Journal of Applied Research in Memory and Cognition 5 (2016) 257–263

Contents lists available at ScienceDirect

Journal of Applied Research in Memory and Cognition

journal homepage: www.elsevier.com/locate/jarmac

Looking Down the Barrel of a Gun: What Do We Know About the Weapon Focus Effect?☆

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Eyewitness memory for the perpetrator or circumstances of a crime is generally worse for scenarios involving weapons compared to those involving non-weapon objects—a pattern known for decades as the *weapon focus effect*. But despite ample support from laboratory experiments and recognition by experts, testimony concerning weapon focus is rarely admissible in court. The present article summarizes a selection of key findings within the weapon focus literature and considers whether the effect warrants consideration by the criminal justice system at this time. We conclude that weapon focus is sufficiently robust and uncontroversial to guide practice so long as consideration is given to the circumstances surrounding the criminal event with a particular emphasis on witness expectation.

Keywords: Weapon focus, Eyewitness memory, Novelty, Arousal, Threat

On the evening of February 11th, 2007, a woman stopped for gas in Montgomery County, Texas. As she stood next to her vehicle, an unknown male drew a gun and demanded her purse. Throughout the 20-second ordeal, the woman reported being terrified of the weapon, and was later able to describe the gun in great detail. Her description of the perpetrator was less than precise (i.e., "light eyes"), yet a young man was charged with the robbery as a direct result. Despite the court admitting expert testimony relating to other eyewitness phenomenon (e.g., cross-racial identifications), the defence was not permitted to present expert evidence as to whether the gun had impaired the woman's memory, and the suspect was convicted on the sole basis of her uncorroborated testimony (e.g., *Blasdell v. State, 2010*, 2015).[1]

The evidence ruled inadmissible in the preceding example dealt with the *weapon focus effect*—a phenomenon whereby the presence of an unexpected weapon (e.g., a gun or knife) impairs

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JMF was supported by a British Academy Postdoctoral Fellowship (administered by the UK Medical Research Council: MC-A060-5PR01) and AG was supported by the UK Medical Research Council (MC-A060-5PR10) while writing this manuscript. We would like to thank the police officers, Crown prosecution, and defence attorneys that consulted with us regarding legal perspectives concerning the weapon focus effect. We would also like to thank Simon Strangeways and Paul Hart for their help in acquiring and generating our figures, Kerri Pickel for her feedback on an earlier draft of this manuscript and the editor and reviewers for their helpful comments during the review process.

☆ Please note that this paper was handled by the current editorial team of JARMAC.

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[1] Herein lies the problem: this case reflects the fact that non-specific descriptions that were potentially impacted by the presence of a weapon are still unduly relied upon in court despite the poor nature of the victim's memory. The accused maintains that he was wrongfully convicted, and no other evidence appears to link him to the crime. In fact, evidence suggesting the accused was *not* the perpetrator of this crime was generally excluded from court. Recently, Canadian courts have acknowledged that "vague, general, generic and non-specific descriptions by an eyewitness effectively reduce a case to unsafe resemblance, not identification" (R. v. St. Louis, 2014, at para. 69).

memory for the perpetrator as well as other details of a criminal event, excluding the weapon itself. Forensic experts have acknowledged the weapon focus effect for decades (e.g., Loftus, 1979; Yarmey & Jones, 1983), although the empirical evidence has emerged more slowly (e.g., Loftus, Loftus, & Messo, 1987). While experts remain confident that weapon focus influences the reliability of eyewitness reports (e.g., Kassin, Tubb, & Hosch, 2001), evidence related to the weapon focus effect is rarely admissible in court. This is a troubling omission given that jurors are generally uncertain as to whether a weapon impairs eyewitness memory (Desmarais & Read, 2011). It is likely that the judicial system has remained reluctant to accept weapon focus due to a lack of clarity with respect to whether this literature is robust enough for application. The present article will address this concern by providing an overview of the weapon focus effect with an emphasis on those findings sufficiently robust and uncontroversial to guide practice. We begin with a basic consideration of the weapon focus effect and its boundary conditions. We next discuss the difficulties inherent in relating weapon focus research to actual criminal events as well as the current criminal justice response. Throughout we aim to elucidate the circumstances under which the weapon focus effect should be considered in court and we make recommendations with respect to practice.

