

The real risks during deadly police shootouts: Accuracy of the naïve shooter

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Abstract

This study aimed to examine the level of shooting accuracy demonstrated by law enforcement recruits upon completion of their law enforcement firearms training in comparison with novice shooters. One hundred and ninety-five male and 52 female law enforcement recruits volunteered. Participants were separated by firearms experience into the following groups: expert (completed law enforcement firearms course, $n = 83$), intermediate (recreational experience, $n = 71$) and novice (minimal/no experience, $n = 93$). All subjects were tested for accuracy at target locations from 3 to 75 ft. For all locations, no difference was found in accuracy between expert and intermediate groups ($p > 0.30$). Experts and intermediates had better results than novices on all locations ($p < 0.05$) except from 3 to 15 ft. Alarming, experts were only 10% more accurate than novices between 3 and 15 ft. Finally, novices and intermediate shooters were more likely to hit head locations from 3 ft (57%), whereas experts mainly hit the body location (78%). The results of this study indicate that officers had no advantage over intermediate shooters and a small advantage over novices.

Keywords

Law enforcement, shooting accuracy, aiming, police shooting

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Introduction

Of the 536 officers feloniously killed in the line of duty from 2000–2009, 490 died due to fatal gunshot wounds (Federal Bureau of Investigation (FBI), 2014). Alarming, 290 of those officers were shot in the head and neck (FBI, 2014). Although 29 of the 536 officer deaths occurred during tactical situations such as hostage taking, high-risk building entry, etc., the remainder of the officers that were killed were attacked while performing routine arrests, investigations, traffic stops and other duties. Numerous articles and reports have addressed the issue of officer-involved use of deadly force and more recently, the lack of shooting accuracy officers demonstrate while performing in a high-stress gunfight. However, no known research has examined the opposing side: the shooting accuracy of inexperienced and

untrained suspects who might fire at officers. Investigating the accuracy of these inexperienced shooters is necessary because their accuracy directly threatens officers' safety in a deadly force conflict. Documentation of the accuracy and speed of a novice shooter in the evolution of use of deadly force situations should influence the quality of instruction and standards officers must attain for firearms training in both pre-service and in-service training.

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Literature review

In 2012, there were a reported 8855 homicides and 142,568 assaults from firearms among the general, civilian population in the US (Criminal Justice Information Services Division, 2014). As noted in a 2011 report, a large contributor to those crimes are more than 1.4 million active street gang members, outlaw motorcycle gangs and prison gangs across the USA, DC and Puerto Rico (FBI, 2011). Gang members are responsible for nearly one-half (48%) of all violent crimes in most States; however, some States, such as Arizona, California and Illinois, report that gang members are responsible for over 90% of violent crimes. Although the amount of firearms and weapons training gang members receive is incredibly variable and mostly unknown, recent trends have revealed some unnerving facts. According to the FBI 2011 National Gang Threat Assessment, at least 53 gangs have been identified as having infiltrated the US military, learning advanced techniques in weaponry and combat. Additionally, the FBI (2011) report stated gang members are often able to acquire high-powered, military-style weapons, as well as body armor, greatly increasing the risk of potentially lethal encounters with police officers and possibly other civilians.

Although many gang members are becoming incredibly lethal with dangerous weapons from experience in military or other training, individuals not affiliated with gangs still pose a significant threat to officers. As previously stated, over half of all violent crimes committed in most States are not gang related and, in 2006, nearly 30% of violent felons had no previous arrest records (FBI, 2011; Reaves, 2006). Additionally, a wide variety of individuals are likely to have at least rudimentary knowledge of handgun skills.

In 2011, Gallup, a daily news source, reported that 47% of American adults had a firearm in their home or elsewhere on their property (Saad, 2011). This is the highest level Gallup has recorded since 1993, albeit marginally above the 44% and 45% highs seen during that period (Saad, 2011). Although firearm-related crimes have declined significantly since 1993 (Langton, 2012), firearms are easily accessible to criminals for criminal enterprise. There are approximately 100 million gun owners in the USA, of these, 40–45 million own handguns (National Rifle Association of America – Institute for Legislative Action (NRA-ILA), 2014). Although the number of these lawfully owned firearms used in crimes is statistically minuscule, it is no secret that gang members and other criminals may acquire otherwise lawfully owned handguns through unlawful transactions and/or theft. Overall, about 1.4 million guns, or an annual average of 232,400, were stolen during burglaries and other property crimes in the six-year period from 2005 to 2010 (Langton, 2012).

