpected stimuli, both relevant and irrelevant, in the situations they encounter.

With current events revolving around police action and use-of-force, understanding the potential for inattentional blindness and deafness, as well as change blindness, in LEOs may play a vital role in understanding how officers perceive situations with high cognitive load. In addition, the ability to detect unexpected stimuli has implications for both officer and civilian safety. If LEOs have a better understanding of how inattentional blindness and deafness may affect their performance in high-stress situations, they may be better able to design training to address anticipation of unexpected stimuli in general. This in turn translates into situations in which officers are less likely to be caught off guard, thus lowering the risk of harm to the officer and potential bystanders.

Simons and Schlosser (2017) attempted to look at rates of inattentional blindness in a law enforcement sample by having both police academy trainees and experienced police officers engage in a simulated traffic stop. The scenario involved either a cooperative or non-cooperative driver as well as a handgun serving as the unexpected stimulus placed on the passenger side dashboard. Simons and Schlosser found that 58% of police academy trainees and 33% of experienced officers failed to see the handgun regardless of how the driver had acted, supporting the notion that experts are subject to inattentional blindness of relevant unexpected stimuli in an interactive scenario. In addition, the experience level of the officer may have played a factor in rates of detection.

Understanding inattentional blindness and deafness in law enforcement officers also has implications in the courtroom, where questionable police actions in the eyes of the public may be explainable by the phenomena. While inattentional blindness and deafness should not serve as a catch-all for police behavior, it may certainly play a role in situations in which an important unexpected stimulus may have been missed by the officer. A prime example of this was demonstrated by Chabris et al. (2011) when they attempted to answer the question of how police officer Kenny Conley was able to run by a fellow officer being assaulted without actually witnessing the event. What was found was that only 35% of participants were able to notice a simulated three-person fight they had run by under low-light conditions similar to those experienced by Officer Conley. Detection rates of the fight increased to between 42% and 72% when participants passed the fight in broad daylight. Chabris et al.'s findings, while ultimately not influencing Officer Conley's conviction appeal, did shed some light on how an officer may have missed such a seemingly obvious event.

Despite the role that inattentional blindness and deafness may play in LEO behavior, little research currently exists that looks at its effects in this population. This current study aims to further research into this particular area by looking at whether LEOs are subject to inattentional blindness and if so, how much their training and experience may play a role in rates of unexpected stimuli detection.

Method

Participants and Design

A between-subjects group design was used for this experiment. One hundred and twenty law enforcement officers (LEO) were contacted to participate via an email list maintained by a Midwest law enforcement training facility.

It is hypothesized that significantly more participants in the control condition will detect the unexpected stimulus (i.e., the large black suitcase) than participants in the experimental condition. Based on existing literature (e.g., Drew et al., 2013; Simons & Chabris, 1999), it is expected that approximately greater than 50% of participants in the control condition will see the unexpected stimulus while less than 50% of participants in the experimental condition will see the unexpected stimulus. A chi-square goodness-of-fit test will be conducted to determine if the rates of detection obtained are significantly different from the expected rates of detection of the unexpected stimulus.

Materials

In order to test for inattentional blindness, participants were shown one video of a mock active shooter scenario in a school setting. The video contained an unexpected stimulus (i.e., a large black suitcase) visible midway through the video and in clear view for approximately 12 seconds.

The scenario video was recorded with a GoPro Hero5 Session handheld camera with a wide-angle lens in 1920x1440 resolution and 60 frames per second. The video was recorded by the primary author and was exported and trimmed using Quicktime video software on an iMac computer. The video survey was then uploaded to the Qualtrics online survey platform.

The video duration was 46 seconds, which included a 2 second fade-to-black blank screen at the conclusion of the scenario. The video scenario took place in the hallways and one classroom of an elementary school (see Figure 1). Hallway 1 measured approximately 64 feet long and 8.5 feet wide. The Open Space consisted of a 17 feet by 17 feet square and contained a glass trophy cabinet against the back wall. Hallway 2 was identical to Hallway 1 in terms of dimensions. Room 234 (Art Instruction) measured approximately 25.5 feet by 18 feet, with a 12.75 feet by 8.5 feet hallway entrance.

The video began in the foyer of the school entrance and proceeded down Hallway 1 where five victims were positioned. Victim 1 was positioned at the entrance of the hallway against the right wall. Approximately 15 feet down the hallway was Victim 2, sitting against the left wall. Fifteen feet further down the hallway was Victim 3, laying on his back in the middle of the floor. Victims 4 and 5 were approximately 15 feet further down the hallway, with Victim 4 sitting against the right wall and Victim 5 approximately 7 feet further down sitting against the left wall. As the camera approached Victim 4, two victims (Victims 6 and 7) rounded the corner and entered Hallway 1. They proceeded to run down the hallway and past the camera as it approached Victim 5.

Once the camera exited Hallway 1 and entered the Open Space, it focused on Victims 8 and 9 who were seated in front of a trophy cabinet directly opposite of the Hallway 1 exit. The camera then turned left and proceeded down Hallway 2 where Victims 10 and 11, approximately 22 feet from the Open Space, were positioned against the right and left walls, respectively. Midway down Hallway 2, the camera reached the entrance to Room 234 (Art Instruction). At this point, the camera turned left and focused on Victim 12, who was sitting against the left wall of the Room 234 entrance, before entering the classroom. As the camera entered, it panned to the left to provide a view of the classroom interior before panning right and stopping on the simulated active shooter. Inside Room 234 (Art Instruction), 7 victims were present. Victims 13, 14, 15, 16, and 17 were sitting at tables, while Victim 18 was positioned against the back wall on the floor. Victim 19 was sitting in a chair, however due to the positioning of the camera as it entered the room, only Victim 19's legs were in view for a very short period of time. As a result, it was not expected that any participants would notice and count Victim 19.

As the camera approached each victim, it panned and focused on each individual, allowing the victim to be in the center of view for approximately one and a half seconds. The unexpected stimulus was a black suitcase and measured 30" by 22" by 10.5" (HxLxW). The suitcase was placed diagonally in the corner of the wall outside of Room 233 such that the sides of the suitcase were making contact with both walls of the corner and the broad face of the suitcase faced the camera, as shown in Figure 1.

Anticipated stimulus detection rates are presented in Figure 3. According to our alternative hypothesis, participants in the control group will notice the unexpected stimulus at a statistically significant higher rate than the experimental group.