How Do Weapons Influence Eyewitness Memory?

Substantial laboratory evidence now exists that the presence of an unexpected weapon reduces the accuracy of subsequent suspect identification attempts or witness accounts of a crime (for reviews, Fawcett, Russell, Peace, & Christie, 2013; Kocab & Sporer, 2016; Pickel, 2015; Steblay, 1992). This finding is depicted schematically in Figure 1, but should not be applied indiscriminately. The magnitude (or even presence) of the weapon focus effect has been found to vary according to the characteristics of the eyewitness, the scenario in which the weapon is embedded (e.g., the perpetrator, surroundings), and the procedure through which memory is tested. As a result, each of these factors (witness, scenario, testing procedure) must be considered prior to evaluating the risk of weapon focus for any given situation. Each of these factors is discussed in turn.

The Eyewitness

With respect to the eyewitness, the roles of expectation and perceived threat deserve special emphasis given that the weapon focus effect has been attributed historically to the weapon drawing attention away from other details by virtue of its unexpected or threatening nature (Loftus et al., 1987). Concerning the former, a great deal of evidence has emerged over the past decade

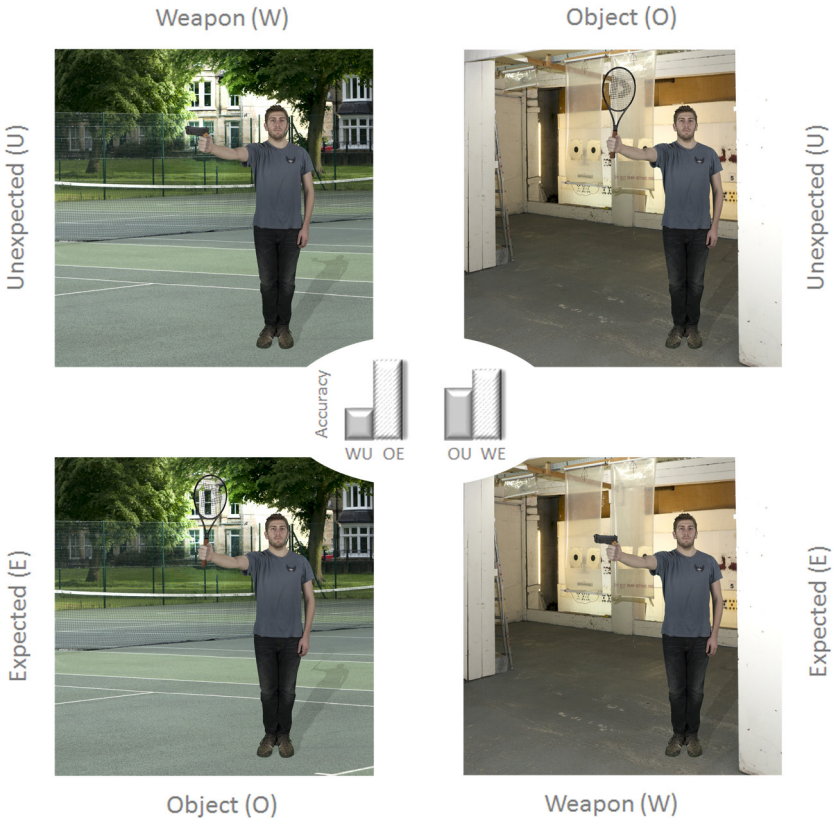

Figure 1. This figure depicts sample images from a laboratory-based experiment manipulating both the type of object involved (weapon, object) and whether that object was expected given the context (expected, unexpected). Many experiments include only the weapon-unexpected (WU) and object-expected (OE) conditions, and it is this comparison that represents the "canonical" weapon focus effect; however, we have designed this figure to emphasize the critical role of expectation in the genesis of the weapon focus effect. With this in mind, the inlaid plot depicts the typical findings from such an experiment: a weapon that is unexpected (WU; *gun in a tennis court*) results in worse memory accuracy than an object that is expected given the context (OE; *racket in a tennis court*). This pattern can be eliminated or even reversed (as depicted) should the weapon be expected (WE; *gun in a shooting range*), and the object be unexpected (OU; *racket in a shooting range*).

