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Deadly Force or Not? Visual and Cognitive Interpretation of Rifles and BB Guns in Crime-Scene Context

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Abstract Although handguns still predominate in gun crimes, rifles are increasingly employed by perpetrators. Little is known about how rifles are visually and cognitively interpreted, or about the degree to which actual rifles can be distinguished from less-lethal or non-lethal replicas. The present research represents an initial effort in this area. Respondents were shown photographs of a realistic crime scene in which a male "assailant" aimed a long gun at a "victim." One of three weapons was depicted for each respondent: a bolt-action rifle, a lever-action rifle, or a BB gun. Respondents were asked to make a timed "shoot/no-shoot" decision about the scene, based on assessment of threat to the "victim." They were then asked to identify the type of weapon they had seen, and to describe features of that weapon. It was shown that rifles were identified correctly with a significantly higher frequency than was the BB gun, which was typically identified as an actual rifle or shotgun. No differences were observed between weapons in terms of recognition, correct features identified, or of excessive precision in attempted identification. However, the bolt-action rifle was correctly identified as such more frequently than was the lever-action rifle, which in turn was identified correctly more frequently than the BB gun. Most importantly, "shoot" decisions, and time to shoot, did not differ significantly between the lethal rifles and the non-lethal BB gun. This research has practical ramifications for the criminal justice system regarding the perception and cognitive processing of rifles and less- or non-lethal replicas, in the areas of eyewitness memory and of "shoot/no-shoot" decision making.

Key Words Shoot/No Shoot Decisions · Long Guns · Rifles/Replicas/BB Guns · Eyewitness Memory

The vast majority of gun crimes in the United States are committed with handguns (e.g., Office of the California Attorney General 2010). However, long guns are increasingly employed by perpetrators of gun violence (compare U.S. Bureau of Justice 1995, w ith Office of the California Attorney General 2010). Recent examples have included the 2012 mass shooting in Colorado (Pearson 2012), a 2014 restaurant robbery in California in which a sporting rifle was employed by the perpetrators (Fresno Bee 2014), and the shooting of five Royal Canadian Mounted Police officers, three of whom were killed, at the time of writing (Fresno Bee 2014). A number of similar instances have been observed in recent months.

The trend toward increasing criminal carrying of long guns has been documented. In the United States, long guns were carried by about 3% of offenders in 1995 (U.S. Bureau of Justice 1995), whereas these weapons were carried in 9.2% of crimes studied by the California Department of Justice in 2010 (Office of the California Attorney General 2010). Visual and cognitive processes, as these pertain to the perception and cognitive interpretation of rifles, are therefore of increasing importance in a variety of tactical, investigative, and courtroom proceedings.

At the present time, however, the literature is largely silent on the cognitive issues involved. For example, how easy is it to identify a rifle, as opposed to a sub-lethal or non-lethal facsimile such as an air rifle or BB gun? How readily can these weapons be confused?

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This question was brought into sharp relief in a 2013 incident in Santa Rosa, California. A thirteen year-old boy, wielding a pellet-gun replica of an AK-47 assault rifle, was shot and killed by sheriff's deputies, who believed him to be armed with the real thing (MSN 2013). Public reaction to this tragedy was largely critical of the law enforcement response; yet the sub-lethal pellet gun was designed to look as much like an AK-47 as possible. The boy wielded the weapon actively, refused to drop it when repeatedly ordered to do so, and ultimately raised it in the direction of the deputies. Under these conditions, it is difficult to understand how these officers, or anyone else for that matter, could have been expected to make the critical distinction.

To date, this type of tragic event has been most frequently reported with objects that resemble *handguns* to some degree, providing a starting point for the investigation of similar situations with long guns. The fact is that people wield a bizarre variety of objects against law enforcement officers, often holding or deploying those objects as if they were firearms. Among many examples, this situation has arisen with a pellet gun in Florida, an electric drill in Washington State (Associated Press 2007), and pellet guns, an enameled toy pistol, a toy rocket, a hose nozzle, and even a shoe in California (e.g., Sharps 2010).

