



The Scene

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Trivia Question: What is meant by the term "Burking"?
(answer on page 6)

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AN EXAMINATION OF POLICE OFFICER MENTAL CHRONOMETRY:

“I SWEAR...I DON’T KNOW HOW I SHOT HIM IN THE BACK”

by

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Abstract

Every year, dozens of suspicious deadly force encounters involving police officers who have shot suspects pit the reputation of well-regarded and highly trained officers against physical evidence which suggests the officers acted maliciously. In particular, suspects are sometimes found to have been shot in the side or back despite the protestations from the firing officers that they had perceived frontal threats from the suspects. While officer malice is one possible (and sometimes probable) explanation for such shooting incidents, other explanations may also exist. This article reports the findings of a 4-experiment study involving 102 police officers in a major police department in the Southwestern United States. The results of the study demonstrate that many variables go into an officer’s ability to react to stimuli in a timely manner and that even in laboratory conditions, there is ample time for the threat picture to change before an officer can either turn on, or turn off, a decision to react by firing a weapon.

Background

There has been considerable attention in criminal justice and criminological scholarly and professional literature on the use of force, including deadly force, by police officers. Commonly, the literature has focused on officer misconduct and outright unlawfulness. Indeed, many criminal justice studies exist which examine the reasons behind violence committed by police officers against citizens.

In the landmark case of *Graham v. Connor* (1989), the U.S. Supreme Court declared that the use-of-force by police officers must be objectively reasonable under the 4th Amendment. For many contemporary observers and critics of the police who occupy seats in community organizations and academia, it is difficult for them to find examples of police use-of-force that meet the standard of objective reasonableness; for some, there is an apparent reflex to find the police at fault in almost any circumstance. They apply a standard of what is objectively reasonable to them (the critics) with the benefits of hindsight, unlimited contemplation, and complete information. They do so in spite of the Supreme Court's admonition in *Graham v. Connor* to determine the objective reasonableness of use-of-force encounters by looking through the eyes of a reasonable police officer in the same circumstances and timeframe as existed when the use-of-force took place.

Instead, the standard often applied to law enforcement use-of-force action is to presume impropriety and excessiveness unless the evidence clearly demonstrates otherwise. Consequently, when the physical evidence at first glance appears to contradict the account given by the "offending" police officer, there is almost never an extension of benefit of the doubt to such officers. Nor is there an assumption that a rational explanation which supports the officer's account might exist and is awaiting discovery.

The Sources of Police Violence

The various academic studies on police violence seem almost universally unaware of alternative explanations for violent acts committed by police officers. The studies tend to approach the broad issue of police violence as always a matter of misconduct and usually a matter of criminality. Some suggest that the para-military structure and culture of modern police agencies contribute to violence perpetrated by police against elements of the citizenry (1-3). They would argue that police agencies must be flexible and adaptive to the changing conditions in the communities they serve and to changing societal norms (4).

A related claim is that police violence can be curtailed through organizational pro-activity via human resource management and policy enforcement (5-7). Smith (8) on the other hand found that personnel and policy variables were poor predictors of police killings. Instead, levels of community violence and community racial composition were positively related to deadly force encounters (8, 9).

Other researchers have claimed that tendencies to use violence to bring about order are inherent in many individuals drawn to police work (10-12). Still another explanation relates generally to the training of police officers. James Fyfe (13) noted that police officers who are properly trained to diffuse potentially volatile situations exert considerably less force than officers without such training.

Many criminal justice scholars are sufficiently concerned about the phenomenon of police violence that they have called for added layers of review. Alpert and Smith (14) suggested that all force encounters between police and citizens should be routinely subject to supervisor review. The supervisor would be obligated to consider the input of not only the officer(s), but

also the suspect(s) and any other witnesses. Further, they recommend that panels of “experts” also be regularly convened to determine the appropriateness of any police encounters involving force.

Indeed, scholarly criminal justice literature is saturated with many plausible explanations for police violence, along with many useful (and some not so useful) recommendations to curb it. These explanations and recommendations come from many directions, but virtually all rely on the basic premise that law enforcement needs to fix itself. In other words, the tone and tenor of the explanations and recommendations from academe is that police violence is an avoidable tragedy that can be significantly reduced if police organizations and individual officers would get their acts together. Although it is true that sociological and organizational variables, including the background and personalities of the of the officers, the biases of the officers, structural impediments to change, the presence or lacking of viable use-of-force policies, and many other factors may play a role in incidents of police violence, an alternative explanation for some questionable deadly force encounters does exist. The explanation is simply this: many incidents involving the apparent misuse of force by police officers can be explained by the realities of human psychological and physiological limitations. The nature of any inherent human limitation manifested in the real world is that it must be understood and accounted for because it cannot easily be overcome.

