

Do Weapons Automatically Capture Attention?

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SUMMARY

Two experiments explored whether weapons automatically capture attention or whether eyewitnesses can overcome the weapon focus effect if so instructed. Witnesses heard a lecture that either instructed them to attend to the target individual and avoid fixating on the weapon or presented unrelated information. Subsequently, they observed the target carrying either a weapon or a book and attempted to remember his appearance. Control witnesses reported fewer correct and more incorrect details when he carried a weapon rather than the book. However, the reports of educated witnesses did not differ between object conditions. Additionally, witnesses' ability to avoid weapon focus was unaffected by weapon unusualness and elevated arousal levels, and control witnesses provided better descriptions of the weapon than the book. Copyright © 2006 John Wiley & Sons, Ltd.

In the eyewitness memory literature, the 'weapon focus effect' is the tendency for witnesses to a crime committed by an armed perpetrator to focus their attention on the weapon so that they do not encode and remember as much information about the perpetrator's physical appearance as they would have if no weapon had been visible. Loftus, Loftus, and Messo (1987) nicely demonstrated the effect by asking participants to watch a slide sequence depicting some customers moving through the order line at a fast food restaurant. In different conditions, the target person held either a gun or a personal check and took money from the cashier. In two experiments, witnesses who saw the gun were less accurate than those who saw the check at identifying the target in a lineup, and in one experiment they provided worse descriptions of him. The authors also showed, using a corneal reflection device, that the witnesses fixated longer and more frequently on the gun than the other witnesses fixated on the check.

Researchers have made progress toward determining the cause of weapon focus by testing two competing explanations. One explanation that seems intuitively appealing is that, because weapons are threatening (either to the witness or to another individual), they increase the witness's arousal or anxiety¹ to a point above the optimal level. Following Easterbrook's (1959) cue-utilisation hypothesis, attentional focus then becomes restricted

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¹In the weapon focus literature, the word *arousal* typically refers to a negative, unpleasant experience of tension or fearfulness. For the purposes of this research, however, we will instead use the term *anxiety* because it more accurately describes the unpleasant condition we have in mind and differentiates it from alternative definitions of 'arousal', such as a more pleasant emotional state of eager excitement and anticipation or an orienting response toward a stimulus.

to central cues (i.e. the weapon) at the expense of peripheral cues (e.g. the perpetrator's features) so that the latter are less accurately remembered later. This explanation has little empirical support. Kramer, Buckhout, and Eugenio (1990) showed that the weapon focus effect can occur even when witnesses' self-reported anxiety is low. In addition, witnesses' ability to remember the target does not worsen when the target threatens another individual (Pickel, 1999), when the object carried by the target is rated by witnesses as particularly threatening (Pickel, 1998), or when witnesses are threatened with a painful stimulus (Maass & Köhnken, 1989). Therefore, although witnesses to crimes might feel frightened or stressed, it is unlikely that their anxiety drives the weapon focus effect (see also Pickel, French, & Betts, 2003; Tooley, Brigham, Maass, & Bothwell, 1987).

A more empirically based explanation is that a weapon is considered unexpected or unusual within many contexts (such as fast food restaurants). Therefore, when robberies occur in these places, the weapon's unusualness attracts attention, with the result that witnesses fixate on the weapon, just as they would fixate on any unusual object in a visual scene (Henderson, Weeks, & Hollingworth, 1999; Loftus & Mackworth, 1978). Several experiments support this hypothesis. For example, Mitchell, Livosky, and Mather (1998) and Pickel (1998) demonstrated that witnesses' memory for a target's appearance deteriorated if the target held an object that was rated as 'novel' or 'unusual', no matter whether the object was a weapon or not. Furthermore, Pickel (1999) found that witnesses who saw a videotaped target carrying a gun performed worse if the setting was one in which a gun is unusual (a baseball field) rather than expected (a shooting range) or if the gun was inconsistent rather than compatible with the target's occupation (i.e. if the target was a Catholic priest rather than a police officer).

Although researchers' understanding of weapon focus has deepened over the past two decades, unanswered questions remain. The present study was designed to address two issues. The first deals with the mechanism underlying a weapon's tendency to attract attention. A critical theoretical question is whether witnesses' visual fixations are under their control or whether weapons capture attention automatically. Barnes and Jones (2000) have explained that 'attentional capture' occurs when a salient or unexpected stimulus (or change to the stimulus) 'grabs' the observer's attention. 'Unexpected' would mean that the stimulus, or some aspect of it, seems unlikely to occur, given the context, and is therefore unanticipated. The term 'capture' suggests that the observer's fixation on the stimulus is automatic, meaning that it is involuntary and unavoidable, occurring without any corresponding intent on the part of the observer (Yantis & Egeth, 1999). In addition, the observer might be unaware of the fixation. Consistent with the view that capture is automatic, Remington, Johnston, and Yantis (1992) reported that, even if instructed to ignore certain abrupt-onset visual stimuli and given incentives to do so, participants could not avoid attending to those stimuli. However, other research suggests that capture is not necessarily automatic and that its occurrence may depend on other task variables. For example, in Remington et al.'s study, the participants' attention was not already focused on any specific location within the visual display at the time that the capturing stimuli appeared. If attention is already focused elsewhere, capture is preventable (Yantis & Jonides, 1990). Furthermore, Yantis (1996) has pointed out that there are different varieties of capture, including a type that he calls 'weakly involuntary capture', which can be overcome if the observer actively attempts to ignore the stimulus. The principal aim of the current research was to examine the weapon focus effect in the context of attentional capture. By doing so, we hoped to develop a better understanding of the effect and its causes.

Although we were primarily interested in the theoretical aspects of the question about capture, the importance of the question is due in part to some practical implications. For example, if weapons capture attention automatically, then this process may occur outside witnesses' awareness. As a result, they may subsequently fail to realise that they spent considerable time looking at the weapon, and in their interviews with police they may exaggerate their opportunity to view the perpetrator or overstate the accuracy of their report. Another implication is that automatic capture should occur across individuals with different goals, regardless of whether they are deliberately trying to encode and remember some aspect of the visual scene or not. In contrast, if there is no automatic capture of attention, then witnesses could conceivably be taught to overcome the weapon focus effect, so that their memory of the target could be comparable to what it would be with no weapon present. Moreover, individuals who are most at risk to observe a crime committed by an armed perpetrator (e.g. bank tellers) could possibly be trained so that they would be prepared to perform better as witnesses.

The existing studies of attentional capture have involved search for basic stimuli, such as a letter of the alphabet in a visual display. It is unknown whether weapons strongly capture attention in a natural environment. Some data indicate that they might. Tooley et al. (1987) showed participants slides of a male target holding one of several different objects. They found that the presence of a weapon impaired line-up identification accuracy even when witnesses were instructed to focus their attention on specific parts of the slides other than the weapon, such as the target's face. However, these authors did not teach the witnesses about the weapon focus effect, nor did they encourage them to try to remember the target's physical appearance or explain why it would be important to do so. In the present study, we explored whether such explicit instructions would be effective.

We also addressed a related question in order to discover more specifically the nature of capture by a weapon, if it in fact occurs. Attentional capture depends in part on the unusualness of the stimulus (Barnes & Jones, 2000; Jones, Moynihan, MacKenzie, & Puente, 2002; Yantis, 1996). Therefore, one might predict that more unusual weapons capture attention more strongly than do commonly seen weapons. In other words, capture might be the weak variety in some situations and the strong variety in others, depending on unusualness. If so, unusualness should interact with instructions to avoid focusing on the weapon, so that witnesses would find it harder to ignore an especially unusual weapon rather than a typical one. We investigated this hypothesis.