Why anyone would aim these bizarre objects at the police is usually unknown. Attempted "suicide by cop," a variety of mental health issues, and other factors may be of importance here; these should be subjected to future research. However, under any given circumstances, officers are expected to make the necessary distinctions, to tell the difference between real and ersatz weapons. These distinctions must be made under rapidly evolving tactical conditions, frequently in poor light (e.g., Sharps 2010), and when portions of the given weapon are obscured by the hands of the suspect or by other environmental features (see also Sharps 2010). When officers cannot make these distinctions, when they fire on a suspect wielding something that only *looks* like a gun, catastrophe may ensue for the suspect and his or her loved ones. Officers may face major civil and criminal charges. The press may prove to be singularly unforgiving (e.g., Sharps and Hess 2008; Sharps 2010).

But are these distinctions really that difficult to make? Sharps and Hess (2008) addressed the question of *handgun* identification directly. The subjects were non-police citizens, those who potentially make up a jury when an officer is accused of wrongdoing. Respondents were shown a crime scene featuring an "assailant" aiming a Beretta handgun at a "victim." This realistic crime scene was developed in consultation with senior police commanders and tactical officers, and has been used in several previous research projects (e.g., Sharps et al. 2007, 2009; Sharps and Hess 2008). Exposure times, from 0.5 to 2.0 seconds, bracketed those of typical importance in real-world shoot/no-shoot decisions (e.g., Moore 2006; see also Sharps 2010).

According to our police experts (e.g., Sharps et al. 2007), the event depicted was a "must-shoot" situation, in which an officer must fire to defend the victim (see also Force Research Institute 2009). Approximately 80% of our subjects concurred, deciding to "shoot" the armed assailant. However, in another condition in which the assailant was unarmed, but merely holding a power screwdriver, approximately the same number of respondents decided to fire, "killing" not an armed assailant, but a man holding a power tool. There was no statistically significant difference; under ideal conditions of lighting and exposure, the average person could not tell a 9mm Beretta handgun from a power screwdriver, even when the latter sported a screwdriver bit, an orange bit-collar, and the word "Craftsman" embossed on the side in large silver letters.

In an additional demonstration of the gap between police reality and popular perception, only 11% of those exposed to the *actual gun condition* believed that a law enforcement officer should *ever* fire under these circumstances, *which 100% of our senior tactical officer consultants believed to require a shooting response*. The gap between reality and popular views, in this area, appears to be very wide.

With very few exceptions, the average citizen will of course never make a shoot/no-shoot decision at all. However, we used a shoot/no-shoot manipulation in the present study, as we did in the 2008 study involving handguns. The purpose was to obtain a *direct* measure of the given respondent's interpretation of a shoot/no-shoot situation, eliminating the cognitive and affective mediation that would derive from placing this situation in a more vicarious, third-person context. We wanted the measurement to be direct and immediate; and in our 2008 experiment, measuring shoot/no-shoot performance very directly, respondents proved to be very limited in their ability to distinguish the threat of a handgun from the total absence of threat posed by a power tool (Sharps and Hess 2008; see also Force Science News 2009).

Does the same limitation apply to the cognitive processing of rifles? Are these larger weapons easier to distinguish from replicas? The research literature, to date, is effectively silent on this issue. The present research formed an initial attempt to address this question on a controlled, empirical basis, using methods previously proven useful in the study of handgun processing, summarized above (Sharps and Hess 2008; see also Sharps et al. 2003). As in our previous research (Sharps and Hess 2008; see also review in Sharps 2010), respondents were asked to make a timed shoot/no-shoot decision when confronted with an assailant wielding an actual or replica firearm. Again as in earlier research (Sharps and Hess 2008), this relatively direct measure was chosen to avoid the mediating cognitive and affective factors involved in the placement of a shoot/no-shoot decision in a vicarious, less- direct third-person context.