The Science of Human Reaction

The scientific study of how quickly the human mind and body can and do react to stimuli (known as mental chronometry) goes back at least to the middle part of the 19th Century. For example, in 1865 Donders conducted experiments involving a mild electric shock to the

right or left foot of his subjects. The subjects would then press a telegraph key with their right or left hands to indicate which foot had received the shock. This experiment involved subjects who knew in advance which foot would be shocked, along with subjects who did not. Donders found a slight difference in response times between the two sets of subjects—approximately 1/15 of a second (15). Donders also conducted experiments measuring the differences in time between responses to a single stimulus (simple reaction time) and responses involving a choice among multiple stimuli (choice reaction time). Donders postulated that if you subtracted the simple reaction time from the choice reaction time, you would have a measure of the mental process of choice itself (16).

Another pioneer in mental chronometry was Merkel. Merkel's studies on choice reaction time demonstrated that as the number of choices increased, reaction time increased as well (1885). This principle was advanced further by Hick (17) who found that reaction times not only increased when subjects were faced with choices, but that they increased linearly. This has come to be known in kinesiology as "Hick's Law." This axiom states that there is a stable relationship existing between the number of stimulus-response alternatives and reaction time. As the number of stimuli-response alternatives increase, reaction time also increases in a linear fashion (18).

Indeed, from the mid-19th Century until the mid-20th Century, the disciplines of psychology and physiology were dominated by studies and experiments that related to the capacity of human beings to react and perform in the face of stimuli requiring a response. Yet, despite the obvious applicability of such studies to law enforcement use-of-force encounters, relatively few within the circles of criminal justice, criminology, and public policy have bothered to consider the role of human performance capacity generally, and mental chronometry specifically, in the

context of police use-of-force and deadly force incidents which are deemed questionable in hindsight.

Smith (19) conducted a study to collect baseline information on officer reaction times with duty handguns. In his study involving over 1,400 officers, he found that it took an average of 0.73 seconds for police officers to react to a visual stimulus by raising their already drawn pistols from a ready position (arms partially extended with firearm above waist level but below eye level) to a firing position and then firing one shot. Further, it took officers an average of 1.82 seconds to draw their weapons from their holster, bring it to eye level, and fire one shot. It took an average of 2.84 seconds for officers to draw and fire two rounds at a target from 7 yards away.

Tobin and Fackler (20) conducted a study which measured the reaction times of officers in firing drawn sidearms (but with finger outside of trigger guard as per the standard police practice) in response to stimuli, and compared those measurements with the time it takes for a person to turn their torsos away (90 and 180 degrees) from officers after posing a threat. They found that it takes officers twice as long to fire their weapons when their trigger finger is outside the trigger guard (0.677 seconds) as compared to having their fingers on the trigger at the time of the stimulus (0.365 seconds). Further, they found that the average individual can turn his or her torso 90 degrees in 0.31 seconds and 180 degrees in 0.676 seconds. In other words, in the time it took an officer with a drawn firearm to fire his or her weapon at a threat, the suspect could already have turned 180 degrees away from the officer at the moment of discharge.

The findings by Tobin and Fackler have been replicated and affirmed in other studies (21-23). In fact, Lewinski (22) demonstrated that suspects can fire weapons at officers, turn and be well into their flight from the officers before the police can react and return fire.

A corollary to the plain implications of the time measurements is the difficulty an officer (or any human being) has in “turning off” a reactionary decision made in the moment. In a shooting situation, once an officer decides to shoot at a suspect in response to some threatening stimulus, it is nearly impossible to abort that decision (21-22, 24-25). In fact in over 600 examined cases of officer shooting decisions during a 7-year period, only one officer was identified who was able to keep himself from firing at a suspect who had already been deemed a threat and the decision to shoot had already been made (21).

Methodology and Results

The present study is a compilation of 4 separate experiments conducted with officers of a large police department in the Southwestern United States. The experiments sought to measure the following:

Experiment #1: Reaction time to a visual stimulus

Experiment #2: Time it takes to stop pulling the trigger

Experiment #3: Simple decision-making

Experiment #4: The role of anticipation

A total of 102 police officers were utilized in each of the four experiments. The officers’ participation in the experiments was voluntary.