Our second research issue concerned the extent to which witnesses who see a weapon can remember it. The weapon focus effect apparently occurs because a weapon attracts more visual attention than does a neutral object (Kramer et al., 1990; Loftus et al, 1987). Therefore, among witnesses who have not learned about the effect, descriptions of the weapon should be better than descriptions of the neutral object. If witnesses who see a weapon can remember it especially well, then police investigators could explicitly ask about it in the hopes that this information could help identify the perpetrator (perhaps because certain weapons might be linked to specific suspects). In contrast to controls, witnesses who have been educated about weapon focus should report poorer descriptions of the weapon (if they can successfully follow instructions), because they should direct their attention away from the weapon and toward the target person. However, descriptions of a neutral object should be similar for the two groups of witnesses.

Some previous research has addressed witnesses' ability to remember weapons, but these studies were limited in terms of the amount of weapon information the eyewitnesses were asked to recall. Kramer et al. (1990) asked participants to name the object carried by

the target, but they did not request a description of it. Even so, their results raise the possibility that a weapon might be remembered better than a neutral object. In four experiments, they found that, compared to witnesses exposed to a neutral object, a greater proportion of those exposed to a weapon could correctly identify the object they saw, although in two of the experiments the difference was not significant. Pickel (1998) also asked participants to name the object they saw without describing it. In one experiment, only 45% of the witnesses who saw a wallet correctly identified it, compared to 100% of those who saw a gun. In a second experiment, nearly half of the witnesses who saw the target carrying a pair of sunglasses said that he was empty-handed, whereas all of those who saw a knife correctly identified that object.

In only one previously published study have witnesses supplied more information about the object than simply its name. Shaw and Skolnick (1999) showed their participants a videotape of a target carrying a neutral object, a weapon or an unusual object. They asked the participants four questions about the object: whether or not the target held something, what it was, what its colour was, and which hand the target used to hold it. A witness's score was the number of questions answered correctly; thus, scores could range from 0 to 4. The authors found no variation across conditions. However, they might have obtained different results if they had asked more probing questions that would have produced more complete descriptions of the objects. Moreover, the researchers' scoring system could not very well discriminate between witnesses who reported different amounts of information. For example, a witness who said the object was a gun and another who said it was a 9 mm semiautomatic pistol would both have received one point for identifying the object. Therefore, the question of how well witnesses can recall the weapon remains.

In the present study, we conducted two experiments to explore the research questions described above. Our participants watched a live, staged event that involved a target individual who carried objects that were either weapons or neutral objects. We taught some witnesses about weapon focus and instructed them to avoid it (the remaining witnesses learned about an eyewitness memory issue unrelated to weapon focus). Due to the lack of relevant empirical data, we made no specific prediction about the effect of these instructions. However, if the instructions do effectively help witnesses overcome weapon focus, the result would be a significant interaction between the instructions and the kind of object present. Specifically, the weapon's presence would impair memory for the target among control witnesses but not those who received the weapon focus instructions.

Additionally, we attempted to measure witnesses' memory for the object they saw more sensitively than in past studies. We expected that, among witnesses who were not given special instructions, the descriptions of the weapon would be more accurate than the descriptions of the neutral object. Moreover, the effect of such instructions should be to reduce the quality of descriptions of the weapon.

EXPERIMENT 1

The participants watched a staged event involving two actors. In different conditions, the target individual held a type of weapon or a neutral object. To examine our first research question (about capture), we informed some randomly selected witnesses about the weapon focus effect and encouraged them to try to avoid it. Others learned about an unrelated topic. The information was presented in a subtle way; not until after they had

heard the critical material did the witnesses discover that they would need to apply what they had learned.

As noted earlier, we thought that the strength of attentional capture might depend on the weapon's unusualness. However, 'unusualness' could mean either that its visual appearance is different from what is expected or that it is an unusual type of weapon. Objects that are unusual according to either definition can cause attentional capture (Barnes & Jones, 2000; Yantis & Egeth, 1999). Because previous studies (e.g. Pickel, 1999) have shown that the same object can either produce a weapon focus effect or not depending on whether the object is consistent with the schema activated by the witness (e.g. the target person is either a priest or a police officer), we thought that the better definition of 'unusualness' would refer to the type of object rather than its appearance. Even so, weapons with an unusual appearance might also strongly capture attention. Therefore, we decided to include a condition with a visually unusual weapon as well as one with an unusual type of weapon.

To address our second research issue, we measured witnesses' memory for the object they saw using a series of items designed to elicit a detailed description. We felt that, with a sensitive measure of this variable, we could effectively test our predictions that witnesses uninformed about weapon focus would retain a more accurate memory of a weapon than of a neutral object and would describe a weapon more accurately than would educated witnesses.

We measured witnesses' levels of anxiety to get a general sense of their emotional reaction to the staged event. However, we were not interested in comparing anxiety across object conditions, as converging evidence strongly implies that unusualness rather than anxiety/threat produces the weapon focus effect (Kramer et al., 1990; Maass & Köhnken, 1989; Mitchell et al., 1998; Pickel, 1998, 1999; Pickel et al., 2003; Tooley et al., 1987).

Method

Participants

The participant-witnesses were 230 undergraduates enrolled in psychology classes at a university in the Midwestern U.S. who earned course credit by participating. They were tested in groups of 3 to 11 students. They ranged in age from 18 to 55 years ($M = 20.03$, $SD = 3.84$). Most (90%) were White; 60% were female.

Materials and procedure

When the witnesses arrived at the classroom used for testing, the experimenter randomly assigned them to seats in a row near the front of the room. The seats were arranged so that all witnesses would have an equally clear view of anyone standing at the front.

After obtaining informed consent, the experimenter told the witnesses that they would watch a scene portrayed by actors. They were not told that they would later try to remember the actors' physical features and clothing. As the first actor entered the room, the experimenter explained that she would play the role of a psychology graduate student who was lecturing on human memory to a cognition class. The witnesses were asked to imagine that they were students in this class. They should listen to the lecturer, just as they would during an actual class, but they were told simply to watch rather than take notes. After thus instructing the witnesses, the experimenter moved to the back of the room, out of their line of sight.

The lecturer then began to address the witnesses. There were two versions of her lecture; the condition was chosen randomly before the start of each testing session. For the Weapon Focus (WF) Lecture condition, the lecturer defined 'weapon focus' and noted that the effect has been well documented in past research. She went on to explain that, in order to supply police investigators with a good description, witnesses should try to notice and remember a criminal's physical features and clothing instead of spending too much time looking at the weapon. Moreover, she cautioned the witnesses not to assume that they would be capable of observing both the weapon and the criminal's appearance, and she encouraged them to concentrate on the latter information. For the Control Lecture condition, the lecturer discussed eyewitness confidence and its relationship to perceived credibility. These witnesses did not receive any information about weapon focus. In both conditions, the talk lasted less than 90 seconds.

The lecturer turned toward the blackboard and picked up a piece of chalk, telling the witnesses that she was about to draw a diagram. Shortly after she began drawing, the second actor (the target) threw open the classroom door, entered, and began speaking loudly. He carried with him one of four objects. In the neutral object (Book) condition, he held a textbook. The other three objects were weapons. In the Standard Gun condition, the target held a black 9 mm semiautomatic pistol. In the Unusual Appearance condition, he held the same gun, except that there were two bands of fluorescent yellow tape wrapped around the barrel. Our intention was to make the weapon visually unusual. Previous research has shown that bright colours and contrasting elements can effectively attract attention in a natural environment (Wogalter & Laughery, 1996). For example, bright orange pylons are used to warn motorists of road hazards, and construction workers sometimes use tape with alternating yellow and black diagonal stripes to block access to a dangerous area. In the Unusual Type condition, the target carried a replica of a 19th-century single-shot percussion pistol, which observers could readily recognise as an antique gun not commonly used today. To ensure that our witnesses would agree that this weapon is an unusual type, we asked 14 pilot participants to look at photos of five different modern, typical-looking weapons as well as the antique and to use a 7-point scale to rate the unusualness of each, given the reference category 'weapons'. The antique was rated as significantly more unusual than the others (antique $M = 6.29$, $SD = 1.64$; all other M 's ≤ 2.50 , SD 's ≤ 2.21), $F(5, 65) = 28.31$, $p < 0.001$, $\omega^2 = 0.66$.