Procedures

Individuals interested in participating in the experiment were provided an online link to the survey. Upon arriving at the webpage, participants were shown a consent form and were required to indicate whether they were 18 years of age or older and gave their consent to participate. The consent form stated that the individuals would be participating in an experiment designed to assess their memory following a video depicting a mock active-shooter scenario. Due to the nature of inattentional blindness (i.e., thinking about it reduces the likelihood of it occurring), no mention of the phenomenon was made to ensure that participants were not primed to expect any unusual stimuli during the experiment.

Upon providing their consent, participants were then presented with an optional demographic survey that asked for the participant's age range, race, and gender. Responses to the questions were optional and participants were made aware that their responses would not impact their ability to participate in the study.

Control condition. Following the demographic survey, participants who were randomly placed in the control condition were presented with the following instructions on screen:

> The following page contains a video with sound. To ensure that you have the best viewing experience, please check that your SCREEN BRIGHTNESS and VOLUME is turned up. It is suggested that you watch the video with HEADPHONES.
>
> After a short loading screen, the video will begin to play automatically. YOU WILL NOT BE ABLE TO PAUSE OR REWIND THE VIDEO ONCE IT BEGINS. Be sure that you are ready for the video before clicking the Next button.

The participants were then required to click the "Next" button on screen. The next page of the survey contained the instructions: “While watching the video, **please pay close attention** to the details of the video.”

The participants were then instructed to click the "NEXT" button. The following page contained the video scenario, along with the instructions: “Once the video ends, please scroll down the page and click the "NEXT" button.”

The video was set to automatically play and was embedded into the survey so that participants could not click the video to pause or rewind it. After the video concluded, the "NEXT" button appeared at the bottom of the page that would take the participant to the question and answer portion of the survey.

Experimental condition. Individuals in the experimental condition followed the same initial procedure as control condition participants, however prior to the video page the survey displayed a different set of instructions:

While watching the video, **please pay close attention to the number of victims you see**.

You will be asked to recall the number of victims following the conclusion of the video.

Similar to the control condition, upon clicking the "NEXT" button the participants were taken to the video page. Neither condition allowed the video to pause, rewind, or restart at any point during the trial.

Survey. Following completion of the video, participants in both conditions were presented with a series of nine questions pertaining to what they had seen in the video, with one to four questions per webpage. Participants were required to provide an answer to any open questions before being allowed to progress to the next page and set of questions.

The first question was designed to assess for the participant's recollection of the number of victims and the degree to which participants in the experimental condition followed task instructions accurately. Question 1 asked "How many victims were present in the video?" The next three questions were related to any unusual items they may have seen in the hallway and increased in specificity. Question 2 asked "During the video, did you notice anyone/anything unusual other than the victims in the hallway?" If the participant answered "No," they were directed to Question 3. If the participant answered "Yes," they were then asked 2b: "Who or what did you see?" and 2c: "What about it was unusual?" before being asked 2d: "During the video, did you notice any *other* unusual items in the hallway?" If the participant answered "No," they were directed to Question 4. If the participant answered "Yes," they were then asked 2e: "What did you see?" and 2f: "What about it was unusual?" Question 3 asked "During the video, did you notice any unusual items in the hallway?" If the participant answered "No," they were directed to Question 4. If the participant answered "Yes," they were then asked 3b: "What did you see?" and 3c: "What about it was unusual?" Question 4 asked "During the video, did you notice a suitcase in the hallway?" If the participant answered "No," they were then directed to Question 5. If the participant answered "Yes," they were then asked 4b: "Please describe the location of the suitcase," 4c: "Please describe the size of the suitcase," 4d: "Please describe the color of the suitcase," and 4e: "Please describe anything else unusual about the suitcase." Question 5 asked, "If you were to see a suitcase during an active-shooter school scenario, what would you think it might contain?" and was intended to gauge the participant's perception of the stimulus as a potentially deadly threat (e.g., an improvised explosive device). Questions 6 and 7 were designed to assess response integrity and guesses. Question 6 asked, "During the video, did you notice a firearm in the hallway?" If the participant answered "No," they were directed to

Question 7. If the participant answered “Yes,” they were asked 6b: “Please describe the location of the firearm,” 6c: “Please describe the size of the firearm,” and 6d: “Please describe the color of the firearm.” Question 7 asked, “During the video, did you notice a knife in the hallway?” If the participant answered “No,” they were directed to Question 8. If the participant answered “Yes,” they were then asked 7b: “Please describe the location of the knife, 7c: “Please describe the size of the knife, and 7d: “Please describe the color of the knife.” Neither a firearm nor knife were present in the video, suggesting that positive responses were a result of either a guess or poor visual acuity. Any participant responses indicating a positive identification of one or both items resulted in that individual’s data being highlighted for further analysis. Question 8 asked “Have you ever participated in an experiment like this?” and Question 9 asked “Have you ever heard of the phenomenon known as inattentional blindness?” Similar to the previous two questions, any positive responses to either of these questions resulted in the participant’s data being highlighted for further analysis.

Upon completion of the survey questions, participants were then presented a screen that thanked them for their time, revealed that the experiment was designed to assess for inattentional blindness, provided a brief definition of inattentional blindness, and instructed the participants to not share anything regarding the study, the video, or the study’s purpose with other participants.

Pilot Data

Prior to conducting the full experiment, a pilot test was conducted to determine which of four video conditions provided the best opportunity for stimulus detection in the control condition.

The videos utilized two different unexpected stimuli across the four experimental conditions. Condition 1 and 2 used a large black suitcase that measured 30” by 22” by 10.5”

(HxLxW). Condition 3 and 4 used a pressure cooker as the unexpected stimulus. The pressure cooker was made of reflective stainless steel with black plastic handles and had an 11” diameter lid (17” including the handle) and a height of 7.25”.

Condition 1 used the same large black suitcase and location that was used in the full experiment.

Condition 2 used this same large black suitcase in the same position, this time with a white and orange paper sign taped to the front of the suitcase. The sign measured 8.5” by 11” with a 6” by 6” orange diamond in the center and was positioned one inch from the top of the suitcase. The orange sign had the word “EXPLOSIVE” written across it, the number “1” in the bottom corner, as well as a symbol representing an exploding object. Conditions 1 and 2 had the large black suitcase in view for approximately 12 seconds.