Meanwhile, as the number of citizens with firearms experience is again growing, it has become more apparent that

the basic firearms training that law enforcement officers receive may not be sufficient. On average, law enforcement academy training programs consist of 760 classroom hours. One-third of these programs include an additional mandatory field-training component, averaging another 450 hours (Reaves, 2009). The average amount of training time spent on firearms skills in the academy is a mere 60 hours, with even less time spent on self-defense skills (Reaves, 2009). Even with in-service training, law enforcement officers may only receive another 12–16 hours or fewer of firearms use training over the course of each year (Lewinski, 2013). Understandably, the amount of education and practice with firearms in which an officer may participate, external to the police academy and training, can greatly enhance their performance. This can vary from military experience and certification courses to simply hunting or personal training from a family member.

Although many officers have acquired experience from numerous methods of firearms training and may continuously work to improve their firearms skills, an argument can be made that the current firearms training law enforcement officers generally receive is lacking and may result in severe consequences for officers (Chappell, 2008; Marion, 1998; Morrison, 1998, 2006; White, 2006). For example, during practice, officers often fire only a single round at a stationary target (Adams et al., 2009; Aveni, 2003), sometimes up to 50–75 ft away (Kelly, 2011). This may be beneficial in practice, but a majority of gunfights and critical situations will likely involve multiple shots being fired in close proximity, usually within only 3–15 ft of the suspect (Kelly, 2011, 2012). A study of officer-involved shootings in Philadelphia revealed that the average distance between the suspect and officer during a shooting incident was a mere 3.52 ft (White, 2006).

Additional research supports this lack of accuracy, indicating that when police officers use deadly force, more often they miss the target than actually hit the target (Matulia, 1985). Although hit rates across different police agencies vary, officer hit rates often do not exceed 50% during officer-involved shootings (Copay and Charles, 2001; Geller and Scott, 1992). In a national survey completed by the Dallas Police Department (1992), hit rates were recorded as low as 25% in some locations. A study examining officer-involved shootings found that as the distance between suspects and officers increased beyond 3 ft, non-injurious shooting (to the suspect) increased from 9% to over 45% (in the 4–20 ft range) (White, 2006). Theoretically, this may be due to the emotional response of the officer to the high stress level that results when they are assaulted by dangerous weapons or suspects shooting in proximity to and at the officers (Schade and Bruns, 1989).

It should be noted that, according to Geller and Scott (1992), academic studies of hit rates or hit accuracies

may be inaccurate due to issues with gaining access to complete reports from officers about missed, or off-target shots, and the variance in terms and information which different departments collect and report. One example of this is the use of the terms 'hit rates' and 'incident hit rates'; although hit rates are individual statistics for each officer and incident hit rates are considered to be collective shooting statistics for an entire department, they are often used interchangeably in reports of officer-involved shootings.

It is well known and researched that the emotional response of officers to being confronted suddenly by someone with the perceived intent and ability to kill them will have a definite effect on the officer's performance (Honig et al., 1998; Lewinski, 2008; Lewinski et al., 2013). However, the purpose of this research was to focus on the weapon management and accuracy of shooters at different levels of training and experience; the assumption being that the alteration in response in a high-stress situation will to some degree be based on and influenced by the fundamental skill level of the officer.

What these statistics appear to imply is that officer firearms training is not extensive enough and occurs too sparsely for officers to gain, and maintain, the expert level of accuracy with their service weapons that is expected of them. With the capabilities of novice shooters unknown, attempting to determine whether officers are prepared enough for shooting situations can only be based upon assumptions and previous general statistics. With the growing number of firearms and firearms experience in the USA, it is pertinent for officers and departments to understand what the officer may be facing while on duty. Therefore, the primary purpose of this study was to examine the level of shooting accuracy recruits had after completing their law enforcement program's firearms training, in comparison with intermediate and inexperienced recruits who had not yet completed law enforcement firearms training.

