

Weapon Focus Effect: A Literature Review

Winner, Social Sciences

Author: Tyler Hatfield

Introduction

The weapon focus effect is described in the literature as the narrowing of a witnesses' attention to the weapon being held by the perpetrator of a crime, to the detriment of peripheral details such as the perpetrator's appearance. Research into this phenomenon intensified during the resurgence of interest in psychology and law in the 1960s, when the abilities and limitations of eyewitness testimony became a major focus of forensic psychologists. The extent to which criminal prosecutions relied upon the evidence given by an eyewitness to achieve a conviction gave rise to the study of how situational and perceptual factors could influence what that witness is able to recall (Marshall, 1966). Early on, the presence or absence of a weapon in a violent crime was identified as one factor that could influence the memory of an eyewitness (Kuehn, 1974). This review will explore the two major hypothesized causes of weapon focus, the arousal hypothesis and the fixation hypothesis, and also examine the ecological validity of the phenomenon.

Initial research assumed the weapon focus effect to be caused by a decrease in peripheral perception as a result of a narrowing of attention due to a heightened state of physical and mental arousal in the presence of a weapon. In the arousal hypothesis, peripheral details are therefore marginalized and not encoded into memory, and this lack of peripherally encoded details, such as facial features, clothing, or mannerisms, diminishes the eyewitness's ability to identify the offender in a police lineup. In contrast, the fixation hypothesis proposes that the phenomenon is not related to mental or physical arousal at all, in fact it is not even caused by a weapon, but is instead based on an individual's fixation on any object that is interesting, unusual, or out of context with what is expected within the environment.

While some experimental psychologists have attempted to determine the cause of the weapon focus effects observed in laboratory experiments, others have questioned whether this research can be extrapolated to the actual witnesses of violent crimes. In a discussion paper on the probative value of eyewitness testimony, Wells, Memon, and Penrod (2006) warn of the dangers of generalizing laboratory experiments conducted on estimator variables to actual eyewitness crimes. The authors caution that rigid experimental controls can never truly encompass the infinite possibilities of scale and variable interactions that occur in violent crimes (Wells et al., 2006). Although the weapon focus effect on eyewitness memory has been studied extensively over the last three decades, experiments have produced conflicting results and no clear consensus on the ecological validity of the phenomenon.

Arousal Hypothesis

Early research attributed the narrowing of attention found in the weapon focus effect to a heightened state of arousal and used Easterbrook's (1959) study of cue-utilization as the underpinning of the arousal theory of weapon focus. Easterbrook (1959) found that a range of environmental cues exist in any given situation and that the totality of that range is the number of cues an individual can observe, focus on, and be able to respond to. The size of this cue utilization range is narrowed by emotional arousal and level of general excitement in reaction to a stimulus (Easterbrook, 1959). This hypothesis can be applied to the emotional arousal produced by a weapon, present during the commission of a crime, where the range of cues being processed by an individual would narrow to the weapon and peripheral information would not be encoded. Studies that apply cue-utilization and arousal to the weapon focus effect traditionally contain a low stress condition and a variety of high stress conditions. In the low stress condition, the participants can observe the researcher's scenario in the absence of arousal and maximize the amount of peripheral details that are encoded. Participants are then asked to recall components of the scenario and scored on their performance. The high stress conditions are designed to create varying levels of arousal in the participants, when viewing the research scenario, in order to reduce peripheral detail encoding and inhibit recall performance. The participants' performance on the recall tasks are then compared across conditions to determine any significant differences.

Johnson and Scott (1976) conducted a simulation study that demonstrated the weapon focus effect in female participants. Ethically unsound by today's standards, this study consisted of the typical high stress weapon and low stress non-weapon conditions, in which the participants' ability to identify the actor in a scenario was tested. What made this experiment unique was the amount of genuine stress placed on the unsuspecting participants. The high stress condition began with intense shouting and arguing in a room adjacent to where completely unaware participants waited to begin the study. The arguing was then followed by a series of loud crashes, after which, a man emerged from the adjacent room, into the participant waiting area, holding a large bloody knife in his bloody hands. The participants in this high stress weapon condition were better able to identify the object in the actor's hands, the bloody knife, and were significantly less able to identify the actor from a photo array than were the participants in the low stress condition (involving a grease pen and grease covered hands, Johnson & Scott, 1976). While the experiment may have been ethically unsound, it remains one of the most realistic laboratory studies on the weapon focus effect and participant arousal.