The target announced that he was looking for the professor who normally taught the class and that he was angry about a failing grade that he had received. He repeatedly demanded that the lecturer tell him where the professor was, but she insisted that she did not know. After a total of approximately 30 seconds, the target stormed from the room. As he did, he addressed the witnesses directly, saying 'Don't tell anybody you saw me'. A moment later, the lecturer followed him, and the experimenter returned to the front of the room.

The witnesses next completed two written forms, starting with the Activation-Deactivation Adjective Check List (AD ACL) Short Form (Thayer, 1989), which assesses transitory emotional states by having participants rate themselves with respect to 20 adjectives using a 4-point scale. The adjectives are divided into four subscales: Tension, Energy, Tiredness and Calmness. Using a commonly accepted practice (Thayer, 1989), we scored only the adjectives for the Tension subscale (jittery, intense, fearful, clutched-up and tense), because only these measure negative rather than positive emotional responses of the sort that witnesses to actual crimes would be expected to feel. The AD ACL correlates highly with physiological indices of anxiety, such as skin conductance and heart rate

(Thayer, 1967). Moreover, obtained test-retest reliability coefficients are good, ranging from 0.57 to 0.87.

To complete the AD ACL, the witnesses indicated whether each adjective definitely, slightly or definitely did not describe their current feelings, or whether they could not decide. Following Thayer's instructions for administering the instrument, the witnesses were asked to work quickly and to record their first immediate response to each item. The AD ACL is scored by assigning up to four points for each response, with the most points given to a rating of 'definitely'. The points are then summed across all adjectives. Higher scores indicate more anxiety; when using the Tension subscale only, scores can range from 5 to 20.

The second form completed by the witnesses was a memory questionnaire (see appendix). One section measured their memory for the appearance of the lecturer and the target using a combination of multiple choice and cued-recall questions. Witnesses were asked about each individual's clothing and accessories (e.g. style, colour) and physical features (e.g. body build, height, age, hair colour and length). Additional questions allowed the witnesses to describe any aspect of the individuals' appearance that they had not been asked about specifically.

This form also contained a section that required witnesses to remember whether the target was carrying any object. If they answered affirmatively, they were asked to specify what it was, which hand the target used to hold it, what he did with it, and its colour, size and shape. These questions were open-ended, and the witnesses were encouraged to provide as much detail as possible.

The memory questionnaire also included a section that served as a manipulation check. One question asked witnesses to remember the content of the female actor's lecture, so that we could verify that those who heard the weapon focus lecture understood and recalled it. A second question asked witnesses for their opinion regarding what individuals should do if they observe an armed perpetrator. The purpose of this question was to determine whether any control witnesses had already learned about weapon focus from some source outside of the experimental session. After completing the memory questionnaire, the experimenter thanked and debriefed the witnesses.

In sum, the design of this experiment was a 2 (lecture) $\times$ 4 (object carried by target) factorial. Both factors were manipulated between participants.

Results

To determine how witnesses' memory questionnaires should be scored, three judges examined the physical appearance of the actors and the objects, and they watched the staged scenario both live and on videotape. They created an answer key that specified the optimal responses to each questionnaire item. A scoring system was then developed that could be used to calculate the number of correct and incorrect details in each memory report. For example, the target's pants were green and made of corduroy; 'green' constituted one correct detail, and 'corduroy' was another. Regarding the objects, the judges made an exhaustive list of the correct details associated with each.

Two raters (individuals who had not been involved in developing the scoring system) evaluated each witness's questionnaire. They calculated the number of correct and the number of incorrect details provided about the target's and the lecturer's appearance. In addition, the raters computed a score for each witness that indicated the amount of correct information provided about the object. However, we recognised that, due to differences in the physical complexity of the four objects, there would be a different maximum number of correct details that could be reported about each (the raters determined that there were

37 correct details for the book, 29 for the standard gun, 31 for the taped gun and 33 for the antique pistol). Therefore, the raters computed the proportion of correct details, or the number of correct details reported divided by the total number of correct details associated with the object; the latter value was obtained from the list compiled by the judges who created the answer key. The raters also counted the number of incorrect details reported about the object. For the latter variable we simply used the raw number of details because we thought that it was not meaningful to talk about the ‘maximum number of incorrect details associated with the object’; the number of incorrect details would be infinite.

The two raters were blind to the experimental hypotheses. Without her knowledge, one was arbitrarily chosen as the primary rater, and her score was entered into the data analyses whenever the raters’ judgements differed. We estimate that interrater reliability was high; using a sample of 120 data points, $r = 0.97$.

Manipulation check

Seven witnesses’ responses were excluded because they failed to demonstrate that they recalled the weapon focus lecture. Two saw the book, one was in the Unusual Appearance condition, and four were in the Unusual Type condition. Of these, all but one said that the lecturer did not address the question of what to do if one observes an armed perpetrator. The seventh witness incorrectly summarised the lecture.

No Control Lecture witnesses were excluded, because none provided responses that indicated that they already knew about the weapon focus effect.

Memory for the man’s appearance

Regarding the number of correct details, the lecture condition interacted with the object carried by the target, $F(3, 215) = 4.63$, $p = 0.004$, $\omega^2 = 0.04$ (see Table 1). We conducted two sets of follow-up simple effects analyses to clarify the results: The first set examined the effect of the object in each lecture condition, and the second looked at the effect of the lecture in each object condition.

Regarding the first set, we expected that, if the weapon focus lecture was effective, control witnesses but not those in the WF Lecture condition should remember fewer correct

Table 1. Experiment 1: Number of details reported about the target by lecture and object conditions

Condition	Type of detail		<i>n</i>
	Correct	Incorrect	
Control lecture			
Book	24.26 _{a1} (5.33)	7.12 _{a1} (1.87)	34
Standard gun	19.30 _{b1} (3.84)	9.26 _{b1} (3.65)	27
Unusual appearance	18.96 _{b1} (3.83)	10.43 _{bc1} (2.87)	28
Unusual type	18.48 _{b1} (4.68)	11.81 _{c1} (3.82)	27
WF lecture			
Book	23.76 _{a1} (5.46)	6.44 _{a1} (1.53)	25
Standard gun	25.07 _{a2} (6.20)	7.18 _{a2} (3.27)	28
Unusual appearance	23.50 _{a2} (6.92)	7.19 _{a2} (2.37)	26
Unusual type	24.39 _{a2} (5.41)	7.82 _{a2} (2.82)	28

Note: Within lecture conditions, means in the same column that do not share the same letter subscript differ at $p < 0.01$. Additionally, within object conditions, means in the same column that do not share the same number subscript differ at $p < 0.01$. Standard deviations are in parentheses.

details about the man if a weapon rather than a book was present. Consistent with that expectation, simple effects analyses revealed that a classic weapon focus effect occurred in the Control Lecture condition, $F(3, 215) = 8.29$, $p < 0.01$, $\omega^2 = 0.21$. Specifically, as shown by a Newman-Keuls test, witnesses who saw the book reported more correct details than did witnesses in the weapon conditions. In contrast, witnesses who heard the weapon focus lecture provided approximately the same number of correct details regardless of object condition, $F(3, 215) = 0.47$, $p > 0.05$, $\omega^2 < 0.001$.