Condition 3 had the pressure cooker placed in the same corner as the suitcase, with the handle touching the wall closest to Room 233 and the side of the pressure cooker against the wall adjacent to the Open Space. Due to its smaller size, the pressure cooker in Condition 3 was visible for 9 seconds.

As the camera approached and focused on Victim 5, the unexpected stimulus was in clear view for the first three conditions the entire time until the camera passed the stimulus.

Condition 4 had the pressure cooker placed in the Open Space, approximately 1.5 feet to the left of Victim 9 and 1.5 feet away from the back wall (see Figure 2). The unexpected stimulus (i.e., pressure cooker) was in clear view as the camera approached and focused on Victims 8 and 9. The pressure cooker in Condition 4 was in view for approximately 10 seconds.

Each victim in the videos, except for Victims 6 and 7 (i.e., runners), was assigned an injury location. The victims indicated their injury location by placing one or both hands on that specific body part. Injury locations were either the head, one arm, one leg, or the torso (from neck to hips). Victims were only assigned one injury and all injury and victim positions remained consistent across conditions. The victims were instructed to either yell for help, yell in pain and indicate location of injury (e.g., “He shot my arm”), or remain silent throughout the entire video.

Thirty-six Minnesota State University, Mankato undergraduate students were randomly assigned to one of the four different conditions. All participants were given the same instructions as the control condition in the full experiment so as to allow for a higher probability of stimulus detection, as compared to the instructions in the experimental condition. The participants were given the same instructions and engaged in the trials in the same fashion as the full experiment. Zero students in the first condition, one student in the second condition, zero students in the third condition, and zero students in the fourth condition were able to see the unexpected stimulus. These rates of detection were below expectations, wherein approximately 50% of participants were expected to notice the stimuli. As a result, it was decided that the first condition (i.e., the suitcase with no sign) would be used for the main portion of the study. This was decided based on the fact that the suitcase was the largest stimulus and in view for the longest duration, thus being the most likely to be visually noticeable. Although the suitcase with the “EXPLOSIVE” sign was noticed by a student, it was decided that the suitcase alone was more representative of a real life scenario.

Results

Demographics

The online survey was distributed and open to participants for twenty-eight days. A total of 120 responses were gathered while the survey was open. 53 responses were removed from the total for being incomplete. Multiple responses originating from the same IP address were considered for removal, however it was determined that multiple participants may have completed the survey from a shared computer (e.g., a work computer), resulting in the same IP address appearing several times. Although participants were randomly assigned to either the control or experimental condition, the two conditions were not evenly distributed as some individuals backed out before completing the survey. In total, 67 responses were included for analysis, with 56.7% (*n*=38) in the control condition and 43.3% (*n*=29) in the experimental condition.

Providing demographic information was optional and did not have any impact on the participant's ability to complete the online survey. The participant demographics are presented in Appendix A - Table 1. One participant did not provide demographic information.

Data

Prior to analysis, one participant in the experimental condition answered that they had noticed the suitcase, however when asked to describe the size, location, and color of the suitcase the participant responded "I didn't see it." As a result, their response to the question of whether they had seen the unexpected stimulus was retroactively changed to "No." This participant also answered "Yes" to the question of: "During the video, did you notice a knife in the hallway?" However, when asked to describe the location, size, and color of the knife, the participant responded "I didn't see it." As a result, their response to the question of whether they had seen the knife was also retroactively changed to "No."

Two participants in the control condition also indicated that they had seen the suitcase, however when asked to describe the size, location, and color, the participants answered "no clue" or "N/A." As a result, their responses were also retroactively changed to "No" to indicate that they had not seen the suitcase.

Question 1 was intended to assess participants' recollection of the number of victims present in the scenario and whether those in the experimental condition followed specific instructions. Mean and standard deviation for victim counts can be found in Appendix A – Table 2. A two-tailed independent samples t-test was conducted to determine whether the difference in mean victim counts for the control and experimental conditions was significant. Levene's test was found to be significant ($F = 6.03$, $p = .02$), indicating unequal variances. As such, participants in the control condition counted significantly more victims ($M = 16.48$, $SD = 4.39$) than participants in the experimental condition ($M = 14.45$, $SD = 1.88$), $t(45.44) = 2.31$, $p = .03$.

Chi-square goodness-of-fit tests were performed to determine whether detection of the unexpected stimulus was consistent with expected rates of detection for Questions 2: "During the video, did you notice anyone or anything unusual other than the victims in the hallway?", 2d: "During the video, did you notice any other unusual items in the hallway?", 3: "During the video, did you notice any unusual items in the hallway?", and 4: "During the video, did you notice a suitcase in the hallway?"

For Question 2 in the control condition, participants did not significantly notice unusual items or individuals any more or less than would be expected, $\chi^2(1) = .42$, $p = .52$. Participants who answered "Yes" to Question 2 were then asked: "During the video, did you notice any other unusual items in the hallway?" Responses were significantly skewed towards "No," $\chi^2(1) = 7.12$, $p < .05$. Participants who answered "No" to Question 2 were asked Question 3: "During the video, did you notice any unusual items in the hallway?" Participant responses were again significantly skewed towards "No," $\chi^2(1) = 3.86$, $p = .05$. Lastly, all participants in the control condition were asked Question 4: "During the video, did you notice a suitcase in the hallway?" A chi-square goodness-of-fit test indicated that rates of unexpected stimulus detection in the control condition were not equal, $\chi^2(1) = 23.68$, $p < .001$. Frequencies for stimulus detection can be seen in Appendix A - Table 3. Participants were more likely to miss detection of the unexpected stimulus.

When broken down by participants, approximately 45% ($n = 17$) of participants in the control condition indicated that they had noticed an unusual item or individual, other than the victims, in the hallway. This detection rate fits with existing literature that suggests about half of all participants would be expected to notice an unexpected stimulus when not under high cognitive load (e.g., Chabris et al., 2011; Liao & Chiang, 2016; Näsholm et al., 2014). However, when asked to provide details of what participants had seen in the video, only one participant indicated that they had noticed the scenario-relevant unexpected stimulus (i.e., the suitcase), while 69% ($n = 11$) noted that they saw something unusual about the victims or the shooter, 12.5% ($n = 2$) indicated seeing an unusual item that was not the suitcase, and 19% ($n = 3$) noted seeing other unusual or unexpected stimuli (e.g., a mannequin and identifying tags worn by volunteers in the video). These detection rates suggest that while not under cognitive load, participants were able to notice or identify aspects of the scene that they deemed unusual and did not belong in the current scenario.