Methods

Subjects

A total of 247 law enforcement recruits (195 male, 52 female) volunteered for the study. The recruits came from two police academies and one certified law enforcement preparation program at an accredited college. Two of the training locations used for testing were in the northern USA and the other training location used was in the southern USA. Details about programs and locations are withheld for confidentiality purposes. Participants were recruited through information given to them by their instructors. To schedule testing dates, recruits scheduled testing times

with the instructor who had informed them of the study. At the time of data collection, none of the recruits from one the geographical locations ($n = 178$) had begun his or her firearms training for their law enforcement program or department. All recruits from the other location ($n = 69$) had officially completed their 40-hour firearms training as part of their police academy program. To identify the sample population better, recruits were classified as expert ($n = 83$), intermediate ($n = 71$) or novice ($n = 93$) according to their previous experience in firearms training. Recruits were placed in the expert category if they had completed formal firearms training through a law enforcement academy or had formal handgun training or certification through the military. The intermediate category consisted of recruits who had not received police academy training but did have previous experience in shooting a pistol or rifle, for example participating in regular hunting seasons or recreational shooting. The intermediate category also included recruits with military firearms training, which mostly addressed carbine, rifle and automatic weapons. Finally, recruits were placed into the novice category if they had no experience or minimal familiarity with firearms, such as only having fired a weapon once or twice in their life. Recruit demographics are as follows: age, 26.56 ± 8.13 years; body mass, 83.74 ± 17.32 kg; average experience in military or previous law enforcement training (only participants with experience, $n = 73$), 4.80 ± 4.05 years; the remainder of the participants ($n = 174$) had no previous military or law enforcement experience. Prior to data collection, recruits completed informed consent forms. All recruits were informed that the purpose of the study was to evaluate their accuracy to hit static targets rapidly from 3 to 75 ft.

Equipment

All the trials were completed at each participating academy's firearms shooting range. For the academies located in the northern USA, the shooting ranges were both indoors, whereas the range at the southern US location was outdoors. Environmental factors, such as ambient light, wind, temperature and humidity were similar for each of the three locations; no compromising environmental factors that may have decreased or enhanced shooting performance or ballistics occurred (Heard, 1997). During testing, all recruits wore their academy-assigned law enforcement uniforms. Recruits used one of the following handgun models offered, either a 9 mm Glock (models 17, 19 or 22), .40 cal Smith and Wesson, or a 9 mm Beretta, differing primarily in size for recruit preference.

The same target model was used for all shooting trials. The target (Grey Man), specifically designed by researchers for this study, was divided into two main sections, head and body, with five different subsections (Figure 1). Sections

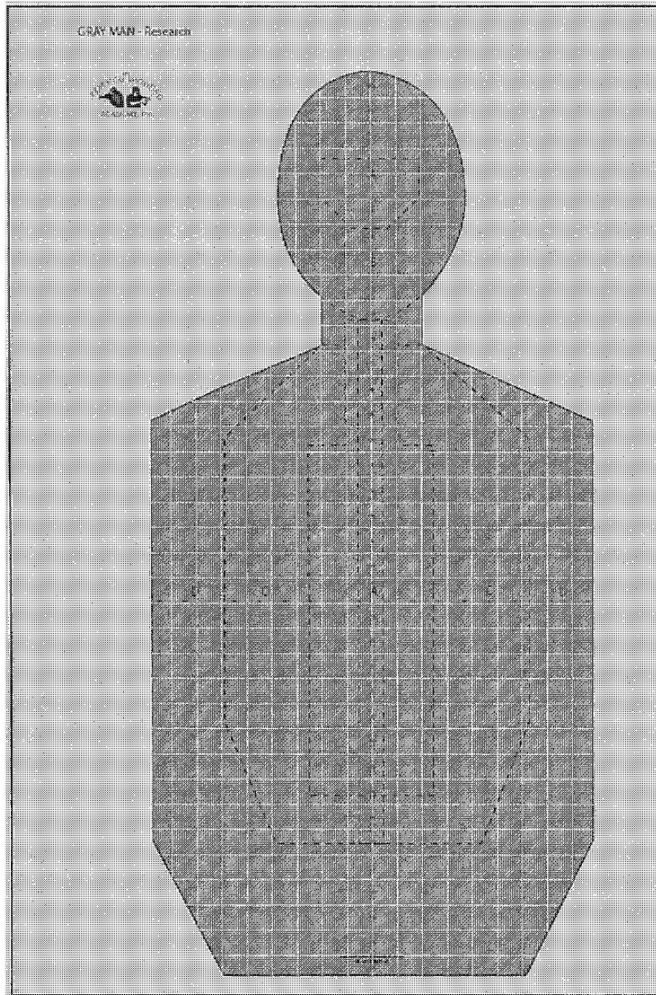


Figure 1. The Grey Man target. Locations are labeled by lethality of hits: Sections Head A and Body A are the most lethal, whereas sections Head B, Body B and Body C are the least lethal.