Regarding the second set of simple effects analyses, we thought that hearing the weapon focus lecture might cause those witnesses to remember more correct details about the man than would control witnesses, but only in the three weapon conditions. When the book was present, the two groups should report a similar amount of details. The results were in line with this hypothesis. In the Standard Gun ($F[1, 215] = 16.36$, $p < 0.01$, $\omega^2 = 0.23$), Unusual Appearance ($F[1, 215] = 9.89$, $p < 0.01$, $\omega^2 = 0.13$), and Unusual Type ($F[1, 215] = 17.14$, $p < 0.01$, $\omega^2 = 0.24$) conditions, WF Lecture witnesses reported more correct details than did control witnesses. There was no difference between lecture conditions, however, when the book was present, $F(1, 215) = 0.13$, $p > 0.05$, $\omega^2 < 0.001$.

Besides the number of correct details about the man, we also analysed the number of incorrect details. For this variable, we obtained an interaction, $F(3, 215) = 3.58$, $p = 0.015$, $\omega^2 = 0.03$. As with the number of correct details, we next looked at simple effects of the object in each lecture condition. The reports of witnesses who were uninformed about the weapon focus effect varied as a function of object, $F(3, 215) = 14.76$, $p < 0.01$, $\omega^2 = 0.23$. A Newman-Keuls test indicated that witnesses who saw the book reported fewer incorrect details than did those in the other conditions; additionally, those in the Standard Gun condition reported fewer incorrect details than did those in the Unusual Type condition. In contrast, for witnesses in the WF Lecture condition, the number of incorrect details did not change across object conditions, $F(3, 215) = 1.02$, $p > 0.05$, $\omega^2 = 0.007$.

We then considered the effect of the lecture in each object condition. In the Standard Gun ($F[1, 215] = 7.25$, $p < 0.01$, $\omega^2 = 0.07$), Unusual Appearance ($F[1, 215] = 17.21$, $p < 0.01$, $\omega^2 = 0.26$), and Unusual Type ($F[1, 215] = 26.72$, $p < 0.01$, $\omega^2 = 0.25$) conditions, witnesses who heard the weapon focus lecture reported fewer incorrect details than did control witnesses. On the other hand, the lecture condition made no difference when the book was present, $F(1, 215) = 0.81$, $p > 0.05$, $\omega^2 = 0.01$.

Memory for the object

We tested two hypotheses related to witnesses' memory for the object carried by the target. First, we predicted that, among witnesses who were not informed about weapon focus (and who therefore generated data revealing the classic weapon focus effect), descriptions of a weapon would be better than descriptions of a neutral object. To examine this prediction, we conducted one-way analyses of variance using only data from witnesses in the Control Lecture condition.

With respect to the proportion of correct details reported about the object, we obtained a significant difference between conditions, $F(3, 112) = 22.85$, $p < 0.001$, $\omega^2 = 0.37$ (see Table 2). A Newman-Keuls test indicated that the proportion was lower for the book than for the three weapon conditions.

The number of incorrect details also varied by object, $F(3, 112) = 12.96$, $p < 0.001$, $\omega^2 = 0.24$. A Newman-Keuls test clarified that witnesses provided more incorrect details about the book than about the three weapons.

Table 2. Experiment 1: Proportion of correct details and number of incorrect details reported about the object by lecture and object conditions

Condition	Type of detail		<i>n</i>
	Proportion	Number	
	Correct	Incorrect	
Control lecture			
Book	0.17 _{a1} (0.59)	1.82 _{a1} (1.22)	34
Standard gun	0.26 _{b1} (0.62)	0.63 _{b1} (0.69)	27
Unusual appearance	0.29 _{b1} (0.56)	0.68 _{b1} (0.72)	28
Unusual type	0.28 _{b1} (0.73)	0.74 _{b1} (0.76)	27
WF lecture			
Book	0.17 ₁ (0.55)	1.52 ₁ (1.05)	25
Standard gun	0.22 ₂ (0.32)	1.18 ₂ (1.22)	28
Unusual appearance	0.24 ₂ (0.37)	1.27 ₂ (1.08)	26
Unusual type	0.23 ₂ (0.61)	1.29 ₂ (1.15)	28

Note: Within lecture conditions, means in the same column that do not share the same letter subscript differ at $p < 0.05$. Additionally, within object conditions, means in the same column that do not share the same number subscript differ at $p < 0.05$. Standard deviations are in parentheses.

Our second hypothesis regarding memory for the object was that witnesses in the WF Lecture condition should provide poorer descriptions of the three weapons than should witnesses who heard the control lecture, but memory for the book should be unaffected by the lecture. Regarding the proportion of correct details reported about the object, we found an interaction, $F(3, 215) = 2.72$, $p < 0.05$, $\omega^2 = 0.02$. Simple effects analyses showed that, as predicted, memory for the book was about the same in each lecture condition, $F(1, 215) = 0.04$, $p > 0.05$, $\omega^2 < 0.001$. Compared to controls, however, witnesses who heard the weapon focus lecture reported a smaller proportion of correct details in the Standard Gun ($F[1, 215] = 7.43$, $p < 0.01$, $\omega^2 = 0.14$), Unusual Appearance ($F[1, 215] = 37.25$, $p < 0.001$, $\omega^2 = 0.74$), and Unusual Type conditions ($F[1, 215] = 76.58$, $p < 0.001$, $\omega^2 = 0.87$).

We similarly obtained an interaction regarding the number of incorrect details reported about the object, $F(3, 215) = 2.58$, $p = 0.05$, $\omega^2 = 0.02$. Follow-up simple effects analyses revealed no difference for the book, $F(1, 215) = 1.29$, $p > 0.05$, $\omega^2 \approx 0$. However, WF Lecture witnesses reported more incorrect details than did controls in the Standard Gun ($F[1, 215] = 4.02$, $p < 0.05$, $\omega^2 = 0.05$), Unusual Appearance ($F[1, 215] = 4.56$, $p < 0.05$, $\omega^2 = 0.08$), and Unusual Type conditions ($F[1, 215] = 3.96$, $p < 0.05$, $\omega^2 = 0.06$).

Memory for the lecturer's appearance

We did not expect either of our independent variables to affect memory for the lecturer. As predicted, we found no effects for the number of correct details (all p 's > 0.37 ; all ω^2 's < 0.001 ; overall $M = 17.50$, $SD = 3.53$) or the number of incorrect details reported (all p 's > 0.25 ; all ω^2 's < 0.01 ; overall $M = 6.59$, $SD = 2.01$).

Anxiety

We measured anxiety using the Tension subscale of the AD ACL. Across conditions, witnesses' ratings fell below the scale's midpoint of 12.5 (overall $M = 9.08$, $SD = 3.87$). There were no significant effects.

Discussion

The data support the conclusion that weapons do not capture attention automatically and involuntarily. Among witnesses who heard the WF Lecture, there were no significant differences between object conditions. Although previous research has failed to identify anxiety as a cause of the weapon focus effect, some critics may argue that one limitation of our finding is that the witnesses were not particularly stressed during the time that they observed the event, as shown by their moderately low AD ACL scores. In Experiment 2 we addressed this point.

The results generally contradict the hypothesis that especially unusual weapons capture attention or attract attention more strongly. Although Control Lecture witnesses reported more incorrect details about the target if they saw the antique gun rather than the standard gun, most dependent variables did not change as a function of unusualness. The implications of this set of results are addressed more fully in the General Discussion.

Our second research hypothesis was that, among Control Lecture witnesses, descriptions of the weapon would be more accurate than descriptions of the neutral object. Consistent with the hypothesis, descriptions of the book included a lower proportion of correct details and more incorrect details than did descriptions of the three weapons. Comments regarding this result are deferred until the General Discussion.