In regards to Question 2 in the experimental condition, participants did not significantly notice unusual items or individuals any more or less than would be expected, $\chi^2(1) = 2.79$, $p = .10$. Participants who answered “Yes” to Question 2 were asked: “During the video, did you notice any other unusual items in the hallway?” Participants were more likely to indicate “No,” $\chi^2(1) = 11.84$, $p < .05$. Participants who answered “No” to Question 2 were asked Question 3: “During the video, did you notice any unusual items in the hallway?” Participant responses were significantly favored “No,” $\chi^2(1) = 6.40$, $p < .05$. Lastly, all participants in the experimental condition were asked Question 4: "During the video, did you notice a suitcase in the hallway?" A chi-square goodness-of-fit test indicated that rates of stimulus detection in the experimental condition were not as expected, $\chi^2(1) = 18.24$, $p < .001$. Frequencies for stimulus detection can be seen in Appendix A - Table 3. Participants were more likely to miss detection of the unexpected stimulus than would be expected.

Similar to the control condition, 66% (n = 19) of participants in the experimental condition responded that they had noticed an unusual item or individual in the hallway. More specifically, of those 19 participants, 89.5% (n = 17) indicated noticing something unusual about the victims or shooter, 5% (n = 1) indicated seeing an unusual item that was not the suitcase, and 5% (n = 1) noted seeing other unexpected stimuli in the video (victim identification tags).

Question 5 asked participants to indicate what they believed a suitcase would contain if encountered in a real life active shooter scenario. Approximately 97% of respondents (n=37) in the control condition and 86% of respondents (n=25) in the experimental condition stated that a suitcase encountered in an active shooter situation would most likely contain a bomb, improvised explosive device, or additional firearms and ammunition. One respondent in the experimental condition stated that the suitcase would most likely contain papers, while the other three respondents in the experimental condition and one respondent in the control condition noted that they would not be concerned with the suitcase during an active shooter scenario.

Questions 6 and 7 were included to assess for participant response integrity, with Question 6 asking: "During the video, did you notice a firearm in the hallway?" and Question 7 asking: "During the video, did you notice a knife in the hallway?" The questions were asked to both the control and experimental group. As neither a firearm nor knife were included in the video, any positive indication of seeing either item suggests that participants may be responding in a socially-desirable fashion. Positive indications may also suggest poor visual acuity or poor recollection of events. Frequencies for responses can be found in Appendix A – Table 4.

As indicated in Appendix A – Table 4, three participants in both the control and experimental condition indicated seeing a firearm during the video. When asked to describe the location, size, and color of the firearm all participants were able to provide details. Five of the six participants indicated seeing a small firearm that was black or blue in color near one of the victims, while one participant indicated seeing a long rifle, black in color, near a door. Review of the video suggests that those who indicated seeing a small firearm actually noticed one of the victim's cell phones on the floor, while the participant who indicated seeing a rifle may have mistaken a tall microphone stand that was used to hold a classroom door open.

Question 8 asked whether participants had ever participated in a study similar to this one. Approximately 91% (*n*=61) of total respondents indicated they had not, while 9% (*n*=6) indicated that they had. Lastly, Question 9 asked whether participants had heard of the phenomenon of inattentional blindness. Approximately 82% (*n*=55) of total participants indicated that they were familiar with the phenomenon, while 18% (*n*=12) indicated that they were unfamiliar with inattentional blindness.

Discussion

The purpose of the current study was meant as an examination of whether law enforcement officers (LEO) were subject to inattentional blindness in a simulated active shooter video scenario. Due to existing literature being unclear as to whether experience and training affect rates of unexpected stimulus detection, it was uncertain whether LEO, who have specific training in responding to active shooter situations, would be subject to inattentional blindness, and if so, to what degree.

The results of the current study do appear to coincide with results of similar studies involving LEO and detection of unexpected stimuli, at least in part (e.g., Chabris et al., 2011; Simons & Schlosser, 2017). In previous studies, rates of unexpected stimulus detection ranged from 33% to 72% depending on the conditions of the dynamic scenario being used. Although participants in this study were able to detect the scenario-relevant unexpected stimulus (i.e., suitcase) at very low rates, participants in both the control and experimental condition identified unusual or unexpected but scenario-irrelevant stimuli (e.g., water bottles, sunglasses) at rates similar to previous studies.

Approximately 45% of participants in the control condition indicated that they had noticed an unusual item or individual, other than the victims, in the hallway. This detection rate fits with previous literature that suggests about half of participants would be expected to notice an unexpected stimulus when not under high cognitive load (e.g., Chabris et al., 2011; Liao & Chiang, 2016; Näsholm et al., 2014). Despite this high detection rate however, only two control condition participants were able to notice and correctly identify the scenario-relevant unexpected stimulus (i.e., the suitcase), with other control condition participants noticing scene-irrelevant items.

These detection rates suggest that when not under high cognitive load, the participants in this study were able to identify unusual items and aspects of the scene at rates similar to existing literature. This in turn lends credence to the possibility that LEO may be subject to inattentional blindness, as the majority of control condition participants indicated they did not see any unusual items or individuals in the scenario. However, indication of noticing unusual stimuli cannot be explained entirely by inattentional blindness as it is possible participants noticed the unusual aspects of the scene, but chose not to indicate as such.

This trend in stimulus detection rates was similar in the experimental condition wherein the majority of participants indicated seeing scene-irrelevant items as opposed to the scene-relevant unexpected stimulus. Interestingly, although the control condition had more participants, detection rates for both relevant and irrelevant stimuli were higher in the experimental condition. This runs counter to previous studies and our hypothesis that individuals under a high cognitive load would be more susceptible to inattentional blindness and thus less likely to notice both relevant and irrelevant stimuli.

It is unclear why those in the experimental condition were more likely to notice unexpected stimuli, although there are a number of potential reasons. Participants in the experimental condition were subject to a higher cognitive load by being required to count and report the number of victims they noticed during the video. Based on total victim counts and standard deviations across both conditions, it appears as though those in the experimental condition were following instructions and focused on counting victims.

The intention of counting the victims was to increase cognitive demand as participants were required to pay careful attention and maintain a running count of all victims they could identify. Although there is a significant difference in the number of victims counted between the control and experimental conditions, it is possible that the instructions and the task of counting victims was not cognitively demanding enough. This may have resulted in very little difference in cognitive load between the two conditions.