showing that witness expectation mediates the magnitude of the effect (for a quantitative model, see Erickson, Lampinen, & Leding, 2014). For example, weapon focus is diminished when the weapon is anticipated on the basis of the environment (e.g., a gun in a shooting gallery; see Figure 1) or due to prior knowledge of the individual holding the weapon (e.g., a gun held by a police officer; Pickel, 1999). Conversely, the effect is larger when the weapon violates cultural stereotypes (e.g., a woman holding a gun; Pickel, 2009, see also Sneyd, 2016).

In contrast to the link between witness expectation and weapon focus, the contribution of perceived threat is less clear. Attentional narrowing due to threat was thought to play a central role by early theorists (e.g., Maass & Kohnken, 1989) and is a common feature of anecdotal reports provided by victims of weapon crime (as in our example; see also Loftus, 1979). Although meta-analyses have shown greater weapon focus in situations judged to be threatening or arousing (Fawcett et al., 2013; Steblay, 1992) or involving criminal compared to non-criminal events (Kocab & Sporer, 2016), laboratory efforts to quantify their contributions have often failed to reveal a reliable relationship (e.g., Erickson et al., 2014; Mitchell, Livosky, & Mather, 1998; Pickel, 1998; although see Peters, 1988). Importantly, weapon focus also emerges in austere scenes where threat is unlikely (e.g., Kramer, Buckhout, & Eugenio, 1990), challenging the view that threat is a *necessary* condition for weapon focus to occur. Convincing evidence for the role of expectation over threat also comes from studies showing that unexpected non-weapon objects elicit an effect analogous to weapon focus (e.g., someone brandishing a stalk of celery; Mitchell et al., 1998). In this respect, Pickel (1998) manipulated in her experiment whether an object carried by the perpetrator was perceived as threatening and whether it was expected given the context in which it appeared. Her study revealed worse memory for the perpetrator when an unexpected weapon (i.e., gun) or unexpected non-weapon object was held (i.e., whole raw chicken or chef doll in a barber shop) but no overall effect of threat and no interaction between threat and expectation (see also Figure 1).[2] Thus, although it is possible that laboratory studies fail to elicit threat similar in nature or magnitude to that experienced during actual criminal events (although see Maass & Kohnken, 1989; Peters, 1988), there is little empirical evidence that threat or arousal are a key factor—at least under typical laboratory conditions. We will return to this idea again later, when we consider whether weapon focus research should be used to guide practice.

The Scenario

Both the scenario in which the weapon is presented and the individual holding the weapon can moderate the weapon focus effect independently of witness expectation. For example, factors diverting attention away from the weapon, such as a perpetrator with some unusual feature, will diminish the effect (Carlson & Carlson, 2012, 2014). The duration of exposure to a weapon is thought to be critical, typically eliciting a smaller effect in experiments involving either brief (i.e., <10 s) or extended (i.e., >60 s) exposure to the weapon (Fawcett et al., 2013; Steblay, 1992). However, memory for items or individuals experienced prior or subsequent to the encounter of a weapon must be considered with care, as exposure to the weapon may not influence memory for those details to the same extent (Erickson et al., 2014). For example, viewing an old acquaintance holding a weapon could result in relatively poor memory for novel features of the scene, but would be unlikely to affect memory for features that were already highly familiar. The same would apply to a stranger who draws a weapon, but then proceeds to interact with the witness for an extended period of time, either with or without the weapon.