EXPERIMENT 2

Experiment 2 had three purposes. First, we attempted to replicate the findings of the first experiment using a different target person who was physically dissimilar to the previous target and wearing different clothing. Second, we recognized that the witnesses in Experiment 1 who heard the WF Lecture may have realised from the content of that lecture that they might later see a weapon, but the same was not true for the Control Lecture witnesses. We wanted to rule out the possibility that the witnesses in the WF Lecture condition provided better reports of the armed target simply because they were alerted to expect a weapon and not because they learned about the weapon focus effect. Therefore, in Experiment 2 all witnesses were told explicitly and in advance that they might see a weapon.

Our third purpose was to address an additional theoretical question. We thought that, despite the Experiment 1 data, weapons might nevertheless capture attention under certain conditions, specifically when witnesses are experiencing a higher level of anxiety than what they would feel in typical, everyday situations. Although the witnesses in the first experiment might have felt slightly more anxious than they normally would (due to the aggressive behaviour of the target, for example), their AD ACL scores were below the scale's midpoint and perhaps not as high as those of witnesses to actual crimes would be. We recognised that witnesses with higher anxiety levels might feel cognitively overloaded and/or experience a reduced attentional capacity (Christianson, 1992; Easterbrook, 1959). As a result, they might be unable to follow our instructions to avoid weapon focus, so that a weapon could involuntarily capture their attention. We wished to investigate this possibility.

Method

Participants

The participant-witnesses were 113 undergraduates enrolled in psychology classes at the same university as Experiment 1 participants. They partially fulfilled a course requirement

by participating and were tested in groups of three to five students. They ranged in age from 18 to 39 years ($M = 19.18$, $SD = 2.61$). Most (97%) were White, and 64% were female.

Materials and procedure

The experiment was divided into two stages: the training phase and the application phase. Upon arrival at the room where the training took place, the witnesses first completed a consent form. Next, the experimenter explained that they would learn some information about how to be credible eyewitnesses and later would try to apply that information by observing an actor and eventually trying to remember what they saw. The experimenter told the witnesses that the actor might be armed with a weapon but assured them that, if he was, he would not harm anyone.

At this point, the witnesses were assigned randomly to one of two lecture conditions. As in Experiment 1, those in the Weapon Focus (WF) Lecture condition learned about that phenomenon and were instructed to try to avoid looking too much at the weapon, whereas control witnesses heard about confidence and credibility. In both conditions, the experimenter spent less than 90 seconds lecturing. Immediately afterward, all witnesses were given the chance to ask questions about the lecture they heard. Then, as a manipulation check, they completed a written form that asked them to summarise the lecture to verify that they understood and remembered it. The experimenter inspected each witness's summary before proceeding to the application phase. None of the witnesses failed to respond satisfactorily.

The form for the manipulation check also included an item that asked the witnesses for their opinion about what they should do if they were to witness a crime involving a weapon. The purpose of this item was to determine whether any control witnesses were already familiar with weapon focus research. None were. In addition, the form asked witnesses for demographic information.

For the application phase, the witnesses moved to a different room on the other side of the building. Upon arriving, they sat at desks that were arranged in a semi-circle facing the door. The experimenter reminded them that they would observe an actor and later try to remember what they saw. In order to increase their anxiety levels, the experimenter also told them that, after completing two written forms, they would individually give oral presentations about their observations to a group of graduate students, who would then evaluate their performance as witnesses. Actually, no oral presentations were required, and no graduate students evaluated the witnesses. Elevating participants' anxiety levels by telling them that they would (or might) have to make a speech is a technique that has been used by previous researchers (e.g. Fredrickson, Mancuso, Branigan, & Tugade, 2000; Ready, Bothwell, & Brigham, 1997).

Prior to conducting this experiment, pilot data were collected to confirm that leading the witnesses to believe that they would have to make a presentation would increase their anxiety levels. Just before watching a monologue (identical to the one used in the main experiment and described below) given by an actor who carried either a gun or a textbook, a randomly selected 14 of the 27 pilot participants were told that they would orally present their observations to graduate students. Immediately after the monologue, the participants completed the short form of the AD ACL (used in Experiment 1). The results on the Tension subscale showed that the participants who expected to speak publicly scored higher ($M = 13.14$, $SD = 2.69$) than controls ($M = 9.31$, $SD = 3.07$), $F(1, 23) = 11.47$, $p = 0.003$, $\omega^2 = 0.28$. The object carried by the actor had no effect on these scores ($p > 0.20$, $\omega^2 = 0.02$).

After telling the witnesses in the main experiment that they would give oral presentations, the experimenter asked them to play the role of students enrolled in a statistics class who were attending a study session to prepare for an exam. They were told that the actor who would enter the room would pretend to be a student in the same class. The witnesses were to imagine that their instructor had stepped out of the room for a moment, and while she was gone they should continue to study. The experimenter gave each witness a specific statistics-related task to perform, such as using a calculator to find the answer to a problem or looking up terms in the glossary of a statistics textbook.

The experimenter then moved to a part of the room that was behind the witnesses. Approximately 30 seconds later, the actor entered. Depending on the condition, he carried either a gun or a textbook, as in Experiment 1. Speaking to the witnesses, he announced that he was looking for their professor, that he was displeased with the grade she had given him on his homework, and that he intended to find her. Through his tone of voice, he indicated that he was angry and upset. After his monologue, which lasted approximately 15 seconds, the actor left the room. As he did, he ordered the witnesses not to try to follow him.

Next the witnesses completed two written forms. The first was the short form of the AD ACL. The second was a memory questionnaire identical to the one used in the first experiment, except that it asked about only one person (the target) instead of two. After both forms were completed, the experimenter debriefed and dismissed the witnesses.

The design of this experiment was a 2 (lecture) $\times$ 2 (object carried by target) factorial. Both factors were manipulated between participants.

Results

Two judges developed a scoring system that specified the correct answers to the memory questionnaire. As in Experiment 1, two raters blind to the hypotheses then reviewed each witness's responses. They calculated the number of correct details and the number of incorrect details about the target's appearance, as well as the proportion of correct details reported about the object and the number of incorrect details about it. We solved disagreements by using the primary rater's scores in the data analyses. A sample of 120 responses indicated that interrater reliability was high ($r = 0.99$).

Anxiety

We attempted to elevate the witnesses' anxiety levels (as measured by the Tension subscale of the AD ACL) by making them believe that they would give an oral presentation. As expected, anxiety levels increased in Experiment 2 ($M = 12.99$, $SD = 3.70$) relative to Experiment 1 ($M = 9.08$, $SD = 3.87$), $F(1, 334) = 78.98$, $p < 0.001$, $\omega^2 = 0.19$.

Memory for the man's appearance

With respect to the number of correct details reported, we obtained a significant interaction between the lecture condition and the object, $F(1, 109) = 17.69$, $p < 0.001$, $\omega^2 = 0.12$ (see Table 3). As in Experiment 1, two sets of simple effects analyses were conducted for clarification. The first set considered the effect of exposure to the object in each lecture condition. The witnesses who heard the control lecture should have demonstrated a typical weapon focus effect. In line with this prediction, those who saw the book provided more correct details about the target individual than did those who saw the gun, $F(1, 109) = 19.30$, $p < 0.001$, $\omega^2 = 0.25$. The witnesses who heard the weapon focus

Table 3. Experiment 2: Details reported about the target and the object by lecture and object conditions

Condition	Details about target		Details about object		<i>n</i>
	Number	Number	Proportion	Number	
	Correct	Incorrect	Correct	Incorrect	
Control lecture					
Book	28.21 _{a1} (4.18)	5.57 _{a1} (1.77)	0.18 _{a1} (0.06)	1.80 _{a1} (1.19)	28
Gun	22.89 _{b1} (4.73)	8.93 _{b1} (3.08)	0.26 _{b1} (0.04)	0.32 _{b1} (0.55)	28
WF lecture					
Book	26.86 _{a1} (3.60)	6.24 _{a1} (2.20)	0.16 ₁ (0.04)	1.74 ₁ (0.90)	29
Gun	28.71 _{a2} (5.45)	6.07 _{a2} (2.58)	0.20 ₂ (0.03)	1.61 ₂ (1.07)	28

Note: Within lecture conditions, means in the same column that do not share the same letter subscript differ at $p < 0.01$. Additionally, within object conditions, means in the same column that do not share the same number subscript differ at $p < 0.01$. Standard deviations are in parentheses.

lecture, however, reported about the same number of correct details no matter which object they saw, $F(1, 109) = 2.38$, $p > 0.05$, $\omega^2 = 0.02$.