Another possible explanation may be that those in the experimental condition were required to be more focused on the video overall, and thus more likely to identify unusual items during the video. By being more focused on aspects of the scene, participants may have been more likely to notice distracting and unusual objects such as water bottles. This may also explain why those in the experimental condition counted less total victims than in the control condition; extraneous items distracted participants from keeping an accurate victim count. Regardless of why those in the experimental condition were more likely to notice stimuli, questions still remain in regards to why detection rates of the scenario-relevant suitcase remained low across both conditions.

Detection of the suitcase was the primary interest in this study as it served as a relevant, albeit unexpected item in an active shooter scenario. The relevance of the suitcase is supported by our participants, who overwhelmingly believed that such an item would most likely contain a bomb or improvised explosive device in a real active shooter situation. The relevance of the suitcase, combined with its location near a victim and its on-screen time of approximately 12 seconds led researchers to believe it as an appropriate unexpected stimulus for the study. Despite this, the suitcase remained undetected for the vast majority of participants across both conditions.

The lack of detection may be due to a variety of factors pertaining to its actual perceived relevance and physical appearance. The irrelevant items noticed and identified by participants in both conditions included water bottles and yellow identification tags worn by the volunteer victims in the video. It may be that the items were unusual as they would not be expected to be seen during an active shooter scenario, resulting in participants more likely to remember their appearance. Likewise, the black suitcase, although relevant, was also inconspicuous and could have been mistaken for another item such as a garbage can, something that would not be considered unusual. As a result, it may be possible that participants had noticed the suitcase, but whether due to having mistaken it for another item or the fact that the black suitcase was indistinct, forgot that they had seen it by the conclusion of the video.

While this study was basic in its design and implementation, it does raise questions regarding LEO training and how it can affect their memory of events. LEO experience and training levels were not assessed in the current study, thus making it impossible to determine to what degree training, particularly active shooter training, had on rates of inattentional blindness. Despite this, results of the current study suggest that LEOs are subject to inattentional blindness at least to some degree, even when not under high cognitive demand. This is important in the context of an active shooter scenario as the stresses induced in the current study do not compare to the real life stress of a life and death situation. It remains to be seen whether LEOs would be more or less likely to notice unexpected stimuli in a real active shooter situation, nor whether certain types of training can lessen the occurrence of the phenomenon. Interestingly, the majority of participants in this study indicated that they were familiar with inattentional blindness, yet detection of unexpected stimuli remained consistent with previous studies. It is uncertain to what degree our participants were aware of inattentional blindness or whether they were made aware of the phenomenon through police training or education. What is clear is that despite being familiar with it, participants were still subject to missing unexpected stimuli during the scenario.

Limitations and Future Research

Although efforts were made to limit the effects of confounding variables, several limitations exist in the present study that should be addressed prior to future replication. There are several limitations inherent in online survey distribution and video-based scenarios. One major limitation of this study is that participants were given access to the survey and video via email. As a result, participants were free to share access with anybody not explicitly contacted by the researchers, despite being asked not to disseminate or discuss the study with anybody outside of the participant pool.

Online accessibility to the study also meant that participants were able to access the survey on any number of internet connected devices including laptops, tablets, and mobile phones. Although the survey was optimized for both desktop computers and mobile devices, the video scenario was not and it is possible that some participants may not have had an optimal viewing experience. In addition, although it is suggested in the survey to view the video at a time and place where the participant would not be disturbed, there is no guarantee that this was the case for all participants.

Another potential limitation is that unlimited access to the online survey allowed for participants to watch the video and answer the survey multiple times. Due to the nature of inattentional blindness, any knowledge of the unexpected stimulus diminishes the chance that the phenomenon will occur. Although participant responses were not indicative of such responding, the ability to do so was present.

Lastly, another major limitation lies within the video scenario itself. The video sequence consisted of individuals of various ages depicting mock injuries, shaky camera movements, and loud, distracting audio. Although every effort was made during the creation of the video to ensure smooth movement and transitions, the shaky nature of the video may have made visual recognition of the unexpected stimulus difficult. This, combined with participants watching on devices smaller than a standard desktop computer monitor may be partially responsible for the low rates of detection.

This study highlights the importance of police response and attention in life-threatening scenarios as the vast majority of participants were unable to detect an item that they perceived as potentially dangerous. Future studies interested in replicating the current study should take into consideration the limitations inherent in an online survey distribution platform and video-based scenario. Having participants watch the video and complete the survey in an environment controlled by the researchers will limit the possibility of environmental distractions and ensure that participants are only watching the video once. In addition, a higher quality video should be made to increase visual recognition of the unexpected stimulus.

Future studies should look at the effects of LEO experience and training on attention during such scenarios. Modifications to the instructions presented prior to the video scenario can be implemented to be more representative of what an officer may expect from a dispatch call as they enter an active shooter scenario. An effort should also be made to determine the degree of cognitive demand being placed on the participants by these instructions. Lastly, a larger and more diverse pool of participants that is representative of LEO nationwide should be used so that results can be generalized.

References

Anderson, G.S., Courtney, A., Plecas, D., & Chamberlin, C. (2005). Multi-tasking behaviors of general duty police officers. *Police Practice and Research, 6*(1), 39-48. doi:10.1080/15614260500047119.

Cartwright-Finch, U., & Lavie, N. (2007). The role of perceptual load in inattentional blindness. *Cognition, 102*(3), 321-340. doi:10.1016/j.cognition.2006.01.002.

Chabris, C. F., Weinberger, A., Fontaine, M., & Simons, D. J. (2011). You do not talk about fight club if you do not notice fight club: Inattentional blindness for a simulated real-world assault. *I-Perception*, *2*(2), 150-153. doi:10.1068/i0436.

Dalton, P., & Fraenkel, N. (2012). Gorillas we have missed: Sustained inattentional deafness for dynamic events. *Cognition, 124*(3), 367-372. doi:10.1016/j.cognition.2012.05.012.

Dehais, F., Causse, M., Vachon, F., Régis, N., Menant, E., & Tremblay, S. (2014). Failure to detect critical auditory alerts in the cockpit: Evidence for inattentional deafness. *Human Factors, 56*, 631-644. doi:10.1177/0018720813510735.

Drew, T., Võ, M., & Wolfe, J. (2013). The invisible gorilla strikes again: Sustained inattentional blindness in expert observers. *Psychological Science, 24*(9), 1848-1853. doi:10.1177/0956797613479386.