Kramer, Buckhout, and Eugenio (1990) attempted to replicate the effect of arousal on weapon focus through an experiment designed to mimic the stress and ambience of a real crime scene. In the first component of the study, a violent crime was staged using a photograph-based scenario, displayed on a slide projector, with an accompanying ominous sound track in order to increase arousal. The scenario consisted of a card game where one player was accused of cheating, which led to an argument and violent physical altercation where the victim had a bottle smashed over his head. Participants were divided into the weapon highly visible (WHV) and weapon less visible (WLV) conditions, and were shown the same scenario with the exception of one photograph. In the WHV condition, the bottle was clearly visible in the attacker's hands, while in the WLV condition, the bottle was concealed behind the

attacker's back. After the scenario was completed, participants were asked questions about the attacker's appearance and the level of their own arousal throughout the scenario. In both the WHV and WLW condition, it was found that as a participant's arousal increased, the amount of recalled details significantly decreased (Kramer et al., 1990). The resulting lineup identifications produced no significant difference in accuracy between conditions, but participants in the high weapon visibility condition were significantly better able to identify and describe the weapon (Kramer et al., 1990).

While the results in the first component of this study seem to support the arousal hypothesis of the weapon focus effect, in the second component, Kramer et al. (1990) attempted to produce the same effect in the absence of both weapons and arousal. The second experiment used the same framework as the first, but contained a photographic slide show that depicted a benign event intended to minimize the participants' level of arousal. This experiment was based on a simple scenario involving a man walking down the hall holding a magazine or a meat cleaver, with no other stimulus present and all other aspects of the two conditions identical. After viewing the slides, each participant was given a questionnaire about the man's physical description, including height, weight, age, facial hair, and clothing. Arousal in both groups of participants was found to be low and insignificant, and there was also no significant difference found in the lineup identification accuracy between the conditions. However, the weapon condition participants scored significantly lower on the feature identification accuracy questionnaire (Kramer et al., 1990).

Similar conflicting findings throughout the eyewitness literature led Deffenbacher et al. (2004) to develop a meta-analysis of the studies that the authors believed used experimental stress conditions that activated a defensive response and activation mode of attention control. The authors believed that only this type of high stress arousal could be shown to correlate with the weapon focus effect, in contrast to the popular cue-utilization hypothesis (Easterbrook 1959), which only required general emotional arousal to cause a narrowing of focus. Deffenbacher et al. (2004) included 450 existing studies of facial recognition ability under variable stress or anxiety criteria. The authors concluded that their statistical analysis provided clear support for heightened stress negatively affecting eye witness memory (Deffenbacher et al., 2004). However, only studies that the authors' deemed to have utilized a specific mode of arousal in the methodology were included in the meta-analysis. This type of judgment-based study selection could skew the data by introducing a bias, even unconsciously, into the statistical analysis. The conflicting findings in the weapon focus effect research based on the arousal hypothesis suggests that while there may be a correlation between weapon-based arousal and memory impairment in an eyewitness, it is not a causal relationship.

Fixation Hypothesis

Current studies (e.g. Erickson, Lampinen, & Leding, 2014; Hope & Wright, 2007; Pickel, Narter, Jameson, & Lenhardt, 2008) have begun to investigate factors, outside of stress and arousal, that may account for the memory impairment of eyewitnesses attributed to the weapon focus effect. One of the works underpinning the current research direction is a study by Loftus and Mackworth (1978), on the cognitive

reasons individuals tend to fixate more often on specific objects within their visual field. The authors describe visual scanning as a process that consists of periods of fixations, with very low eye movement, and saccades, which consist of rapidly moving the eye from place to place. By tracking the eye movements of participants while they viewed photographs of landscape scenes, the authors showed that individuals fixated more often on informative items, and items that had a low probability of normally belonging within the scene, than on uninteresting items that fit the expected scenario (Loftus & Mackworth, 1978).