The second set of simple effects analyses examined the effect of the lecture in each object condition. As expected, among witnesses who saw the gun, WF lecture witnesses reported more correct details than did control witnesses, $F(1, 109) = 23.10$, $p < 0.001$, $\omega^2 = 0.24$. There was no effect of lecture, however, when the book was present, $F(1, 109) = 1.27$, $p > 0.05$, $\omega^2 = 0.01$.

Regarding the number of incorrect details, we found another significant interaction, $F(1, 109) = 14.60$, $p < 0.001$, $\omega^2 = 0.76$. When considering simple effects of the object in each lecture condition, we discovered that, in the Control Lecture condition, fewer incorrect details were reported when the book rather than the gun was present, $F(1, 109) = 26.22$, $p < 0.001$, $\omega^2 = 0.30$. In contrast, there was no difference between objects in the WF Lecture condition, $F(1, 109) = 0.07$, $p > 0.05$, $\omega^2 < 0.01$.

When examining the effect of the lecture in each object condition, we found that, in the gun condition, witnesses who heard the WF lecture reported fewer incorrect details than did controls, $F(1, 109) = 18.99$, $p < 0.001$, $\omega^2 = 0.19$. In contrast, the lecture made no difference when witnesses saw the book, $F(1, 109) = 1.07$, $p > 0.05$, $\omega^2 = 0.01$.

Memory for the object

As in Experiment 1, we first conducted one-way analyses of variance using only Control Lecture data in order to determine whether witnesses uneducated about weapon focus would provide better descriptions of the gun than the book. As expected, we discovered that the proportion of correct details reported was greater for the gun ($M = 0.26$, $SD = 0.05$) than for the book ($M = 0.18$, $SD = 0.06$), $F(1, 51) = 35.28$, $p < 0.001$, $\omega^2 = 0.39$. In addition, the number of incorrect details was smaller for the gun ($M = 0.32$, $SD = 0.55$) than for the book ($M = 1.80$, $SD = 1.19$), $F(1, 51) = 34.97$, $p < 0.001$, $\omega^2 = 0.65$. These analyses exclude three witnesses who failed to report that the target carried a book; no witnesses who saw the gun failed to identify it.

We then tested a second hypothesis: that WF lecture witnesses should provide less accurate information about the gun than should witnesses who heard the control lecture, but memory for the book should not vary by lecture condition. With respect to

the proportion of correct details reported about the object, we obtained an interaction, $F(1, 108) = 6.92$, $p = 0.01$, $\omega^2 = 0.03$. As expected, a simple effects analysis revealed that memory for the book was similar in the two lecture conditions, $F(1, 108) = 1.03$, $p > 0.05$, $\omega^2 = 0$. However, WF lecture witnesses reported a smaller proportion of correct details about the gun than did controls, $F(1, 108) = 23.23$, $p < 0.001$, $\omega^2 = 0.37$.

We also obtained an interaction for the number of incorrect details, $F(1, 108) = 13.49$, $p < 0.001$, $\omega^2 = 0.08$. The lecture did not influence memory for the book, $F(1, 108) = 0.05$, $p > 0.05$, $\omega^2 < 0.001$, but WF lecture witnesses reported more incorrect details about the gun than did controls, $F(1, 108) = 25.60$, $p < 0.001$, $\omega^2 = 0.36$.

Discussion

In the second experiment, we used a new target individual, warned witnesses in all conditions that they might see a weapon, and raised witnesses' anxiety levels to above the midpoint of the AD ACL Tension subscale. Even with these changes, the data replicated the Experiment 1 finding that witnesses can avoid the weapon focus effect if instructed to do so and strengthened our conclusion that weapons do not 'strongly' capture attention.

We also replicated the results regarding memory for the object carried by the target. These results imply that, when the weapon focus effect occurs, witnesses who see a weapon not only remember less about the perpetrator than they would if a neutral object were present but also remember the weapon better than they would a neutral object.

GENERAL DISCUSSION

Our primary research question concerned the mechanism by which weapons attract attention. Previous research has indicated that the weapon focus effect occurs because a weapon's unusualness within many contexts attracts witnesses' attention (Mitchell et al., 1998; Pickel, 1998, 1999). Our data extend that research by demonstrating that weapons seem to capture attention in a 'weak' rather than a 'strong' way (Yantis, 1996). Thus, direction of visual attention to a weapon is not an involuntary and unavoidable response on the part of the witnesses, even under conditions of elevated anxiety. Instead, naive witnesses will focus on a weapon, but educated ones can turn their attention elsewhere if they actively endeavour to do so. These new findings can enhance researchers' knowledge of the cognitive processes that underlie the weapon focus effect. The results imply that a weapon's presence does not produce an automatic reaction that witnesses cannot control and about which they have no awareness.

In addition to assessing the possibility of attentional capture *per se*, we also wondered whether the instructions given to witnesses might interact with the weapon's unusualness, with 'unusualness' defined either in terms of visual appearance or type. We thought that the answer to this question would help determine whether capture takes the strong form in some situations and the weak form in others. We found little evidence that the form of capture varies with weapon unusualness. On only one measure (the number of incorrect details about the target) was one of the unusual guns (specifically, the unusual type) associated with poorer performance than the standard gun. However, even though our antique pistol and the gun with fluorescent tape were truly more unusual than the standard

gun, it is possible that the three weapons were all so unusual within a classroom setting that differences between conditions were difficult to detect. Therefore, researchers could continue to explore the effects of unusualness in future studies, as this variable may be relevant to questions about capture. Perhaps several weapons varying along a continuum of unusualness could be tested. By including weapons that seem less unusual or by changing the context of the scene that the witnesses observe (e.g. a gun is not unusual at a shooting range), one might be able to rule out the possibility of strong capture more definitively.

There is a potential practical application for our findings. People who are most likely to witness actual crimes could perhaps be taught to overcome weapon focus (meaning that they could recover from the memory deficit that typically occurs when a weapon is present). For example, convenience store clerks, bank tellers, or other individuals who work at businesses with a high risk of robbery² could benefit from training specific to the weapon issue, just as many of these employees already receive tips on how to estimate a perpetrator's height and so on. Ultimately, the training might enable them to supply police investigators with more accurate descriptions of the perpetrators they observe, which in turn could lead to a greater probability that the culprits would be arrested and successfully prosecuted.

Before we began collecting data, we were unsure how much training witnesses would need in order to overcome the weapon focus effect. We started with a brief lecture that was presented in a subtle way, so that the witnesses were not explicitly told until the end of the lecture that they might get a chance to apply what they had learned. We found that the witnesses were able to follow their instructions. Therefore, extensive training or practice is not necessary to achieve an effect, at least if the witnesses are tested after a short delay. Our witnesses waited for only a few seconds (in Experiment 1) or about 20 minutes (in Experiment 2) before attempting to apply the instructions they received. In actual cases, however, months or years might pass between the training and the observation of the crime. The witnesses might forget some of the information they learned, or it might not be salient to them at the time that the crime occurs. If so, perhaps periodic refresher courses could prove useful. Future research could address the practical issue of the long-term effects of training.