Eyewitness abilities to remember the given weapon correctly were also evaluated. Specific eyewitness measures included the accuracy of weapon identification; the ability to recall correct features of the given weapon; tendencies to produce an incorrect identification in terms of unwarranted precision (e.g., identifying the precise caliber of the weapon); and the ability to recognize the weapon from a photograph. Thus, this experiment addressed two critical aspects of cognitive processing: the ability to distinguish a rifle from a sub-lethal replica, and eyewitness memory for these long guns under controlled conditions.

Method

Participants One hundred and forty-one respondents were recruited from the lower-division student population at a central California university, receiving course credit for their participation. Thirty-eight were male (mean age =19.84 years, SD =2.48 years), and one hundred and three were female (mean age =18.82 years, SD =0.91 years), reflecting the proportions of the classes. All were demonstrated by means of a standard Snellen vision test to possess visual acuity in excess of 20/40, sufficient to distinguish the smallest relevant features of weapons as presented. The university at which this study was conducted is located in a highly multicultural area, and has a high attrition rate. The student population is therefore relatively representative of the current American population, with the obvious exceptions that this relatively young population tended to be possessed of relatively good health and strong visual acuity, and that 73%, rather than slightly over 50% (the case for the general population), of this sample was female.

Materials and Procedure Respondents participated individually. They were instructed that they would see situations which might involve hazard to others, and that they could choose to shoot or not to shoot depending on their judgment of that hazard. They were further instructed that a decision to shoot involved the pressing of a hand-held button. This button was a switch interfaced to a Lafayette Instruments projection tachistoscope apparatus, modified, for this procedure, to time response on an interfaced Lafayette clock/counter.

Respondents were presented with a high-quality digital image of a male "perpetrator," aiming a weapon at a male "victim," in a suburban driveway setting used in our previous research (e.g., Sharps et al. 2007, 2009; Sharps and Hess 2008). Lighting in the image was strong overhead sunlight; no shadows obscured any features of the assailant, victim, or weapon. The exposure time was limited to a period of 10 seconds, a considerably longer period than the fraction of a single second typical of a shoot/no-shoot decision under field conditions (e.g., Grossman 1996, 2004; Moore 2006; Montejano 2004); those who did not fire within this extended time frame were classified as "no-shoot" decisions, as would typically be the case in real-world tactical operations. The scene was presented on a white screen, located approximately fifteen feet from the subject.

Each subject saw one of three scenes. The scenes were identical as described above, except for the fact that in each scene, the "assailant" held one of three weapons. One was a lever-action, spring-fired Daisy BB gun, a non-lethal weapon (hereafter termed the "BB gun"), which would not require a shooting response. The second weapon was a Winchester .44 Magnum "Trapper" rifle, a lethal lever-action weapon of the "deer rifle" type (hereafter termed the ".44."). The third was a bolt-action Ruger M-77 30.06 rifle with a telescopic sight, a lethal rifle of the "high powered" type (hereafter termed the "30.06"). These weapons were specifically selected for the additional, "feature-intensive" elements presented by the .44 and the even more feature-intensive 30.06, by comparison with the BB gun. It should be noted that other long-gun types should be used in further research on this issue, as other configurations of long gun might result in different configurations of results in future studies. However, for this preliminary effort into the domain of long guns, this design made it possible to compare shoot/no-shoot response, and time to respond, between those respondents confronted with one of two lethal weapons, each actively requiring a shooting response (see Sharps and Hess 2008; Sharps 2010), and those confronted with a spring-powered BB gun, which, given its relative lack of power, would by law-enforcement standards require no such response (e.g., Moore 2006; Montejano 2004). As stated above, respondents indicated their decision to "shoot," if they did so, by pressing the hand-held button, which in turn stopped the timer.