Loftus, Loftus, and Messo (1987) applied the eye movement tracking technique to the weapon focus effect in an experiment which displayed a new series of slides, containing a weapon and a non-weapon condition, in the absence of any emotional arousal. The scenario depicted customers in a restaurant line waiting to pay their bills and only differed in one aspect: the customer in the non-weapon condition displayed a check to the cashier and received money in return, while the customer in the weapon condition displayed a gun to the cashier and also received money in return. In addition to eye movement tracking, each participant was given a questionnaire about peripheral details and asked to identify the actor from the slides in a photo array lineup. The results from the study produced an interesting dichotomy. Even though participants fixated longer and more often on the gun than the check, there was no significant difference in the scores on the peripheral detail questionnaire. Despite this, the non-weapon participants had a marginally more significant accuracy rate in lineup identifications than did the weapon condition participants (Loftus et al., 1987).

Stebly's (1992) meta-analysis of 19 studies, including Kramer et al. (1990), reported similar results in low arousal weapon-present and weapon-absent conditions, where a moderate level of significance was found in memory impairment for feature accuracy in the weapon condition compared against the non-weapon condition. However, in contrast to Kramer et al. (1990), Steblay's (1992) meta-analysis produced a very slight significance in the reduced accuracy of the lineup identifications by the weapon condition participants, but with an effect size of only 0.13.

To determine if it is a weapon's unusualness that attracts an individual's attention, Pickel et al. (2006) tested participants' ability to consciously avoid fixating on the weapon if instructed beforehand about the weapon focus phenomenon. To accomplish this, participants were divided into two main groups: the weapon focus lecture condition, who were given instruction on the weapon focus effect, and the control lecture condition, who were given instruction on eyewitness confidence. Also, to further differentiate any effect that may be caused by an unusual object, the authors presented four scenarios to each lecture condition: one where no weapon was present and three different weapon-present conditions, each with a unique type of weapon. In the weapon-absent condition, participants were shown a book, and in the weapon-present conditions, participants saw either a standard pistol, a pistol with bright yellow tape around the barrel, or a large antique flintlock firearm. The results of the control lecture condition followed the template of the weapons focus effect, with participants in the non-weapon book condition able to provide significantly more detailed and accurate feature information than those in the three weapon conditions. In contrast, the participants in the weapon focus lecture condition

experienced no difference in detail or accuracy for feature information across all four conditions (Pickel et al., 2006). These findings indicate that the weapon focus effect is not an automatic response, but the results of a cognitive process that an individual can consciously overcome.

Pickel et al. built on this study in 2009, showing that the gender of the person holding the weapon can increase the memory impairment of the weapon focus effect, due to the participants' belief that it is more unusual for a women to be in possession of a weapon. Additionally, the memory impairment effect can be reduced or eliminated if the participant is told before exposure to a perpetrator to treat them as dangerous and threatening (Pickel et al., 2009). These results could have practical applications for developing a training system for first responders, or any others that may encounter crime or violence in their daily lives, and allow them to gain the ability to overcome any memory impairment caused by the weapon focus effect.

Ecological Validity of the Weapon Focus Effect

Since a large amount of laboratory research has been devoted to the weapon focus effect, it is important to establish how well the phenomenon may be generalized to real-life crime. Since it is not possible for psychologists to gather their participants and stake out a gas station to wait for an armed robbery to occur, data must be collected from archival police records and interviews with the witnesses of violent crime. According to Wells et al. (2006), archival research presents a unique set of problems that must be overcome, including: the difficulty establishing cause and effect relationships; the lack of readily apparent ground truth; and the possibility of system variables that may have been conducted improperly by the investigating law enforcement agency, skewing the data.