Eitam, B., Yeshurun, Y., & Hassan, K. (2013). Blinded by irrelevance: Pure irrelevance induced "blindness". *Journal of Experimental Psychology, 39*(3), 611.

French, R. S. (1953). The discrimination of dot patterns as a function of number and average separation of dots. *Journal of Experimental Psychology, 46*(1), 1-9. doi:10.1037/h0059543.

Greig, P. R., Higham, H., & Nobre, A. C. (2014). Failure to perceive clinical events: An under-recognised source of error. *Resuscitation, 85*(7), 952-956. doi:10.1016/j.resuscitation.2014.03.316.

Gur, R. C., & Hilgard, E. R. (1975). Visual imagery and the discrimination of differences between altered pictures simultaneously and successively presented. *British Journal of Psychology, 66*(3), 341-345. doi:10.1111/j.2044-8295.1975.tb01470.x.

Hughes-hallett, A., Mayer, E. K., Marcus, H. J., Pratt, P., Mason, S., Darzi, A. W., & Vale, J. A. (2015). Inattention blindness in surgery. *Surgical Endoscopy, 29*(11), 3184-3189. doi:10.1007/s00464-014-4051-3.

Hyman, I. E., Sarb, B. A., & Wise-Swanson, B. (2014). Failure to see money on a tree: Inattentional blindness for objects that guided behavior. *Frontiers in Psychology, 5*, 356. doi:10.3389/fpsyg.2014.00356.

Lavie, N., Hirst, A., de Fockert, J. W., & Viding, E. (2004). Load theory of selective attention and cognitive control. *Journal of Experimental Psychology: General, 133*(3), 339-354. doi:10.1037/0096-3445.133.3.339.

Levin, D. T., & Simons, D. J. (1997). Failure to detect changes to attended objects in motion pictures. *Psychonomic Bulletin & Review, 4*(4), 501-506. doi:10.3758/BF03214339.

Liao, C., & Chiang, T. (2016). Reducing occupational injuries attributed to inattentional blindness in the construction industry. *Safety Science, 89*, 129-137. doi:10.1016/j.ssci.2016.06.010.

Mack, A., & Rock, I. (1998). *Inattentional blindness.* Cambridge, MA: MIT Press.

Memmert, D., & Furley, P. (2007). "I spy with my little eye!": Breadth of attention, inattentional blindness, and tactical decision making in team sports. *Journal of Sport & Exercise Psychology, 29*(3), 365-381.

Most, S. B. (2013). Setting sights higher: Category-level attentional set modulates sustained inattentional blindness. *Psychological Research, 77*(2), 139-46. doi:10.1007/s00426-011-0379-7.

Most, S. B., Simons, D. J., Scholl, B. J., Jimenez, R., Clifford, E., & Chabris, C. F. (2001). How not to be seen: The contribution of similarity and selective ignoring to sustained inattentional blindness. *Psychological Science, 12*(1), 9-17. doi:10.1111/1467-9280.00303.

Murphy, G., & Greene, C. M. (2015). High perceptual load causes inattentional blindness and deafness in drivers. *Visual Cognition, 23*(7), 810-814. doi:10.1080/13506285.2015.1093245.

Näsholm, E., Rohlfing, S., & Sauer, J. D. (2014). Pirate stealth or inattentional blindness? The effects of target relevance and sustained attention on security monitoring for experienced and naïve operators. *PLoS One, 9*(1), e86157. doi:10.1371/journal.pone.0086157.

O'Regan, J. K., Rensink, R. A., & Clark, J. J. (1999). Change-blindness as a result of 'mudsplashes'. *Nature, 398*(6722), 34. doi:10.1038/17953.

Pammer, K., Bairnsfather, J., Burns, J., & Hellsing, A. (2015). Not all hazards are created equal: The significance of hazards in inattentional blindness for static driving scenes. *Applied Cognitive Psychology, 29*(5), 782-788. doi:10.1002/acp.3153.

Pashler, H. (1988). Familiarity and visual change detection. *Perception and Psychophysics, 44*(4), 369-378.

Raveh, D., & Lavie, N. (2015). Load-induced inattentional deafness. *Attention, Perception and Psychophysics, 77*(2), 483-492. doi:10.3758/s13414-014-0776-2.

Rensink, R. A., O'Regan, J. K., & Clark, J. J. (1997). To see or not to see: The need for attention to perceive changes in scenes. *Psychological Science, 8*(5), 368-373. doi:10.1111/j.1467-9280.1997.tb00427.x.

Richards, A., Hannon, E. M., & Derakshan, N. (2010). Predicting and manipulating the incidence of inattentional blindness. *Psychological Research, 74*(6), 513-23. doi:10.1007/s00426-009-0273-8.

Simons, D. J., & Chabris, C. F. (1999). Gorillas in our midst: Sustained inattentional blindness for dynamic events. *Perception, 28*(9), 1059-1074. doi:10.1068/p281059.

Simons, D. J., & Levin, D. T. (1998). Failure to detect changes to people during a real-world interaction. *Psychonomic Bulletin & Review, 5*(4), 644-649. doi:10.3758/BF03208840.

Simons, D. J., & Rensink, R. A. (2005). Change blindness: Past, present, and future. *Trends in Cognitive Sciences, 9*(1), 16-20. doi:10.1016/j.tics.2004.11.006.

Simons, D. J., & Schlosser, M. D. (2017). Inattentional blindness for a gun during a simulated police vehicle stop. *Cognitive Research: Principles and Implications, 2*(1), 37. doi:10.1186/s41235-017-0074-3.

Violanti, J.M., Fekedulegn, D., Hartley, T.A., Charles, L.E., Andrew, M.E., Ma, C.C., & Burchfiel, C.M. (2016). Highly rated and most frequent stressors among police officers: Gender differences. *American Journal of Criminal Justice, 41*, 645-662. doi:10.1007/s12103-016-9342-x.

Wayand, J. F., Levin, D. T., & Varakin, D. A. (2005). Inattentional blindness for a noxious multimodal stimulus. *The American Journal of Psychology, 118*(3), 339-352.

Werner, S., & Thies, B. (2000). Is 'change blindness' attenuated by domain-specific expertise? an expert-novices comparison of change detection in football images. *Visual Cognition,* *7*(1-3), 163-173. doi:10.1080/135062800394748.