The Testing Procedure

Less is known about how the testing procedure interacts with weapon focus. Evidence now suggests an extended retention interval (e.g., testing after a delay of 24+ hours) diminishes the effect (Fawcett et al., 2013). However, given that retrieval accuracy is low in the weapon relative to the non-weapon condition to begin with, the decrease in weapon focus across longer delays is likely an artifact reflecting declining memory in the non-weapon condition rather than better memory in the weapon condition. Testing procedures in which participants are required to recall details relevant to the event have shown larger weapon focus effects relative to selecting a suspect from a police line-up (Fawcett et al., 2013; Kocab & Sporer, 2016; Steblay, 1992). That said, recent research indicates that the influence of weapon focus on suspect lineups may be more pronounced than originally considered. For example, witnesses appear to have difficulty discriminating a perpetrator from innocent foils in line-ups, and are more likely to commit false identifications when a weapon was involved in a mock crime (Carlson & Carlson, 2012; Erickson et al., 2014; but see, Kocab & Sporer, 2016). This finding is troubling and warrants careful consideration, particularly in light of the evidence that individuals exposed to weapons are also more susceptible to false information, introduced for instance through leading questions or exposure to police suspects (Saunders, 2009). Luckily, witnesses may be sensitive to the fact that exposure to a weapon reduces memory accuracy, shown by a greater correspondence between suspect identification accuracy in a mock police line-up and reported confidence concerning those identifications (Carlson, Dias, Weatherford, & Carlson, 2016).

Should Weapon Focus Research be Used to Guide Practice?

Having reviewed the key findings within the literature, it is our view that the weapon focus effect is sufficiently robust to warrant consideration by the judicial system so long as the circumstances surrounding the crime are considered in tandem. Although some applications are certainly in need of further attention and development (see Table 1 for some examples), we

[2] The effects of unexpected non-weapon objects on eyewitness memory are also worth considering in the context of the criminal justice system on the account that criminal events sometimes involve strange objects – such as a photograph of a gun (November 19, 2014, "Man threatens to kill staff at Tesco near Cambridge – while brandishing PHOTO of a gun", Cambridge News, 2014) or a plate of bacon and eggs (February 23, 2016, "Bacon and Eggs Assault", CBC News, 2016).

Table 1
Sample Applications in Need of Further Consideration Within the Weapon Focus Literature Separated According to Their Locus of Influence (Witness, Scenario, Testing Procedure)

The witness	
1	Could training produce a lasting reduction in the magnitude of the weapon focus effect in at risk populations (e.g., bank tellers, store clerks)?
2	Are eyewitnesses able to judge the degree to which weapon focus has influenced their memory of a criminal event?
3	Are some witnesses more susceptible to the weapon focus effect than others? What individual difference measures differentiate these populations?
4	What is the role of threat and arousal in the weapon focus effect when observed under realistic circumstances?
5	Does familiarity with the class of weapon (e.g., a military officer observing a rifle) reduce the impact of an otherwise unexpected weapon?
The scenario	
6	How does the effective combat range of the weapon and distance from the perpetrator relate to the magnitude of the weapon focus effect?
7	How does weapon visibility impact the magnitude of the weapon focus effect? How visible must a weapon be to produce the effect? What about implied weapons (e.g., "Don't make me take out my gun. . .")?
8	How do social cues (e.g., gaze) shape the weapon focus effect for scenarios involving multiple witnesses?
9	Are particular scenarios (e.g., bank robbery) associated with stronger weapon-expectancy cues? Do these cues predict the presence and strength of the weapon focus effect?
10	Does weapon focus vary as a function of the type of crime or manner in which the weapon is used?
The testing procedure	
11	How do police interviewing or investigative techniques differ between weapon and non-weapon crimes and do these differences interact with the weapon focus effect?
12	Could the ratio of weapon-to-perpetrator or crime event details available in memory bias the extent to which persons are able to accurately recall weapon details relative to perpetrator or crime event details? If we control for the proportion of details available, do these effects change in scope?
12	Could a simple measure be developed to assay whether a witness account is likely to be influenced by weapon focus? Are there characteristic features that discriminate between those accounts that are or are not influenced by weapon focus?
13	Presuming that threat or arousal do contribute to the effect, could reinstating these emotional or physiological states at test improve memory for the event?