Head A and Body A were considered to be the most lethal, whereas sections Head B, Body B and Body C were the least lethal areas. The Grey Man target was also covered with a subdued grid pattern that allowed the researchers accurately to measure within one square inch shots that hit the target. Subsequently, the researchers could precisely locate the shot within a target area and also on an (x, y) grid.

Procedures

Prior to data collection, recruits were scheduled to come to the range. Upon arrival, recruits were informed that they would be shooting at a total of nine targets, each from a different distance. Researchers also instructed the recruits that they would fire three rounds at each target and they should try to shoot as accurately as possible and as quickly as they could without compromising accuracy. No instruction was given on where the recruit should aim on the target, only

that shots should be taken rapidly and as accurately as possible. Additionally, recruits were told they would not be graded academically on their performance and their results would be confidential.

Recruits started at an arbitrary/randomized distance from the target and the target moved through the remainder of the eight distances in a randomized order. At each firing position, a researcher provided the recruit with one magazine, loaded with three rounds. After the researcher had ensured that the recruit had positively identified the target, the recruit was given the command to load the firearm and engage the target upon a go signal from a PACT timer. Once the recruit had completed firing the three rounds, a researcher would replace the target, which was located on a motorized track, and send the target to the next randomized distance using the track controls. This procedure was repeated until the recruit had completed firing at all nine target distances. For individuals in the intermediate and novice group, a certified firearms instructor provided basic information on weapon safety with a handgun and if necessary aided them with loading the weapon and basic weapon handling. Only after all data collection was complete were recruits given their performance scores and informed of the full intent of the study.

Statistical analysis

The variables measured for analysis were hit percentages at different distances between the subject groups, as well as the location of the shots fired (head shots versus body shots) from 3 to 21 ft between the groups. Rounds penetrating the target within the gray area (Figure 1) were considered target hits, whereas any rounds outside of this area or missing the target completely were considered target misses. Hit percentages were calculated by dividing the number of hits by total rounds at each target (three rounds/target). Head shot locations were considered to be rounds penetrating areas Head A and Head B, and body shot locations were considered to be rounds penetrating locations Body A, Body B and Body C. All comparisons were made using separate analyses of variance (ANOVAs) with independent samples and Bonferroni-adjusted post-hoc testing (SPSS, IBM Corporation, Armonk, NY, USA). The criterion to reject the null hypothesis was $p < 0.05$. All descriptive statistics are reported as mean (M) $\pm$ SD.

Results

The hit percentages and rates are displayed in Tables 1 and 2. The analysis examining the point of impact in head and body shots from all targets are displayed in Table 2. A significant difference was found between groups in total hit percentages ($F = 22.84, p < 0.01$). Recruits in the expert and intermediate groups shot more accurately than the novice group (both $p <$

Table 1. Hit accuracy by group and distance.

Distance	3–15 ft		18–45 ft	
Rounds fired	9		12	
Group	Rounds hit	%	Rounds hit	%
Expert	7.89 (1.10)	87.68	4.55 (2.17)	37.95
Intermediate	7.52 (1.41)	83.57	4.90 (2.10)	40.85
Novice	6.78 (1.80)	75.39	3.31 (1.96)	27.60

Distance	60–75 ft		Overall	
Rounds fired	6		27	
Group	Rounds hit	%	Rounds hit*	%
Expert	0.84 (0.90)	14.06	13.30 (2.93)	49.26
Intermediate	0.76 (0.87)	12.68	13.01 (3.03)	48.20
Novice	0.33 (0.57)	5.56	10.51 (3.07)	39.91

*See Figure 2 and Discussion section for significance levels.

0.01); however there was no difference in accuracy between the expert and intermediate groups ($p = 1.0$). Recruits in the expert group shot more accurately ($p < 0.01$) than the novice group at 3–15 ft ($F = 12.72, p < 0.01$); however, there was no significant difference between the expert and intermediate groups ($p = 0.37$). At the 21–45 ft distance ($F = 13.83, p < 0.01$), recruits in the expert and intermediate groups shot more accurately than the novice group (both $p < 0.01$) with no significant difference between the expert and intermediate groups ($p = 0.90$). From the 60 to 75 ft range ($F = 10.67, p < 0.01$), expert and intermediate recruits shot significantly better than the novice group ($p < 0.05$) with no significant difference between expert and intermediate groups ($p = 1.0$).