As in all previous research in this series (summarized in Sharps 2010), a ten-minute retention interval was imposed, during which respondents provided demographic information similar to that which would be requested by a police dispatcher on receiving a report of a violent crime. (The ten-minute interval was standardized for this research as it provides a reasonable average of police response times to violent crimes in populated areas [e.g., Moore 2006; Montejano 2004; Sharps et al. 2007, 2009, 2012], yielding a reasonably typical period between the time of a crime and the first eyewitness statements to law enforcement).

At the conclusion of the retention interval, respondents were asked to identify and describe the weapon they had seen. These protocols were later scored for the identification of a correct weapon type (e.g., rifle or BB gun); for the identification of an incorrect weapon type (e.g., a shotgun, or, in the case of the BB gun, a rifle); for correct features of the given weapon (e.g., a bolt, or lever, or hammer); and for a tendency to respond with excessive precision (e.g., giving a specific rifle caliber, which could not be ascertained from the images employed).

Respondents were then asked to identify the weapon they had seen from one of three photographs, presented in one of two counterbalanced orders. Each of these digital photographs, taken with a Sony Alpha SLR digital camera, depicted the entire weapon in profile, photographed from a distance of five feet (1.54 m) against a plain white background. The longest of these weapons, the 30.06, nearly filled the frame, from side to side, with a small border (about one inch, 2.54 cm) on each side. The .44 and the BB gun, each several inches shorter, were centered in the frame in the same position, perspective, and scale as the 30.06. This manipulation, which for convenience was termed the "weapon line-up," allowed an assessment of the ability of the given respondent to recognize the weapon depicted in the crime scene.

Results

Shoot/No-Shoot. Chi-square analysis demonstrated no significant differences between the three weapons in terms of shoot/no-shoot decisions; respondents were equally likely to fire on an assailant holding a lethal rifle or a decidedly non-lethal BB gun (see Table 1). For those who fired, an analysis of variance (ANOVA) demonstrated no significant difference in shoot/no-shoot decision time between the lethal .44 and 30.06 rifles and the relatively low-powered, spring-activated Daisy BB gun (see Table 1).

Eyewitness memory. Numbers of correct features were ascertained by three raters. All had to agree that a given feature was in fact correct. There was no significant difference among the weapons in terms of the number of correct weapon features identified. None of the weapons yielded higher incorrect precision (e.g., caliber) than any of the others.

However, the different weapons yielded significantly different levels of correct weapon *identification*, $\chi 2\ (2) = 52.18$, $p < .001$ (see Table 2). The BB gun was correctly identified as such *by only one respondent*. Ten respondents thought it was a shotgun, and two reported it to be a *double-barreled* shotgun. The others thought it was some kind of rifle. Thus, the BB gun was correctly identified with less statistical frequency than the .44 and the 30.06. The 30.06, in turn, was correctly identified as a rifle more frequently than the .44 or the BB gun (see Table 2). Respondent gender did not significantly influence these results.

During the analysis of these data, the first author of this paper pointed out the fact that the popular video game series "Call of Duty" features shotguns as a popular weapon choice. The question was raised as to whether this fact might have influenced these results. Although that potential source of error must remain entirely hypothetical, it is interesting to note (see Table 2), that 36.89% of these respondents incorrectly identified the given weapon *as a shotgun*, with approximately 1/3 of those confronted with a BB gun seeing it as a shotgun; with almost half of those who observed the .44 making this mistake; and with 9% of the 30.06 group following suit ($\chi 2\ (2) = 21.16$, $p < .001$). Two BB gun respondents identified this Daisy spring-action toy as a *double-barreled* shotgun, as did 3 respondents in the .44 condition, and none in the 30.06 group. (The $\chi 2$ test of this effect was not significant, but was not meaningful given these low numbers). A reviewer of an earlier version of this manuscript pointed out, quite correctly, that the gender proportions of this study may be important in the interpretation of this result, and of this hypothesis, in that women may play "Call of Duty" less than do men. The authors were unable to find any objective data related to this specific question, so it must be noted that these factors remain hypothetical; this idea is merely offered for its potential heuristic value for future studies, and must not be regarded as definitive in any way.