In one of the first studies on real-life crime and memory, Yuille and Cutshall (1986) conducted interviews on 13 witnesses of a violent shooting four or five months after the original crime had occurred. If the weapon focus effect is actually present during real-life violent crimes, and had indeed affected the memory of these eyewitnesses, Yuille and Cutshall (1986) would have been expected to find inaccuracy in witness descriptions of peripheral details. To establish ground truth, all crime scene materials were considered, including autopsy results, statements of first responders, crime scene photographs, and the physical descriptions of the thief and victim. To assess the accuracy of the witnesses' memory recall, original witness statements to police were then compared to the known evidence. Recall was found to be 76% accurate on descriptions of people and 89% accurate on the descriptions of objects (Yuille & Cutshall, 1986). When the authors re-interviewed the witnesses four or five months later, no decrease in accuracy was detected: in fact, witnesses were able to provide a larger volume of correct information because Yuille and Cutshall (1986) asked questions police had not included in the original interviews. These results, though limited by a small sample size, contrast with the weapon focus effect's contention that memory for violent crime will be impaired.

Similarly, Cooper et al. (2002) found no evidence of a weapon focus effect in a study of sexual assault victims in Vancouver, British Columbia. Victims who were assaulted with a weapon displayed the same level of detail and accuracy while recalling the event as victims who were assaulted in the absence of a weapon (Cooper et al., 2002). Furthermore, in a British study on eyewitness memory utilizing the statements given to police by 62 victims and 8 bystander-witnesses of violent crimes, Wagstaff, Macveigh, Boston, Scott, Brunas-Wagstaff, and Cole (2003) found no significant difference in memory recall for total identification of features such as height, age, build, or hair colour in the presence of a weapon. However, when the identification variables were considered individually, a significant increase in accuracy ($R^2 = 0.28$, $p < 0.001$) was found when identifying hair colour in the presence of a weapon (Wagstaff et al., 2003). A finding that the identification accuracy of a peripheral detail, in this instance hair colour, was actually greater in the presence of a weapon, runs contrary to the fundamental concept of the weapon focus effect.

Behrman and Davey (2001) examined 271 police cases to explore how memory is related to eyewitness identifications in real-life crimes. In the weapon focus component of the archival study, no significant difference in lineup identification accuracy of the police suspect between weapon and no-weapon crimes was found. A study on eyewitness lineup identifications was also performed by Valentine et al. (2003) on 314 live lineups conducted by the Metropolitan Police Department in London, England. This analysis also found no significant overall difference in the lineup identification accuracy of eyewitnesses in the presence or absence of a weapon used in the crime. There was one value of significance in a subset of the weapon variables, however, where females were significantly more likely than males to identify a suspect in the presence of a weapon (Valentine et al., 2003).

In contrast to the majority of archival research, a study conducted by Tollestrup, Turtle, and Yuille (1994) did find a significant weapon focus effect in lineup identifications, despite no significant difference in the amount or accuracy of details eyewitnesses provided, including perpetrator descriptions, in the presence or absence of a weapon. Only 44% ($n = 21$) of identification attempts in crimes where a weapon was used resulted in a positive identification, while 71% ($n = 7$) of eyewitnesses in weaponless crimes were able to make a positive identification. The authors propose that this difference in identification accuracy could be attributed to the amount and type of cases in which police attempt to obtain a suspect identification from an eyewitness. In only 23% of weaponless crimes were eyewitnesses shown a lineup by police in order to obtain an identification, while this rate increased to 51% when the offences involved a weapon (Tollestrup et al., 1994). It is possible that police are showing identification lineups to very unsure eyewitnesses in weapon-related crimes because these offences are considered much more serious, and a greater pressure exists on police to collect evidence and solve the crime. The unbalanced application of eyewitness lineup identification attempts by police between weapon absent and weapon present offences offers a plausible explanation for the difference in lineup identification accuracy.