The number of head shots taken significantly varied between groups (novices compared with intermediate and experts) at 3 ft ($F = 18.12, p < 0.01$), and 9 ft ($F = 11.76, p < 0.01$); however, there was no significant differences found in head shots at 15 ft ($F = 2.11, p < 0.12$) or 21 ft ($F = 0.73, p = 0.48$). Similarly, significant differences were found between groups in all of the body shots at the 3 ft ($F = 22.43, p < 0.01$), 9 ft ($F = 16.61, p < 0.01$), 15 ft ($F = 7.00, p < 0.01$), and 21 ft ($F = 9.67, p < 0.01$) locations (see Figure 2).

Novice shooters had 75% hit accuracy on distances from 3 to 15 ft. Intermediate and expert shooters only had a small margin of increased accuracy (84% and 88% respectively) (see Table 1).

Discussion

The primary purpose of the study was to investigate the effectiveness of academy firearms training, as well as the

accuracy of individuals without any handgun firearms experience or training. The results of this study demonstrated that individuals who had completed standard, law enforcement academy firearms training were not more accurate in their shooting than those who had not had any law enforcement handgun training. As well, they were only moderately more accurate than individuals who had minimal firearms and little to no handgun experience (Table 1). As anticipated, the novice shooters did not perform as well as the intermediate and expert groups. However, it was unexpected that the novices would be so accurate in comparison with intermediate and expert shooters at the closer distances. Also, results for overall shot hits and misses for intermediate and expert participants would be nearly identical across all distances.

One factor that may have had a large influence over the similarity between the intermediate and expert groups is the amount of external experience intermediate participants had with long-barrelled weapons. It may be that additional military training or extensive previous experience with long-barrelled firearms increased the accuracy ratings of the intermediate group because of the transference of these skills to handgun manipulation.

However, it is important to realize that law enforcement officers are expected to perform at a much higher level than average or intermediate shooters and to do so under highly stressful conditions. As a large percentage of the population has considerable experience with firearms, it should be assumed by officers that individuals they encounter are likely to have such experience. Therefore, this study's results indicate an alarming need for improved firearms training for officers. Further investigation is suggested to examine the possibility of a skill transfer in weapon manipulation between long-barrel firearms and handguns as well as officer accuracy under combat shooting conditions. The New York Police Department (NYPD) reported an 18–20% degradation of accuracy skills once an officer becomes involved in an actual gunfight (Vila and Morrison, 1994). This suggests that such motor skills are subject to degradation during levels of high stress.

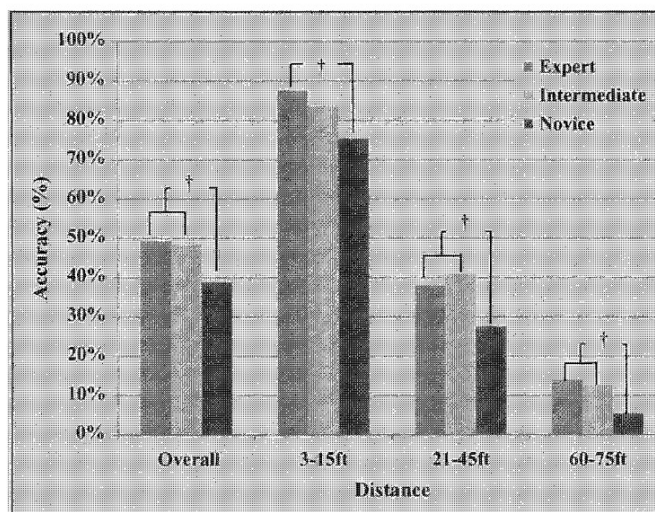
Current firearms training in some departments required officers often to fire at a target up to 75 ft away. We do not intend to diminish the significance of this as a test or demonstration of an officer's sophisticated weapon skills. However, it is important to note that an average of 47% of the adversarial conflicts in which officers fired their weapons, occurred at a distance of 3–15 ft, as reported by the Intentional Discharge Reports from 2011 and 2012 for the NYPD (Kelly, 2011, 2012). As demonstrated by the current study, novice shooters are able to fire at a distance of 3–15 ft with an accuracy of nearly 75%, and intermediate shooters with an accuracy of 84%. Expert level shooters, who had completed accredited, law

Table 2. Head vs. body shots from 3 to 21 ft by group.