Finally, chi-square analysis of the "weapon lineup" revealed no significant difference in recognition accuracy among the three weapons (see Table 2). Recognition accuracy did not differ between a bolt-action, high-powered rifle with a scope; a lever-action deer rifle; and a "toy" BB gun.

Table 1 Frequency of Shoot/No-Shoot Response by Weapon Type, and Response Times in Seconds (Means/SD's) for "Shoot" Respondents (Those Who Made the Decision to "Fire" on the "Assailant")

	Shoot	No-Shoot	Response Time (M/SD)
BB Gun	26 (60.5%)	17 (39.5%)	1.26/1.46
.44	31 (63.3%)	18 (36.7%)	1.55/2.02
30.06	33 (63.8%)	16 (36.2%)	1.71/2.00

Discussion

Shoot/No-Shoot Decisions. As noted in detail above, law-enforcement officers are increasingly confronted with assailants who are armed with long guns. Some of these are lethal rifles and shotguns. Others are sub-lethal or non-lethal replicas, such as the Daisy BB gun used in the present experiment, or the pellet-gun replica of an AK-47 wielded by the teenager in 2013, as detailed above.

Officers are expected immediately to tell the difference between the lethal long gun and the non-lethal replica, frequently under conditions which impair their vision, and with time constraints which may obviate much of the utility of their police training (Clifford and Richards 1977; see below). Although the Clifford and Richards study did not assess weapon identification, it did assess visual interpretation, and

Table 2 Eyewitness Memory for Weapon Observed in Crime Scene

	BB Gun	.44	30.06
Weapon correctly identified	.02	.43	.78
Weapon correctly selected in "lineup"	23 (53.5%)	21 (42.9%)	32 (65.30%)*
Weapon incorrectly selected in "lineup"	19 (44.7%)	27 (55.10%)	16 (32.7%)*
Weapon incorrectly identified as shotgun	10 (23.26%)	24 (48.98%)	4 (8.16%)

*Three respondents, one in each weapon condition, made no selection

no data exist which might specifically exempt firearms from this effect. Yet the present research demonstrated that the average person, the potential juror in a shoot/no-shoot criminal proceeding, cannot tell a lethal rifle from a decidedly non-lethal spring-powered BB gun. The Daisy BB gun in this study presents a somewhat toy-like appearance, with no hammer, bolt, magazine, or other attributes typical of real long guns; yet only one of our respondents was able to identify it for what it was. The others saw it as a real rifle or shotgun, and acted accordingly. It should be emphasized that the Daisy BB gun simply presented, beyond its lever and trigger, none of the attributes which might be attributed to a "real" long gun, modern or more antique; it has no loading gate, no hammer, no tubular or clip magazine, no adjustable sights, and no safety lever or bolt, fully visible or partially obscured. The magazine and barrel are housed in the same tubular structure, and there is no forestock. Thus the BB gun, while visibly a relatively featureless simulacrum of a lever-action rifle, is on a feature-intensive basis clearly lacking those features which might render it, to observation, as an actual firearm *per se*. Human beings, under rapidly-evolving conditions, simply were not shown to be able to make such distinctions effectively; it would therefore seem highly inappropriate, from a scientific perspective, to expect such superhuman abilities simply to arise spontaneously in law enforcement officers.