Another potential difference between our witnesses and those in real-world cases is that the latter might have higher levels of anxiety while viewing a crime. We tried to engage the witnesses (rather than treat them as an uninvolved audience) by having them play specific roles and by having the target address them directly. Moreover, we elevated their anxiety levels in Experiment 2 with no change in the results. Therefore, we contend that witnesses can probably apply their training even if they feel moderately anxious. However, it is possible that extremely high anxiety would lead to a catastrophic decrement in memory performance (Deffenbacher, 1994) and an impaired ability to control attentional focus. Could real witnesses successfully follow instructions to avoid weapon focus? Some no doubt feel terrified as they watch a crime unfold, especially if they are personally threatened or victimized. On the other hand, some witnesses feel only moderate or low levels of anxiety. For example, Christianson and Hübner (1993) found that bystander witnesses to actual bank robberies retrospectively reported their fear of injury, fear of death

²For various reasons, such as their location and extended hours of operation, some businesses are frequently targeted. For example, by December 6, 2005, a particular convenience store in Indianapolis had been robbed eight times during the calendar year (Higgins, 2005).

and overall fear below the midpoint of the rating scale, and the tellers' ratings were near the midpoint. Similarly, all of the witnesses that Yuille and Cutshall (1986) categorised as less directly involved in a shooting retrospectively rated their stress as five or less on a 7-point scale, and one witness reported feeling no stress. In sum, different witnesses in real cases probably feel very different levels of anxiety, but in at least some situations anxiety probably would not seriously impair the ability to follow instructions to avoid weapon focus. Because we were mainly interested in using the present study to examine theoretical issues associated with attentional capture, we leave an empirical investigation of the practical applications to future researchers.

Our second research question was whether naive witnesses can remember the weapon better than they can a neutral object. Our findings indicate that they do; among Control Lecture witnesses, descriptions of the weapons were more accurate than descriptions of the book. Furthermore, Control Lecture witnesses remembered the weapons better than did WF Lecture witnesses. Shaw and Skolnick (1999), in contrast, obtained no difference between naive witnesses' descriptions of a weapon versus a neutral object, but they assessed memory using only four questions, with the responses scored categorically as correct or incorrect. We suggest that significant results emerged in our study because we measured witnesses' memory more sensitively, asking a series of open-ended questions about the object's appearance so that witnesses had the opportunity to report many details. Nevertheless, it would be wise to attempt to replicate our results in future studies using additional objects. Although we used three different weapon conditions, all were handguns. Moreover, we used only one control object (a textbook).

If this finding proves to be reliable, then it could be useful to police investigators. Although the presence/absence of a weapon is an example of what Wells (1978) called an *estimator variable*, or one that can be estimated but not controlled by the criminal justice system, investigators can certainly decide which questions to ask when interviewing witnesses (in other words, the structure or composition of the interview is a *system variable*). Knowing that witnesses uninformed about the weapon focus effect are likely to direct their attention to the weapon, a police officer could make a point of eliciting a detailed description of the weapon involved in a crime. This information could help in at least two ways. First, it could assist in identifying the perpetrator if the officer can associate the weapon with a particular suspect (e.g. Joe Smith owns a gun like this) or a type of suspect (e.g. members of the Vice Lords gang carry knives like this). Second, the information could increase the likelihood of recovering the weapon because patrol officers know what to look out for, and after it is found, the weapon can be used as evidence during the prosecution of the suspect.

Our study has some limitations that should be kept in mind when interpreting the results. One is that our witnesses did not observe an actual crime. Real witnesses' motivation to remember what they saw accurately and completely might be either higher (due to feelings of civic duty) or lower (due to fear of retaliation from the perpetrator) than our witnesses'. Another limitation is that our sample was not very demographically diverse, as most participants were young, white, and from the Midwestern U.S. Additional research is needed to determine the reliability of our findings. However, the current evidence points to two conclusions: that the cognitive mechanism responsible for the weapon focus effect is the weak form of attentional capture, which in turn suggests that witnesses who are informed about the effect are capable of overcoming it; and that witnesses who are uninformed should be asked in detail about the weapon, as they will probably remember it more accurately than they would a non-weapon.

ACKNOWLEDGEMENTS

We thank Dustin Bennett, Misty Bodkins, Marianna Craig, Kim Gordon, Tom Lenhardt, Linh Littleford, Cathy McCue, and Kristin Ritchey for their assistance with this project.

REFERENCES

- Barnes, R., & Jones, M. R. (2000). Expectancy, attention, and time. *Cognitive Psychology*, 41, 254–311.
- Christianson, S.-Å. (1992). Emotional stress and eyewitness memory: A critical review. *Psychological Bulletin*, 112(2), 284–309.
- Christianson, S.-Å., & Hübner, B. (1993). Hands up! A study of witnesses' emotional reactions and memories associated with bank robberies. *Applied Cognitive Psychology*, 7(5), 365–379.
- Deffenbacher, K. A. (1994). Effects of arousal on everyday memory. *Human Performance*, 7(2), 141–161.
- Easterbrook, J. A. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological Review*, 66, 183–201.
- Fredrickson, B. L., Mancuso, R. A., Branigan, C., & Tugade, M. M. (2000). The undoing effect of positive emotions. *Motivation and Emotion*, 24(4), 237–258.
- Henderson, J. M., Weeks, P. A., & Hollingworth, A. (1999). The effects of semantic consistency on eye movements during complex scene viewing. *Journal of Experimental Psychology: Human Perception and Performance*, 25(1), 210–228.
- Higgins, W. (2005). Merchants up in arms over robbery spree. *The Indianapolis Star*, A1–A9.
- Jones, M. R., Moynihan, H., MacKenzie, N., & Puente, J. (2002). Temporal aspects of stimulus-driven attending in dynamic arrays. *Psychological Science*, 13(4), 313–319.
- Kramer, T. H., Buckhout, R., & Eugenio, P. (1990). Weapon focus, arousal, and eyewitness memory: Attention must be paid. *Law and Human Behavior*, 14(2), 167–184.
- Loftus, E. F., Loftus, G. R., & Messo, J. (1987). Some facts about “weapon focus.” *Law and Human Behavior*, 11(1), 55–62.
- Loftus, G. R., & Mackworth, N. H. (1978). Cognitive determinants of fixation location during picture viewing. *Journal of Experimental Psychology: Human Perception and Performance*, 4, 565–572.
- Maass, A., & Köhnken, G. (1989). Eyewitness identification: Simulating the ‘weapon effect.’ *Law and Human Behavior*, 13(4), 397–408.
- Mitchell, K. J., Livovsky, M., & Mather, M. (1998). The weapon focus effect revisited: The role of novelty. *Legal and Criminological Psychology*, 3, 287–303.
- Pickel, K. L. (1998). Unusualness and threat as possible causes of ‘weapon focus.’ *Memory*, 6(3), 277–295.
- Pickel, K. L. (1999). The influence of context on the ‘weapon focus’ effect. *Law and Human Behavior*, 23(3), 299–311.
- Pickel, K. L., French, T. A., & Betts, J. M. (2003). A cross-modal weapon focus effect: The influence of a weapon's presence on memory for auditory information. *Memory*, 11(3), 277–292.
- Ready, D. J., Bothwell, R. K., & Brigham, J. C. (1997). The effects of hypnosis, context reinstatement, and anxiety on eyewitness memory. *International Journal of Clinical and Experimental Hypnosis*, 45(1), 55–68.
- Remington, R. W., Johnston, J. C., & Yantis, S. (1992). Involuntary capture by abrupt onsets. *Perception and Psychophysics*, 51(3), 279–290.
- Shaw, J. I., & Skolnick, P. (1999). Weapon focus and gender differences in eyewitness accuracy: Arousal versus salience. *Journal of Applied Social Psychology*, 29, 2328–2341.
- Thayer, R. E. (1967). Measurement of activation through self-report. *Psychological Reports*, 20, 663–678.
- Thayer, R. E. (1989). *The biopsychology of mood and arousal*. New York, NY: Oxford Press.
- Tooley, V., Brigham, J. C., Maass, A., & Bothwell, R. K. (1987). Facial recognition: Weapon effect and attentional focus. *Journal of Applied Social Psychology*, 17(10), 845–859.