Distance	3		9		15		21	
Rounds fired	3		3		3		3	
Head target	Rounds hit	%	Rounds hit	%	Rounds hit	%	Rounds hit	%
Expert	0.64 (1.21)	21.29	0.18 (0.60)	6.02	0.17 (0.51)	5.14	0.11 (0.31)	3.61
Intermediate	1.70 (1.42)	56.81	0.82 (1.05)	27.23	0.35 (0.66)	11.74	0.18 (0.46)	6.10
Novice	1.72 (1.35)	57.35	0.71 (1.02)	23.66	0.29 (0.54)	9.68	0.17 (0.48)	5.73
Body target	Rounds hit	%	Rounds hit	%	Rounds hit	%	Rounds hit	%
Expert	2.33 (1.22)	77.91	2.52 (0.87)	83.94	2.05 (0.97)	68.27	1.55 (1.00)	51.81
Intermediate	1.18 (1.45)	39.44	1.65 (1.29)	54.93	1.75 (1.17)	58.22	1.72 (0.97)	57.28
Novice	1.09 (1.36)	36.20	1.61 (1.24)	53.76	1.45 (1.04)	48.39	1.10 (0.89)	36.56

*Significant differences in head shots between groups occurred at 3 ft and 9 ft ($p < 0.01$).

† Significant differences in body shots between groups occurred at all distances ($p < 0.01$).

**Figure 2.** Shooting accuracy of groups by target distance.

enforcement officer firearms training, hardly showed an advantage over these groups, with an accuracy of 88% – a mere 13% better than shooters who had never had experience with a firearm. In a simple comparison, the expert shooters hit one of the major zones on the target with eight of the nine bullets they fired at these distances. The total novice hit one of the major zones on the target with seven of the nine bullets they fired at these distances.

Because almost half of all shootings occur at such close ranges, officers need to have a better advantage over a threatening suspect. According to the 2011 Law Enforcement Officers Feloniously Killed in Action (LEOKA) reports, 65% of the officers killed with a firearm were 10 ft or less from the assailant (FBI, 2011). Reports from 2002–2011 show that of the 500 officers killed with firearms, roughly 300 had suffered fatal wounds caused by shots to the head (FBI, 2011). The findings of this study

simply exemplify this data. It was observed that at short ranges novice and intermediate shooters are more likely to aim for the head. Novices demonstrated head shot accuracy of 41% between 3 and 9 ft and nearly 25% between 3 and 21 ft.

In addition to the novice shooters' accuracy for head shots, it should be noted that as shooting distance increased, novice shooters were more likely to shift their focus to firing at the center of the body. They decreased head shots from 57% at 3 ft to only 10% of total shots fired when the distance increased to 15 ft. By contrast, recruits who had completed all of their firearms training and were in the expert group maintained a 60–80% hit rate for body shots to the target, decreasing by only 10% accuracy from 3 to 15 ft. The intermediate recruits showed similarities to both groups, decreasing in the percentage of shots aimed at the head after 3 ft (decrease from 57% to only 12% at 15 ft) and maintaining steady accuracy at the body area (55% at 9 ft to 58% at 15 ft).

The slight difference that exists between novices and trained law enforcement officers at the critical distance of 3–15 ft is theorized by the researchers to be likely due to two components: the use of block education for firearms training and the shift from an external to internal attentional focus when firing. A vast majority of law enforcement academy firearms training courses, including those in this study, use block, repetitive practice, in which skills are broken down and taught in long duration sessions over a shorter length of time (i.e. four- to eight-hour classes taught over the course of two to four weeks, each class teaching a new skill). Although this method is often used for efficiency such as range and instructor availability and may be beneficial for short-term learning, block training has been observed through multiple studies to be ineffective for long-term learning and performance (Battig, 1979; Helsdingen et al., 2011; Schmidt and Wrisberg, 2008; Shea

et al., 1990; Ste-Marie et al., 2004; Vickers, 2007). In particular, when individuals are challenged with complex, unusual, and new conditions, those with block training consistently performed worse than individuals who learned their skill using random practice techniques (Schmidt and Bjork, 1992; Schmidt and Wrisberg, 2008; Ste-Marie et al., 2004). The noted research concludes that students in a block training program rapidly learn the skills and both the instructor and students are pleased with the progress. However, block training produces one of the highest rates of any type of training on the speed of deterioration of the acquired skill.