Note: Some of these applications are novel whereas others have been addressed in part, but are in need of further study.

are compelled in this evaluation by three converging sources.[3] First, laboratory experiments have consistently demonstrated impaired memory for scenarios involving unexpected weapons. This provides a solid empirical basis for the weapon focus effect and its boundary conditions. Second, the weapon focus effect has been observed in a variety of simulated events (e.g., Maass & Kohnken, 1989; Peters, 1988; Pickel, Ross, & Truelove, 2006) and virtual scenarios (e.g., Kim, Park, & Lee, 2014), providing varying degrees of experimental control and ecological validity. Hence, weapon focus is observable under realistic conditions emulating natural behaviour while retaining experimental control. Finally, weapon focus is a common feature of witness accounts following exposure to a weapon (for discussion see, Loftus, 1979), suggesting that it also emerges under realistic conditions. Therefore, it is our view that the question should not be whether weapon focus influences eyewitness memory, but under what circumstances and to what degree.

The circumstances under which weapon focus is most likely to occur vary in their empirical support. The most robust factor highlighted here is that of witness expectation, wherein weapon focus is most profound when the weapon is unexpected. It is therefore important to adopt a multifaceted approach to understanding the mindset of the witness when the weapon was encountered. Were there environmental- or perpetrator-specific cues that the weapon might appear? Was the perpetrator considered likely to have a weapon? Many of these considerations may be idiosyncratic and several individuals could witness the same scenario but experience weapon focus to varying degrees (if at all) dependent upon their expectations, background, and understanding of the event. Given that expectations unfold over time, it is also important to consider cues that build to the appearance of a weapon. For example, a store clerk who observes a customer acting suspiciously might expect a weapon to be present before a weapon is actually drawn. Although this scenario has not been investigated as such, the available evidence suggests that forewarning could mitigate the effect (e.g., Pickel, 2009; Pickel et al., 2006). In summary, each witness must be considered individually and in context to determine whether weapon focus is a probable concern.

At least two major factors—the effects of test delay and exposure duration—have been identified largely through meta-analysis rather than primary investigations (although, see Kramer et al., 1990). These findings emerge from comparisons across studies and hence should be viewed as promising but not yet fully established, pending further investigation. Their discussion in court is consequently advocated only with suitable caution. The finding that weapon focus is larger for witness accounts than suspect identification technically falls within the same category, though this distinction is far more consistent, as demonstrated by difficulties obtaining the effect for suspect identification (for discussion, see Kocab & Sporer, 2016). The

[3] Our claim that the weapon focus effect is relevant to real-crime scenarios is supported by the presence of a small aggregate effect observed in a meta-analytic synthesis of the current archival and field studies (Fawcett et al., 2013). While recognizing this fact we do not wish to give those studies undue weight in light of recent practical and methodological critiques of such experiments (e.g., Horry, Halford, Brewer, Milne, & Bull, 2013; see also, Kocab and Sporer, 2016).

precise cause of this difference across measures is unclear. One possibility is that weapon focus simply has a larger effect on measures of recall (on which most witness accounts are based) than measures of recognition (which is the basis of suspect identification). Others have argued that the difference emerges because weapon focus has a larger impact on suspect absent line-ups whereas most investigations of suspect identification use only suspect present line-ups (Carlson & Carlson, 2012; although, see Kocab & Sporer, 2016). The etiology of this difference remains to be discovered, but the key fact is that current evidence supports a moderate effect of weapon presence on measures of feature accuracy and only a small effect of weapon presence on measures of suspect identification (Fawcett et al., 2013; Kocab & Sporer, 2016; Steblay, 1992). Thus, whereas weapon focus should still be considered in the context of a suspect line-up, the effect seems to have a greater impact on a witness's description of the perpetrator.