Experiment #1: Reaction Time to a Visual Stimulus

Experiment #1 involved the use of a stimulus board that was placed in front of each participating officer. The stimulus board was a 10”x 10” square and displayed a pattern of clusters of light on the face of it. There were 9 clusters of lights on the square board (3 rows containing

3 clusters each) and each cluster contained 3 LED indicators. While viewing the board, officers were asked to grip a modified Glock training pistol. The Glock was fitted with an electronic device to capture trigger-pull data and record it in a computer. Officers were instructed to observe the light clusters in the upper left quadrant of the stimulus board. They were told to pull the trigger once, as quickly as possible, when a particular green light was illuminated.

The average trigger pull reaction for the 102 participating officers, upon viewing the green light, was 0.31 seconds. Broken down further, it took an average of 0.25 seconds to mentally process that the light was on and decide to pull the trigger; it took 0.06 seconds mechanically pull the trigger.

Experiment #2: The Time it takes to Stop Pulling the Trigger

Officers in this phase of the study were instructed that the researcher was measuring the officer's ability to pull the trigger rapidly. The officer was asked to repeatedly pull the trigger as quickly as possible when the light on the stimulus board came on. However, they were also instructed to stop pulling the trigger immediately upon the light going off. In fact, they were misinformed that any extra trigger pulls after the light stopped illuminating would count against their overall score. As such, this experiment modestly added the elements of on-going attention and motivation.

On average, participating officers stopped pulling the trigger within 0.35 seconds from when the light went off. Approximately 68% of the officers (one standard deviation) fell within the range of 0.10 and 0.60 seconds to cease pulling the trigger. Many officers did pull the trigger more than once after the light went off. In one example, an officer pulled the trigger three times during the illumination of the light, began a fourth trigger pull as the light went out, and

then pulled the trigger a fifth time. The fourth and fifth trigger pull took only a half second to complete. This officer, reacting within a range that is comprised of 68% of the participants, still had two “unjustified” trigger pulls.

Experiment #3: Simple Decision-Making

Through this experiment, an attempt was made to understand the impact of simple decision-making and visual complexity on reaction time. This experiment was an extension of Experiment #1 in that this experiment added confounding elements to the simple determination of whether a light was illuminated (as was the case in Experiment #1). The element of a “go/no-go” decision requirement was one such addition. In Experiment #1, the illumination of the green light in the upper left corner (the only light to be illuminated) was all one needed to pull the trigger. In Experiment #3, officers were instructed that cluster of lights may be illuminated anywhere on the top line of the board. Further, they were only to pull the trigger when all three lights in a cluster were illuminated. They were not to pull the trigger if only two lights of a cluster came on.

The requirement of go/no-go decision-making in this experiment essentially doubled the reaction times found observed in Experiment #1. This is consistent with other reaction time literature. The average for the 102 participating officers to identify the illumination of 3-light clusters, react to it, and actually pull the trigger was 0.56 seconds. If you back out the 0.06 seconds to mechanically pull the trigger, then the average time to perceive the light cluster, mentally process it, and decide to pull the trigger was 0.50 seconds (as compared to 0.25 seconds in Experiment #1).

The range of reaction times (not counting the actual trigger pull) was 0.44 seconds to

0.69 seconds within one standard deviation (68% of the officers). The 25% variability with one standard deviation can be explained in part by individual reaction and processing ability, varying capacity to concentrate, anxiety, and other factors. It is worth noting that these same variables exist amongst the same officers in the real world. An obvious implication is that average, comparable officers do not necessarily bring the same baggage or ability to a shooting incident; different officers may bring about different outcomes to otherwise similar circumstances.

An interesting side note of Experiment #3 relates to the so-called “Oops Factor.” Of all trigger pulls, 9% occurred when the cluster pattern did not warrant them. Further, 4% of the 3-light cluster illuminations resulted in no trigger pull when there should have been one. While the error rates here are not unfamiliar or even alarming within the context of laboratory experiments, the outside world (including prosecutors, community leaders, academicians, and victims of accidental shootings) are less forgiving of honest errors made in the field.

Experiment #4: The Role of Anticipation

The final experiment of the study measured the influence of anticipation on reaction times. In this experiment, the participants were presented with a variety of lights on the stimulus board. All of the lights illuminated at irregular intervals. The lights, which were yellow, red, and green, would go on and off. Eventually, a pattern of green lights would begin to appear. When the pattern of green lights was complete, the participant was expected to pull the trigger. If the pattern never became complete, then no trigger was warranted and the participant was to wait for the next completed pattern.