In addition to the use of block practice during their firearms courses, officers are taught to focus predominately on their weapon and their body. For example, they are taught the necessity of attention to the grip, trigger press, stance, body and arm alignment, balance, the sight picture, etc. Subsequently, officers appropriately learn the importance of these elements but again, their primary attentional focus is on themselves (Lohse et al., 2012; Wulf and Dufek, 2009).

With practice and experience, officers, much like athletes, are able to move past this internal focus on the manipulation of their weapon and use an external attentional focus to concentrate on their target and the situation (Lohse et al., 2012). Numerous studies have observed that external focus promotes better performance through allowing more automatic and reflexive movements, rather than interfering with automatic motor responses (Lohse, 2012; Lohse et al., 2012; Wulf et al., 2001b). This was demonstrated in law enforcement by a study that examined both amateur and highly experienced officers' gaze during a high-stress encounter (Vickers and Lewinski, 2012). Researchers found that with the firearms training and experience provided by an average North American Police Academy, amateur or average officers are likely to spend more time focusing on the sights and manipulation of their own weapon, rather than their target or suspect (Vickers and Lewinski, 2012). Only after an undetermined but extra amount of training did the officers in the Vickers and Lewinski (2012) study revert to highly skilled and automatic manipulation of their handgun. This automatic manipulation allows experts to manipulate their handgun in a sophisticated fashion, while intently visually and cognitively remaining externally focused on the assailant and the dynamics of the incident. This should be a goal in every department, to train the officer so the motor program becomes automatic, freeing cognitive resources for observation, cognitive processing and immediate decision-making, even if the attained advantage is measured in tenths of a second.

The absence of an internal focus upon manipulation of the weapon may likely be the explanation for novice and

intermediate shooters aiming primarily at the head at close ranges. While officers are trained to sight and shoot at a suspect's center mass, novices have no training at aiming or handling a weapon, and therefore are more likely to aim where they are looking (Lessler, 2013). In close-contact social situations, individuals tend to look at the face, watching for facial gestures, expressions, etc.; therefore, shots aimed at the head during close-encounter shootings may be more heavily linked to natural instincts, resulting in shooters automatically pointing the gun to where they are looking, directly at the face while concurrently aligning and firing their weapon. In practice, they are emulating the introductory firearms training concept of initially pointing the weapon, much like an individual uses their index finger to point to an object.

Overall, while it is possible that the high percentage of hits to the head area by the novice shooters could be explained by a novice looking over the firearm sights, which would tend to create high hits, the high number of head hits suggest the individuals naturally point the firearm where they are looking – at the head. This begs the question regarding police officer firearms training and the current practice to fire at center body mass at minimal distances: Is this the best point of aim and is this training counter-intuitive to natural instinct? Therefore, it is recommended that further research and investigation be aimed at answering whether this training forces the officer to spend precious additional time to re-focus and shoot toward an area that is not one of normal or instinctual visual focus?

We are aware from the FBI (2011) National Gang Threat Assessment that certain gang members are becoming more prone to wear body armor. The original law enforcement body armor was typically rated and marketed to protect the officer against the handgun rounds that the officer carried. This was to prevent officer deaths at the hands of criminals who successfully took the officer's weapon. Today, body armor is still mostly effective against rounds up to and including handgun rounds typically used by law enforcement. It is well known that police officers target center body mass, and in a planned attack, the prepared felon intent upon murder would be well served to obtain armor designed to negate the deadly force response of the officer.

Additionally, it is important to consider other factors when discussing the viability of a head shot vs. targeting the center body mass at close range. One reason officers target center mass is that, by definition, it's the largest vital target area. In theory, this means there will be fewer errant rounds that may potentially injure innocent bystanders. While engaged in felonious assaults, criminals are likely not concerned with collateral damage, but law enforcement officers must consider such a possibility. Another factor in targeting center body mass is that center body mass moves

more slowly than limbs or the head. A final and key factor for center of mass aiming is that while targeting the head may be the best alternative for immediate incapacitation by military personnel engaged in close-quarter battle, law enforcement is aware of the public perception and current social unacceptability of civilian law enforcement targeting the head as a standard operating procedure. An expansion of research needs to be completed on this specific theory. Therefore, it is emphasized that researchers are not suggesting that training for close-quarter encounters should target center body mass only. However, there are other factors to be considered. Head-shot training should be a part of the trainer's curriculum so that officers can effectively deal with suspects wearing body armor, to stop a threat effectively in situations where center body mass shots seem to have little effect, or in instances where the head shot is simply the best alternative in a bad situation. Officers need the correct tools to stop the threat as quickly as possible.