Shouldn't police training bridge this gap, providing officers with abilities to gauge the identity of a firearm in a way that would ordinarily be denied to most of the civil population? A classic study by Clifford and Richards (1977), mentioned above, provides a partial answer to this question in the related domain of eyewitness memory (see Sharps 2010), although, admittedly, not directed to the question of firearm identification *per se*. In the Clifford and Richards study, officers and civilians were exposed to an eyewitness situation which required an extensive interaction with a given person, or one which required only a brief interaction. It was found that police officers were superior, in the more extensive interactions, in the abilities which enable one to perceive, interpret, and recall. However, when the interaction was brief, there was *no statistical difference* between officers and the civil population in these abilities. This research indicates strongly that for police training to operate effectively on officers' cognitive processing, it must have *time* to operate; and in the fractions of a second in which shooting situations may evolve (e.g., Grossman 1996, 2004; Moore 2006; Montejano 2004; Sharps 2010), time is a very fleeting commodity. This is especially true under the high-stress conditions of a shooting situation, in which police cognitive interpretation has been shown to be substantially diminished due to the physiological factors involved (e.g., Grossman 1996, 2004; Hope et al. 2012). Law enforcement officers have the same human nervous systems as do civilians. Police training requires sufficient time to modify responses to tactical situations. The work of Clifford and Richards (1977) indicates that when sufficient time is *not* available, as is frequently the case in shoot/no-shoot decisions, it is unrealistic to expect current training to bridge the relevant gap in visual interpretation.

It is possible that future police training, based in cognitive principles, may bridge this gap. In recent work (Sharps et al. 2010, 2014), cognitive principles were used to create training for the detection of improvised explosive devices (IED's); this training, in experimental contexts, literally doubled the speed and probability of successful IED detection. Thus it is possible that the use of cognitive principles, properly applied, may ultimately provide effective training to improve shoot/no-shoot distinctions. It would also be of interest to develop an understanding of individual differences, cognitive and affective, which led some respondents in the present experiment to refrain from firing. Unfortunately, so few of our respondents did not shoot, in this study, that this question will require substantial additional research.

These prospects lie in the future. No relevant cognitively-based training currently exists in the realm of handgun or long gun identification and interpretation; law enforcement officers are simply, at the present time, expected to make distinctions that, in view of the present research, human beings cannot reliably make. This fact may provide an important point at law for those officers accused of misconduct in shoot/no-shoot decisions involving long gun replicas.

Eyewitness Memory Earlier research on handgun identification (Sharps et al. 2003) demonstrated that people are generally poor at weapon recognition. In that research, recently-seen common handguns, under ideal conditions, were correctly recognized less than half of the time.

Relatively poor recognition memory for weapons was also observed in the present research. In a recognition memory test (the "weapon lineup"), rifles proved to be no more recognizable than did the Daisy BB gun.

However, in terms of correct and incorrect weapon *identification*, rifles were remembered more accurately than was the BB gun, and the scope-mounted 30.06 was remembered more accurately than the .44. These results are readily explicable in terms of the second author's Gestalt/Feature Intensive Processing theory of visual cognition (G/FI; see Sharps and Nunes 2002; Sharps 2003), which has been successfully applied to cognitive processing several areas of law enforcement (e.g., Sharps 2010, 2012; Sharps and Hess 2008; Sharps et al. 2003, 2007, 2009, 2010, 2012, 2014).

Work under the auspices of the G/FI processing theory of visual cognition has shown that eyewitness phenomena may be encapsulated along a single processing dimension (Sharps and Nunes 2002; Sharps 2003, 2010, 2012). People in eyewitness situations typically encode the original memory in a "gestalt" manner, with little actual attention to details which might assist in making a correct identification. However, as the witness reviews the given memories, the resultant feature-intensive analysis will process both veridical details and those which derive from reconfigurative processes or post-event suggestions. As Bartlett (1932) demonstrated, such details may be readily fabricated, wholly unconsciously on the part of the witness, from vague impressions, post-event information, or other sources (see also Sharps 2010, for review of supporting research). However, if the initial representation (in the present case, the long gun originally observed) presents a greater variety of veridical details, such reconfiguration may be diminished. This was observed in earlier work (Sharps et al. 2003) in which such feature-rich items as Uzi assault weapons were better recalled than weapons which presented fewer features, such as short-barreled revolvers.