Appendix A – Tables

Table 1

Participant Demographics

	n
Age Range	
18-24	0
25-34	5
35-44	27
45-54	18
55-64	14
65-74	3
75 and older	0
Gender	
Male	63
Female	3
Other	0
Race or Ethnicity	
White	64
Black or African American	1
Asian or Pacific Islander	1
Other	0

Table 2

Mean and Standard Deviation Victim Counts by Condition

	M	*SD*
Control Condition	16.48	4.39
Experimental Condition	14.45	1.88

Table 3

Participant Detection Rates for Questions 2, 3, and 4 by Condition

	Control		Experimental	
	n	*n*	*n*	*n*
Q2: "…notice anyone or anything unusual other than the victims in the hallway?"	17 (19)	21 (19)	19 (14.5)	10 (14.5)
"…notice any other unusual items in the hallway?"	3 (8.5)*	14 (8.5)*	2 (9.5)**	17 (9.5)**
Q3: "…notice any unusual items in the hallway?"	6 (10.5)*	15 (10.5)*	1 (5)*	9 (5)*
Q4: "…notice a suitcase in the hallway?"	2 (19)**	36 (19)**	3 (14.5)**	26 (14.5)**

Note: *=p<.05; **=p<.001; *n* indicates number of participants who detected stimulus, with expected rates in ( ).

Table 4

Participant Detection Rates for Questions 6 and 7 by Condition

	Control	Experimental
	n	n
Q6: "…notice a firearm in the hallway?"	3 (35)	3 (26)
Q7: "…notice a knife in the hallway?"	0 (38)	0 (29)

Note: *n* indicates number of participants who detected stimulus, with undetected rates in ( )

Appendix B - Figures

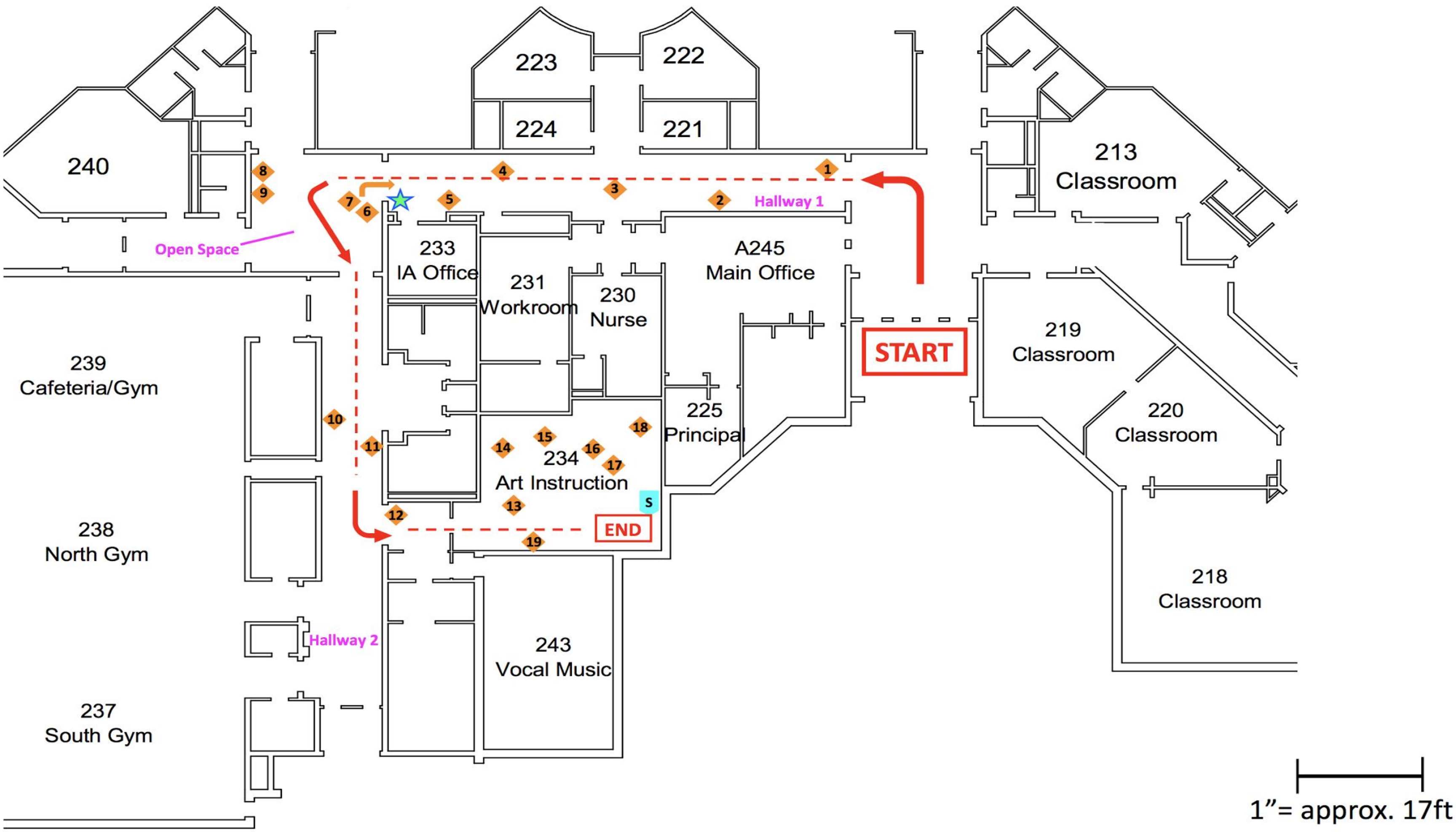

Figure 1. Victim and stimulus placement for Conditions 1, 2, and 3.