Similarly, laboratory evidence for the role of threat has been sparse and, at present, can only be viewed to moderate (rather than elicit) the weapon focus effect. However, as touched upon earlier, we are unable to rule out the possibility that threat elicited in the laboratory fails to encompass the range of emotions experienced during actual criminal events. Different emotions, including threat, are known to cause attentional narrowing predominantly in scenarios involving an attention magnet (e.g., a dead body; Laney, Campbell, Heuer, & Reisberg, 2004) or an active personal goal capable of capturing attention (e.g., escape; Levine & Edelstein, 2009). Enhancing the salience of such magnets and personal goals using an immersive virtual reality simulation of a weapon crime has revealed complementary—but additive—effects of threat and expectation (Kim et al., 2014). This preliminary finding suggests that weapon focus could involve independent effects arising from threat and expectation that collectively influence eyewitness memory. That said, the perception of threat by witnesses in real criminal events could differ from the physiological threat or arousal experienced by those witnesses. Such differences may help to reconcile the discrepancy between frequent witness reports of feeling threatened, which is in contrast to the yet limited laboratory support for threat as a causal factor in weapon focus. This is a key area in need of greater development using further simulated events (e.g., Maass & Kohnken, 1989; Peters, 1988; Pickel et al., 2006) and applied techniques (e.g., Hulse & Memon, 2006; Kim et al., 2014) capable of balancing experimental control with the immersion necessary to emulate the threat experienced during a crime.

Although considering the boundary conditions summarized above provides useful guidance, we caution that crimes rarely conform to these parameters. Weapon focus is presently expected to be largest for a brief crime involving an unexpected, threatening weapon that is committed by a previously unknown perpetrator with no pre- or post-weapon exposure and for which the witness's statement is taken within 24 h of the event. Seldom do criminal events fit this description perfectly, which may explain why most archival or field studies of actual crimes have reported little or no evidence of the weapon focus effect (e.g., Behrman & Davey, 2001; Valentine, Pickering, & Darling, 2003; but, see Tollestrup, Turtle, & Yuille, 1994). A recent meta-analysis has demonstrated an aggregate weapon focus effect when these studies are combined, but the magnitude of that effect is smaller compared to laboratory studies. Interestingly, laboratory studies that closely match typical criminal events (i.e., long exposure duration, long retention interval, high perceived threat, unexpected weapon) also show a reduced weapon focus effect comparable to the aggregate effect for archival or field studies. Difficulties observing a consistent weapon focus effect within archival or field studies therefore may reflect the influence of moderators typical of real-world crime (Fawcett et al., 2013; although, see Footnote 3). Overall, we regard the weapon focus effect to be sufficiently robust to be considered in court, but we emphasize that each witness account must be scrutinized to determine whether weapon focus is relevant, rather than presuming it to be applicable simply because a weapon was present.

How Does the Criminal Justice System View Weapon Focus?

Finally, in light of the evidence discussed thus far it is important to consider how the criminal justice system presently evaluates weapon focus. While criminal justice professionals acknowledge that weapon focus may negatively impact memory, they view their everyday practice as divergent from research outcomes. For example, police officers often report that weapon focus is inconsistent across cases, and memory deficits can be circumvented by enhanced interviewing skills. Further, weapon-related offences such as robbery (i.e., the "typical" weapon focus scenario) are less common than a weapon being present in domestic violence scenarios (often charged as a level 2 or aggravated assault in Canada; Statistics Canada, 2016; The Daily, 2015). The evidence summarized above should enlighten the perceived inconsistencies in this effect: whereas weapon focus may occur for a typical robbery (so long as it adheres to the specified boundaries), domestic violence cases might instead involve a variation of this effect with preserved memory for the perpetrator. In fact, in some instances police officers have described apparently greater weapon focus (and better recall of weapon-related details) without impaired perpetrator identification, owing to the victim's familiarity with the perpetrator (Edmonton Police Service, personal communication, 2016). Overall, from a policing standpoint, weapon focus is commonly acknowledged to exist, but is an issue for the courts to address.