This was also the case in the present work. The BB gun presented relatively few features; it has a butt-stock and a lever, true, but no hammer or loading gate, and the magazine and barrel are housed in the same tube. The .44, however, presented more features than the BB gun (including its wooden forestock, tubular magazine, loading gate and hammer), and the 30.06 presented even more features (including scope, scope mounts, bolt, distinctive trigger guard, unified wooden stock, and buttplate). Thus, with the long guns used in the present research, the number of features correctly recalled reflected the level of potential feature-intensive processing, in terms of features of the given weapon initially presented.

It should be noted that the actual reported recall of these features *per se* did not differ between BB gun and rifles. However, the average person may simply not know the correct term for a given feature of a gun, as observed in our previous work (Sharps et al. 2003); one need not know the term "lever" or "forestock" to have the visual memory of that feature influence overall identification.

In short, weapons presenting more visual features are better remembered than those presenting fewer, even if the names of the given features are not known to the given respondent. Therefore, the present research suggests that law enforcement officers may feel somewhat more confident with regard to eyewitness descriptions of weapons which present more features for inspection. However, there is a caveat: human eyewitness memory for any object tends to become reconfigured (Bartlett 1932; Ahlberg and Sharps 2002; Bergman and Roediger 1999; Sharps et al. 2009), and this reconfiguration begins almost immediately, certainly within ten minutes after a given event (Sharps et al. 2012). Therefore, although more feature-intensive weapons may be recalled with greater accuracy, it is well to remember, in real-world criminal contexts, that specific features may be confabulated by a given witness as well.

An unexpected finding surfaced in these results. The .44 and the BB gun were repeatedly identified as shotguns, sometimes even as *double-barreled* shotguns. Now, the .44 had a tubular magazine which might conceivably be construed as a second barrel, but the BB gun presented only a single barrel/magazine tubular assembly. How the BB gun could have been perceived as a double-barreled shotgun is at this point incomprehensible, unless respondents simply abandoned, in their minds, the specific features of the given weapon, and identified it as a double-barreled shotgun based on a general, "gestalt" concept (e.g., Sharps 2003, 2010, 2012) involving a type of weapon with which they were familiar (perhaps, hypothetically, from a videogame?). Beyond this, the authors have no interpretation of this extraordinary set of responses. This result must remain a subject of further study. However, *if* experience with videogames is shown, in future research, to influence eyewitness memory and the interpretation of shoot/no-shoot decisions, the importance of this line of inquiry is hard to overestimate.

The present research does indicate, however, that a non-trivial fraction of potential witnesses to crimes tends to identify BB guns and even rifles as shotguns. This is a potentially important fact for investigators and attorneys concerned with eyewitness memory for weapons.

Future research is needed; but the present research indicates that eyewitness memory for long guns tends to be poor, that it is influenced by the level of feature-intensive processing afforded by the given weapon, and that it is relatively unreliable in terms of the distinction between actual rifles and sub-lethal or non-lethal replicas such as BB guns.

Summary. The present research represents an initial empirical inquiry into the perceptual and cognitive interpretation of long guns, a topic of increasing importance to law enforcement and judicial proceedings. The results indicate that human beings do not in general distinguish a relatively harmless weapon such as a BB gun from truly lethal weapons such as rifles, either on a shoot/no-shoot or eyewitness basis. Although there may be an expectation that law enforcement personnel should be able reliably to make this distinction, there is no empirical basis or specific, cognitively-based training that would support this idea. Finally, although the prospect of feature-intensive processing improved the identification of long guns, this was clearly insufficient to influence either shoot/no-shoot decisions or recognition memory for these weapons.

It is suggested that these results may be of importance to investigators, jurors, attorneys and judges who must evaluate law enforcement shoot/no-shoot decisions with regard to long guns and replicas. It is further suggested that efforts be made in the psychological community to develop effective field-valid training for law enforcement officers confronted with such decisions.

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