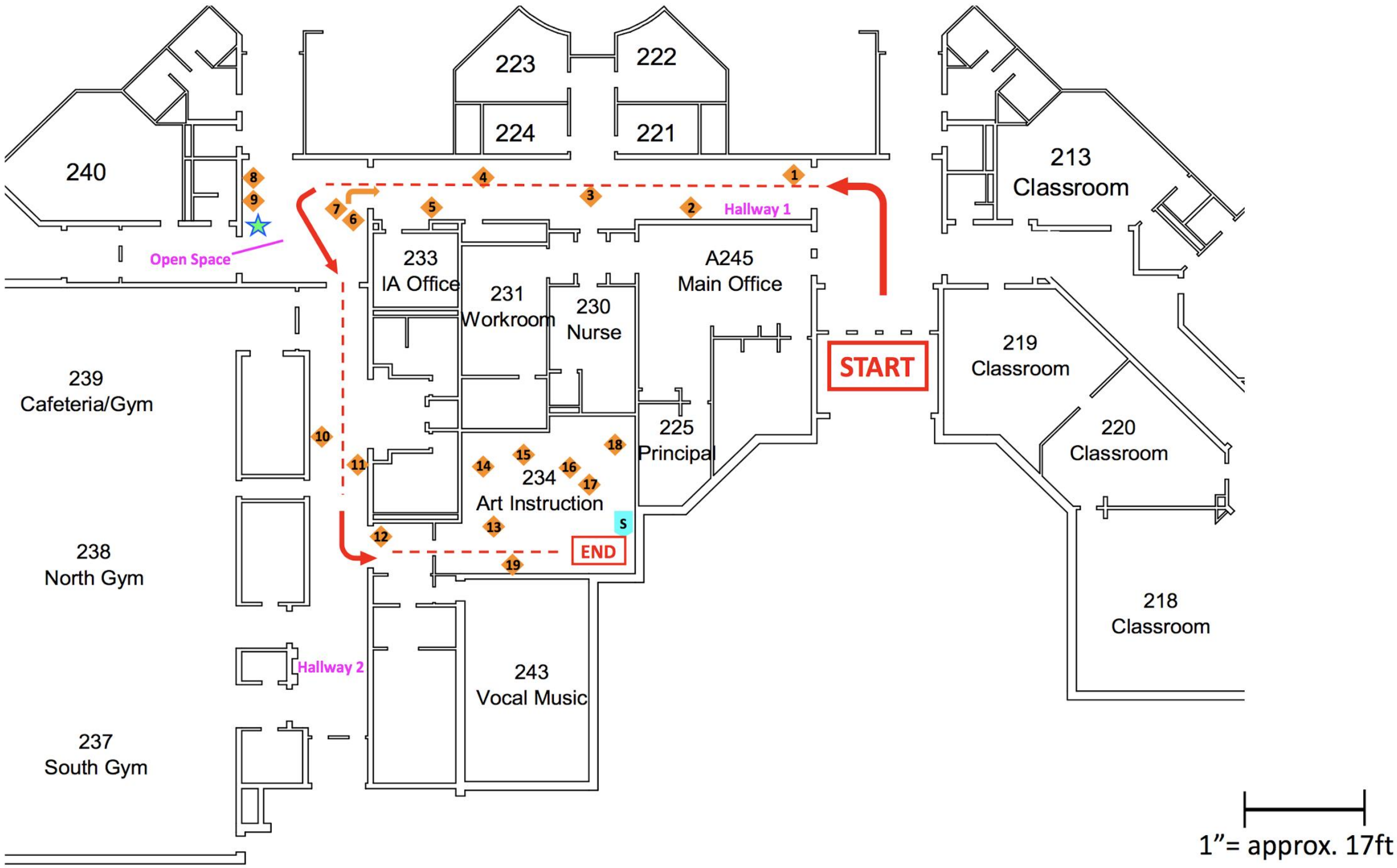

Figure 2. Victim and stimulus placement for Condition 4.

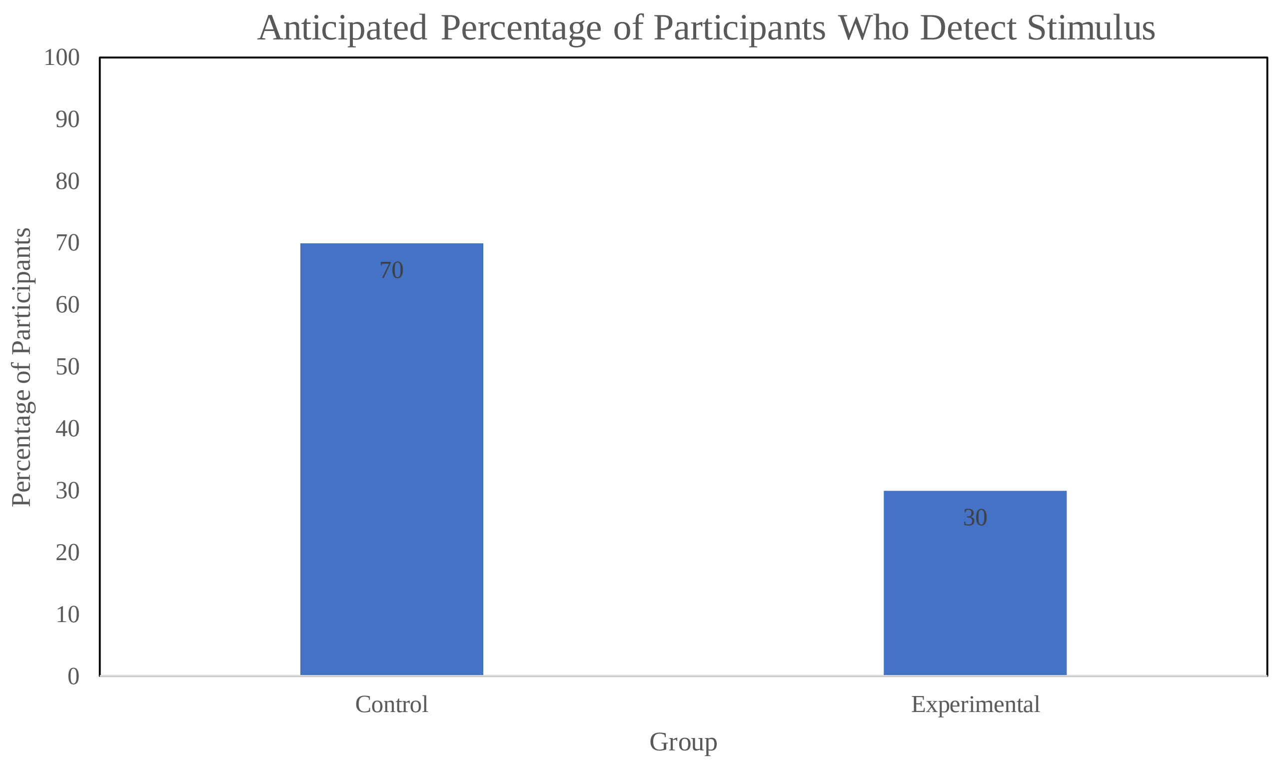

Figure 3. Anticipated percentage of participants in control and experimental condition who detect stimulus.