Multiple studies examining real crimes in police case files or utilizing actual witness identifications in police line-ups (e.g. Yuille & Cutshall, 1986; Behrman & Davey, 2001; Valentine et al., 2003; Wagstaff et

al, 2003) have been unable to find any significant weapon focus effect on eyewitness identifications, in contrast to the laboratory-derived data. Steblay (1992) suggests that the reason for this lack of ecological validity is that a witness in an actual violent crime may experience such a multitude of unmeasurable stimuli that the weapon focus effect is essentially drowned out or made irrelevant in comparison to the other factors.

Discussion

The weapons focus effect has been shown to produce significant differences in memory performance in multiple laboratory research scenarios (e.g. Johnson & Scot, 1976; Kramer et al., 1990; Valentine et al., 2003; Steblay, 1992). Initial hypotheses, based upon Easterbrook's (1959) cue-utilization study, proposed that the weapon focus effect was caused by an eyewitness' increased level of arousal due to the threatening presence of a weapon. The increased level of arousal would then cause the witness to physically focus their attention on the weapon, reducing the individual's ability to encode peripheral scene details. However, since the memory impairment phenomenon of the effect could be produced in the presence of a weapon, but absent a heightened state of arousal, the causative agent of the weapon focus effect could not be an individual's level of arousal (e.g. Loftus et al., 1987; Kramer et al., 1990; Pickel et al., 2006).

The fixation theory of weapon focus was developed to explain weaknesses in the arousal theory. This new approach centred on the belief that people focus their attention on objects in the visual field that do not fit in with the expected context of the background. With Loftus et al.'s (1978) eye movement tracking technique, subsequent studies allowed a participant's visual attention to be definitively calculated, determining that unusual items do in fact capture a person's attention (Loftus et al., 1987). Building on these findings, Pickel et al. (2006) demonstrated that focusing on a weapon during a laboratory experiment, devoid of increased arousal, reduced a participant's ability to encode perpetrator feature details in comparison to a non-weapon condition.

Whatever the causative agent of the weapon focus effect may be, researchers have not been able to demonstrate the ecological validity of the laboratory phenomenon (e.g. Cooper et al., 2002; Yuille & Cutshall, 1986). Multiple archival research studies of police case files and interviews with eyewitnesses to actual crime (e.g. Behrman & Davey, 2001; Cooper, Kennedy, Hervé, & Yuille, 2002; Valentine, Pickering, & Darling, 2003) have been unable to find consistent evidence of a weapon focus effect. The conflicting research results and lack of proven ecological validity raise serious questions about whether expert witnesses should be able to present laboratory-derived data on the weapon focus effect to juries during criminal trials. It is a distinct possibility that whatever causes the weapon focus effect in research studies is overshadowed by the extreme stress and multitude of environmental variables found in real-life crime, which cannot be replicated in the laboratory. Even if a study could be designed to replicate the experience of witnessing a true crime, it would not be ethically permissible to actually conduct such an experiment. Even the moderate stress created in the Johnson and Scot (1976) experiment, which utilized an out-of-sight conflict followed by the appearance of a bloody knife, would no longer be

feasible in light of recent incidences of violence on university campuses. The only practical way forward for the continuation of ecologically valid research into the weapon focus effect is a closer partnership with law enforcement agencies, which would result in more detailed and higher sample-sized archival research of eyewitness to actual crime. Without this enhanced cooperation from law enforcement, or the experimental involvement of eyewitnesses to real crime, further weapon focus research will continue to demonstrate a phenomenon that has no application to the real world.