- Wells, G. L. (1978). Applied eyewitness testimony research: System variables and estimator variables. *Journal of Personality and Social Psychology*, 36, 1546–1557.
- Wogalter, M. S., & Laughery, K. R. (1996). Warning! Sign and label effectiveness. *Current Directions in Psychological Science*, 5(2), 33–37.
- Yantis, S. (1996). Attentional capture in vision. In A. F. Kramer, M. G. H. Coles, & G. D. Logan (Eds.), *Converging operations in the study of visual selective attention* (pp. 45–76). Washington, DC: American Psychological Association.
- Yantis, S., & Egeth, H. E. (1999). On the distinction between visual salience and stimulus-driven attentional capture. *Journal of Experimental Psychology: Human Perception and Performance*, 25(3), 661–676.
- Yantis, S., & Jonides, J. (1990). Abrupt visual onsets and selective attention: Voluntary versus automatic allocation. *Journal of Experimental Psychology: Human Perception and Performance*, 16(1), 121–134.
- Yuille, J. C., & Cutshall, J. L. (1986). A case study of eyewitness memory of a crime. *Journal of Applied Psychology*, 71(2), 291–301.

APPENDIX

SECTION 1: THE WOMAN (LAURA)

1. Think about the top Laura was wearing.

A. What kind of a top was it?

_____ shirt _____sweater _____jacket _____sweatshirt _____ other; describe:

B. Refer to your answer above. Can you describe more specifically what kind it was? For example, if you said it was a sweatshirt, was it a hooded sweatshirt or a crew neck? Did it zip up the front? Was there a design or logo on it?

C. What colour was Laura's top?

D. Was the top long-sleeved or short-sleeved?

2. Think about the pants or shorts Laura was wearing.

A. Were they pants or shorts? _____pants _____shorts

B. Can you describe more specifically what kind they were? For example, if you said they were pants, were they jeans, track pants, dress pants, khakis or some other kind? Was there a brand name visible?

C. What colour were Laura's pants or shorts?

3. Was Laura wearing glasses? _____yes _____no If you said yes, please describe them (colour of frames and style):

4. Was Laura wearing a hat? _____yes _____no If you said yes, please describe it (What colour was it? What kind? Was there a logo?):

5. A. What kind of footwear was Laura wearing?

_____athletic shoes _____boots _____casual shoes _____dressy shoes _____sandals
_____other; describe:

B. Refer to your previous answer. Can you describe more specifically what kind of footwear she wore? For example, if you said boots, were they hiking boots, cowboy boots, or some other kind? Did they lace up or slip on? Was a brand name visible?

C. What colour was the footwear?

6. Was Laura wearing any jewelry, such as a wristwatch, earrings, a necklace, a bracelet or rings? If you say yes, please describe the colour and type.
7. What was Laura's ethnic background?
_____white _____black _____Hispanic/Latina _____Asian _____other; describe:
8. About how tall was she? Please write down a specific height in feet and inches.
9. How would you describe her body type?
_____thin _____medium build _____overweight
10. What colour was her hair?
_____light brown _____dark brown _____red _____black _____gray _____blonde
_____other; describe:
11. How long was her hair?
_____short (above the ears and collar) _____about collar-length _____long (over the shoulders)
12. Was her hair pulled back with a rubber band or clip, or did she wear it loose?
13. Exactly how old you think she is (please write down a specific number of years)?
_____ years old
14. Did Laura have any tattoos that you could see? _____yes _____no If yes, please describe where they were on her body and what they looked like:
15. Did Laura have any scars or birthmarks that you could see? _____yes _____no If yes, please describe where they were on her body and what they looked like:
16. Did Laura explain in her lecture to the class what witnesses should do if they see a crime in which a weapon is involved? If so, what did she say that witnesses should do? Check one:

_____ she didn't specifically address the issue in her lecture

_____ she did address this issue; in one sentence, please summarise what she said
17. In your opinion, what should witnesses do if they see a crime in which a weapon is involved? Please answer in one sentence.

SECTION 2: THE MAN

1. Think about the top the man was wearing.

A. What kind of a top was it?

_____ shirt _____sweater _____jacket _____sweatshirt _____ other; describe:

B. Refer to your last answer. Can you describe more specifically what kind it was? For example, if you said it was a sweatshirt, was it a hooded sweatshirt or a crew neck? Did it zip up the front? Was there a design or logo on it?

C. What color was the man's top?

D. Was the top long-sleeved or short-sleeved?

2. Think about the pants or shorts the man was wearing.

A. Were they pants or shorts? _____pants _____shorts

B. Can you describe more specifically what kind they were? For example, if you said they were pants, were they jeans, track pants, dress pants, khakis or some other kind? Was there a brand name visible?

C. What colour were the man's pants or shorts?

3. Was the man wearing glasses? _____yes _____no If you said yes, please describe them (colour of frames and style):

4. Was the man wearing a hat? _____yes _____no If you said yes, please describe it (What color was it? What kind? Was there a logo?):

5. A. What kind of footwear was the man wearing?

_____athletic shoes _____boots _____casual shoes _____dressy shoes _____sandals _____other; describe:

B. Refer to your previous answer. Can you describe more specifically what kind of footwear he wore? For example, if you said boots, were they hiking boots, cowboy boots, or some other kind? Did they lace up or slip on? Was a brand name visible?

C. What colour was the footwear?

6. Was the man wearing any jewellery, such as a wristwatch, earring, a necklace, a bracelet, or rings? If you say yes, please describe the colour and type.

7. What was the man's ethnic background?

_____white _____black _____Hispanic/Latino _____Asian _____other; describe

8. About how tall was he? Please write down a specific height in feet and inches.

9. How would you describe his body type?
 _____thin _____medium build _____overweight
10. What colour was his hair?
 _____light brown _____dark brown _____red _____black _____gray _____blonde
 _____other; describe:
11. How long was his hair? _____shaved _____short (above the ears and collar)
 _____about collar-length _____long (over the shoulders)
12. Exactly how old you think he is (please write down a specific number of years)?
 _____ years old
13. Did the man have any tattoos that you could see? _____yes _____no If yes, please describe where they were on his body and what they looked like:
14. Did he have any scars or birthmarks that you could see? _____yes _____no If yes, please describe where they were on his body and what they looked like:
15. Did he have any facial hair? _____yes _____no If yes, please describe what it looked like:
16. What did the man say while he was in the room? Please be as specific as you can.
17. Have you ever seen this man before the experiment today? If so, please explain where you've seen him.
18. A. Did the man bring any object with him into the room? _____no _____yes

If you said there was an object, please answer the remaining six questions. If you said there was not an object, you are finished with the questionnaire. Please turn it face down on your desk and wait quietly. Thank you!

- B. Which hand did he hold the object in? _____right _____left
- C. What was the object?
- D. What type or kind was it? For example, if you were describing a 'truck', you could say it was a pickup truck, or a moving van, or a semi, or a dump truck.
- E. What colour(s) was it?
- F. Please describe the object in as much detail as you can. How big was it? What was its shape?
- G. What did the man do with the object?

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