While it is clear that many judges realize the potential impact of a weapon on eyewitness memory (see *R. v. Turner*, 2012), few courts have recognized weapon focus as warranting expert testimony (e.g., *Jordan v. State*, 1996; *United States v. Smith*, 1984) despite a wealth of research establishing this effect (e.g., Fawcett et al., 2013; Kocab & Sporer, 2016). Even in recent cases, the judicial response has been twofold: (1) denial of expert testimony concerning weapon focus (e.g., Benton, McDonnell, Ross, Thomas, & Bradshaw, 2007), and (2) non-specific instructions to juries regarding eyewitness phenomena. Further adding to the problem is the prevalent view that ". . .the problems of identification are clearly within the general

knowledge and comprehension of judges and properly instructed juries" (*R. v. Fengstad*, 1994, Supra. 74).[4] However, counter to this widespread belief, the weapon focus effect is often associated with the lowest scores on surveys of lay knowledge concerning eyewitness memory for both judges and jurors, suggesting that the effect is not well understood by either population (Magnussen et al., 2008; Magnussen, Melinder, Stridbeck, & Raja, 2009).

Given that weapon focus is *not* considered one of the five generally accepted eyewitness principles with consensus in the scientific literature (see *Commonwealth v. Gomes*, 2015), we would endorse the two-pronged solution proposed by Wise, Dauphinais, and Safer (2007): (a) permit expert testimony when case evidence relies heavily on eyewitness reports, and, (b) educate the principal participants in the criminal justice system. Although expert testimony on weapon focus continues to be excluded, there has been some progress on the educational front. In the Report and Recommendations of the Supreme Judicial Court Study on Eyewitness Evidence (2013), it was recommended that model jury instructions should be adjusted to incorporate acknowledgement of the weapon focus effect.[5] Further, the Canadian Judicial Council (2012) recommended that judges use a series of instructions to guide jurors on how to assess witness testimony, including whether anything may have interfered with or distracted the witness from observing the details of the event and whether anything unusual happened that would enhance memory. While these recommendations are a step in the right direction, there remains no consensus concerning the evaluation of weapon focus in court.

Summary and Conclusions

The present article evaluated the merit of the weapon focus effect with respect to applications within the criminal justice system. We have summarized a selection of key findings within the literature and identified areas of further development. It is our conclusion that converging evidence from laboratory studies, simulated events, and actual witness accounts support the relevance of expert testimony concerning weapon focus in cases involving a weapon. In fact, such testimony could prove vital in addressing misconceptions concerning the effect amongst both judges and jurors (e.g., Magnussen et al., 2008). However, we caution that the particulars of the crime are important, and that they must reside within the boundaries for which weapon focus is thought to occur in order to promote accurate translation of empirical research to courtroom testimony.

Author Contributions

All authors contributed to the writing of this manuscript.

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[4] While several psychological surveys on layperson and professional knowledge concerning eyewitness factors (including weapon focus) seem to support this view as a whole (e.g., Desmarais and Read, 2011; Kassin et al., 2001; Magnussen et al., 2009; Read and Desmarais, 2009), they also suggest that provision of contextual information surrounding eyewitness phenomena increase decision accuracy. That said, jurors tend to defer to the knowledge and expertise of judges and assume they are sufficiently knowledgeable about eyewitness factors to reliably distinguish when experts are warranted (Magnussen et al., 2009).

[5] Specifically, the SJC (commissioned by the Massachusetts Court System) recommended the inclusion of the following jury instruction if a weapon was involved and the witness saw a weapon during the event: ". . .the visible presence of a weapon may reduce the reliability of an identification if the crime is of short duration, but the longer the event the more time the witness has to adapt to the presence of the weapon" (2013, p. 381).

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Received 11 May 2016;
received in revised form 3 July 2016;
accepted 4 July 2016