References

- Behrman, B. W., & Davey, S. L. (2001). Eyewitness identification in actual criminal cases: An archival analysis. *Law and Human Behavior, 25*, 475-491.
- Cooper, B. S., Kennedy, M. A., Hervé, H. F., & Yuille, J. C. (2002). Weapon focus in sexual assault memories of prostitutes. *International Journal of Law and Psychiatry, 25*(2), 181-191.
- Deffenbacher, K. A., Bornstein, B. H., Penrod, S. D., & McGorty, E. K. (2004). A meta-analytic review of the effects of high stress on eyewitness memory. *Law and Human Behavior, 28*(6), 687-706. doi:10.1007/s10979-004-0565-x
- Easterbrook, J. A. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological Review, 66*(3), 183-201. doi:10.1037/h0047707
- Erickson, W. B., Lampinen, J. M., & Leding, J. K. (2014). The weapon focus effect in target-present and target-absent line-ups: The roles of threat, novelty, and timing. *Applied Cognitive Psychology, 28*(3), 349-359. doi:10.1002/acp.3005
- Johnson, C., & Scott, B. (1976). *Eyewitness testimony and subject identification as a function of arousal, sex of witness, and scheduling of interrogation*. Paper presented at American Psychological Association Convention, Washington, DC.
- Hope, L., & Wright, D. (2007). Beyond unusual? Examining the role of attention in the weapon focus effect. *Applied Cognitive Psychology, 21*(7), 951-961. doi:10.1002/acp.1307
- Hulse, L. M., & Memon, A. 2006. Fatal impact? The effects of emotional arousal and weapon presence on police officers' memories for a simulated crime. *Legal & Criminological Psychology, 11*(2), 313-325.
- 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. doi:10.1007/BF01062971
- Kuehn, L.L. (1974). Looking down a gun barrel: Person perception and violent crime. *Perceptual and Motor Skills, 39*(2), 1159-1164.
- Loftus, G.R. & Mackworth, N.H. (1978). Cognitive determinants of fixation location during picture viewing. *Journal of Experimental Psychology: Human Perception and Performance, 4*(4), 565-572.
- Loftus, E. F., Loftus, G. R., & Messo, J. (1987). Some facts about 'weapon focus.' *Law and Human Behavior, 11*(1), 55-62. doi:10.1007/BF01044839

Marshall, James (1966). *Law and psychology in conflict*. New York, NY: The Bobbs-Merrill Company, Inc.

Pickel, K. L., Ross, S. J., & Truelove, R. S. (2006). Do weapons automatically capture attention? *Applied Cognitive Psychology*, *20*(7), 871-893. doi:10.1002/acp.1235

Pickel, K. L., Narter, D. B., Jameson, M. M., & Lenhardt, T. T. (2008). The weapon focus effect in child eyewitnesses. *Psychology, Crime & Law*, *14*(1), 61-72

Pickel, K. L. (2009). The weapon focus effect on memory for female versus male perpetrators. *Memory*, *17*(6), 664-678. doi:10.1080/09658210903029412

Stebly, N. M. (1992). A meta-analytic review of the weapon focus effect. *Law and Human Behavior*, *16*(4), 413-424. doi:10.1007/BF02352267

Tollestrup, P., Turtle, J., & Yuille, J. (1994). Actual victims and witnesses to robbery and fraud: An archival analysis. In D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *Adult Eyewitness Testimony: Current Trends and Developments* (pp. 144–160). New York, NY: Cambridge University Press.

Valentine, T., Pickering, A., & Darling, S. (2003). Characteristics of eyewitness identification that predict the outcome of real lineups. *Applied Cognitive Psychology*, *17*, 969-993. doi: 10.1002/acp.939

Wagstaff, G. F., Macveigh, J., Boston, R., Scott, L., Brunas-Wagstaff, J., & Cole, J. (2003). Can laboratory findings on eyewitness testimony be generalized to the real world? An archival analysis of the influence of violence, weapon presence, and age on eyewitness accuracy. *Journal of Psychology: Interdisciplinary and Applied*, *137*(1), 17-28.

Wells, G. L., Memon, A., & Penrod, S. D. (2006). Eyewitness evidence: Improving its probative value. *Psychological Science in the Public Interest*, *7*(2), 45-75.

Yuille, J. C., & Cutshall, J. L. (1986). A case study of eyewitness memory of a crime. *Journal of Applied Psychology*, *71*(2), 291-301. doi:10.1037/0021-9010.71.2.291