Implications

In examining the results of this research, it is important to recognize the unfortunately high number of officers who are killed in close-contact encounters with firearms. Although the expert level recruits in this study demonstrated high levels of accuracy within the 3–15 ft range, they also had no significant skill advantage over the intermediate shooters, and a mildly improved advantage over novice shooters. While officers are trained and encouraged to engage and neutralize threats within a close proximity (Davis, 2006; Adams et al., 2009), previous research has observed that a majority resort to more natural instincts and retreat while drawing and trying to address the threat (Lewinski et al., 2013). In a study by Lewinski and colleagues (2013) examining officer reaction to a deadly threat presented during a roadside traffic stop, it was observed that, regardless of training, only 12 of 93 officers made an offensive attempt to control the suspect's weapon when it was within close proximity of ~ 1–2 ft. Of those twelve, only three were successful, while the remainder ceased their attempt to engage the suspect, and utilized a retreating maneuver (Lewinski et al., 2013). This retreat, although effective in placing distance between the officer and suspect, also often gave the suspect a firing advantage over the officer. Regardless of the holster used, it took the officers over two seconds to retreat, draw and engage. It has been found that in a majority of officer involved shootings, the suspect tends to fire first (White, 2006). Officers utilizing only a draw then retreat tactic, or a better retreating while drawing tactic still allows the suspect more time to attack (Lewinski et al., 2013), possibly resulting in more officer injuries or death. If officers get stuck in a draw first then move reaction, they will be caught behind the reactionary

gap while in close proximity to the assailant, allowing the assailant to fire a handgun multiple times before the average officer can even draw the weapon from the holster.

At the rapid speeds in which a gunfight can unfold and the accuracy of novice and intermediate shooters at close range, officers would benefit immensely from a strong tactical awareness, pre-event assessment and close-encounter training (Miller and Kurata, 2007). Officers should be able to react to assault cues at the earliest possible moment during an encounter to optimize their chances of preventing or controlling the incident and enhancing their survival. Additionally, the results of this study indicate that officers, although held to a higher standard in firearms training and qualifications, may not be gaining the advantage they need from current law enforcement firearms certification courses. Upon graduation from their law enforcement academies, these courses should have prepared officers for dynamic, deadly use of force situations. Overall, firearms performance standards should be reviewed and the possible addition of random or spaced training intervals considered. The department should consider improving the officers' skills to the level where the weapon manipulation skills become fully automatic and the officer can develop an emphasis upon an external focus of attention and an early detection of threat cues (more details on training automaticity see Kibele, 2006; Vickers 2007; Wulf et al., 2001a).

Additional training methods may also increase officer accuracy. It has been suggested that officers who performed mental training regimens, along with firearms training, were significantly more accurate in their shooting than those who only performed single training or no training (Couture et al., 1999). It is also recommended that the next innovative stage of training would be teaching officers 'pattern recognition' on how to read evolving threats and intervene or control them before they become deadly for the officer.

After basic skill training, athletic teams spend a large portion of their training in 'videotape review' of their opponents so they can enhance their ability at recognizing and being able to intervene in evolving plays. A similar method of incident review training should take place in law enforcement, reviewing the threat cues and dynamics of officer involved shooting situations as recorded by dash cams, body cams, surveillance systems, etc. This is a way to begin to optimize officer training, tactical awareness and responsiveness, and would go beyond basic simulation training, so that officers would be able to make better decisions, perform in ways that maximizes their own safety and insure the greatest safety as well for the citizenry.

Conclusion

Overall, the results of this study indicate that trained officers had a very small advantage in shooting accuracy over

intermediate and novice shooters. Although the level of experience in intermediate shooters may have played a significant role in these findings, it is pertinent to remember that officers are expected to be able to perform with incredible precision and when their training, performance and accuracy fall short, it often results in injury, death or other severe consequences for themselves and others. Officers should be aware of the possible threat each suspect may pose – even those with minimal firearms experience. As demonstrated, rounds fired by novice and intermediate shooters in close proximity encounters are more likely to result in immediately lethal hits, as they fire primarily at the head. This finding is in line with the 2011 FBI report indicating roughly three of five officers feloniously killed with a firearm died of shots to the head and neck.

Most importantly, however, considering the implications of shooting accuracy, authors of this study suggest officers and departments evaluate their officer firearms training techniques, assessments, and regularity to determine whether improvements or changes are necessary, with the safety of their officers and citizens in mind.

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