Like Experiment #3, this phase of the study required officers to make a “go/no-go” decision. Further, Experiment #4 included greater visual complexity than any of the other three ex-

periments. However, the anticipation of the perceived “threat” in the form of an increasingly-complete green light pattern was an entirely new dimension embedded in the officers’ reactions.

Interestingly, the addition of an ability (or liability) to anticipate the threat caused the reaction times of participants to drop from 0.56 seconds to 0.46 seconds. Further, anticipation was apparently responsible for reducing the failure to pull the trigger when justified to practically zero. Perhaps somewhat surprising, the element of anticipation also appears to have reduced unwarranted trigger pulls. While some observers might have expected that anticipation would cause officers to “jump the gun,” in fact, just the opposite occurred. The unwarranted trigger pull rate dropped from 9% in Experiment #3 to 5% in Experiment #4. Quite possibly, the greater level of concentration devoted to the forming pattern of green lights made it more keenly evident to participants when the pattern failed to ultimately materialize, thereby reducing the number of improper trigger pulls.

The table below summarizes the reaction times measured in the four experiments.

Table 1: Average Reaction Times Across the Four Experiments

<u>Movement</u>	<u>Average Time Needed</u>
Pull trigger after a visual stimulus	0.31 seconds
Stop pulling the trigger	0.35 seconds
Go/no-go decision to pull trigger	0.56 seconds
Pull trigger after anticipation	0.46 seconds

Discussion

While all four experiments in this study were conducted under laboratory conditions, the

implications for police officers on the streets are fairly evident. It does not take a significant degree of imagination to see how variability in officer reaction times under different conditions, as measured by the consummation of trigger pulls, is relevant for assessing police shootings in the field.

As noted earlier, a number of studies have shown that armed suspects can fire upon police officers and begin to run away before the officers can physiologically react and return fire (20, 21-23). The 4-part study presented here provides additional empirical evidence concerning the limited capacity of police officers, or any other human beings, to react. Stated simply, reaction takes time; further, reaction is difficult to turn off. "Stopping" is a reaction to a change in stimulus. Like any other reaction, "stopping" is never instantaneous.

While some elements in the community and academe will forever remain skeptical of officers who are involved in a shootings, police investigators and prosecutors should give careful consideration to the findings of this study and others related to it. If an officer with an otherwise exemplary record is involved in a shooting incident, and, despite the officer's insistence that a threat was perceived, the suspect was shot in the side or back, investigators and prosecutors may want to consider that something other than an execution or attempted execution took place.

In fact, the physical and psychological limitations of the human condition do not apply only to law enforcement officers. Detectives called to the scene of a "routine" shooting incident between two civilians may wish to not-so-readily dismiss the claim of the suspect that the victim had posed a threat, despite entry bullet wounds in the victim's back. Obviously, consideration of reaction time doesn't explain all shootings. Common sense, eye-witness testimony, and physical evidence tend to close the cases. But in those instances when common sense sug-

gests the suspect's innocence while the victim's wounds suggest the suspect's guilt, innocence *may* still be an option.

There are also implications in this study for academe. In particular, more scholarly research should be done on past and potential use-of-force encounters which are suspicious in nature to determine what role human capacity—and especially mental chronometry—play in these incidents. Once again, reaction times do not explain all use-of-force encounters. Further, the existence of some unlawful use-of-force in the law enforcement community, past and present, is well documented and must be confronted and condemned. However, use-of-force decisions and outcomes which appear unjustified but are actually manifestations of limited human capacity are not unlawful (although they may be mistakes and they may be tragic). Through additional studies, the academic community can not only educate itself in this area, but serve as a genuine partner with law enforcement to develop realistic and useful training and policies that will minimize, where possible, tragic use-of-force and deadly force encounters while still promoting the safety of the officers.

Police officers cannot be expected to defy biological and physical laws as they perform their duties. To require perfect comprehension and instantaneous, flawless reaction of police officers in the field is to require the impossible. And to send officers to prison when they fail to do the impossible is a most grievous injustice. Only through deference to scientific research which uncovers the true capacity (or incapacity as the case may be) of police officers to react to threatening stimuli may we begin to understand how at least some of the deadly force encounters play out between law enforcement and suspects. Certainly it is our obligation as constituents of the criminal justice system to follow truth wherever the science takes us.

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