Tueller Drill Research Comparison

By Duane Wolfe

The understanding of the research into reaction and response time is a critical component to both law enforcement training and understanding officer use of force. This article will compare four different studies and the information that they provide.

The article will include the article written in SWAT magazine from 1983 entitled, "How Close is too Close?" It should be noted that the article was never peer reviewed and it doesn't provide any information about the methodology, the subjects, or the equipment used in the study. Yet, despite that the article garnered the attention of the law enforcement community and spawned a better understanding of action versus reaction, which was the author's stated objective.

It also resulted in the information being misinterpreted and devolving into the "21-foot Rule". A rule that generally is interpreted as, "You may use deadly force against anyone closer than 21 feet who has an edged weapon" or "You cannot use deadly force on anyone farther away than 21 feet armed with an edged weapon".

The author relied on a reprint of the original article, "How Close is Too Close" (GunGoddess.com, n.d.)and a vdeo 21-foot Principle Clarified by Ken Wallentine and Dennis Tueller (Wallentine & Tueller, Dennis, n.d.) for information on the Tueller Drill.

The article provides us with two quotes that describe the methodology.

1. "We have done some testing along those lines recently and have found that an average healthy male can cover the traditional seven-yard distance in a time of about one and one-half seconds."
2. "How long does it take you to draw your handgun and place two center hits on a man size target at seven yards. Those of us who have learned and practiced proper pistolcraft techniques would say that a time of about one and one-half seconds is acceptable for that drill." In the video Tueller states, one and a half seconds to two seconds.

In the video Tueller states that he never meant for the reaction drill to become a "rule" and that the term "rule" was a bastardization of the drill and that the decision to use deadly force relies upon the totality of circumstances not a specific distance. The drill was intended to teach officers to get off the line of attack, to increase distance and to utilize cover whenever possible.

The three-peer reviewed published studies used for comparison are "Ambush Leading Cause of Officer Fatalities-When Every Second Counts: Analysis of Officer Movement from Trained Ready Tactical Positions" by Lewinski, et al. (2015), "A Scientific Examination of the 21-foot Rule" by Sandel, et al. (2021) and "Evaluation of Tactical Movement and Firearms Draw Performance During Charging Knife Attacks" by Kantor, et al. (2023).

The comparison of the research papers will focus on several areas:

1. The time it takes for someone to run 21 feet.

2. The time it takes an officer to draw and fire at a stationary target.
3. The time it takes an officer to draw and fire at an attacker starting at 21 feet.
4. The success rates of officers remaining stationary, and using tactical movement to avoid a knife attack from 21 feet.

Draw and firing timing methods.

Tueller	Lewinski	Sandel	Kantor
Stopwatch	Video analysis	Video analysis	Video analysis And kinetic motion Sensors

Obviously, the use of a stopwatch is not as accurate as video analysis or kinetic motion sensors due to the impact of the reaction and response time of the operator on the actual start and stop times.

Firearms used.

Tueller	Lewinski	Sandel	Kantor
Unknown	9mm Beretta, .45 S&W	Glock 17T	Glock 17T

In 1983 it would have been common for officers to carry double action revolvers and semi-automatic pistols, but the Tueller references don't specify. The Beretta and the Smith and Wesson are both double action pistols. The Glock 17T would have a lighter and shorter trigger press than a double action revolver or the first shot of a double action semi-automatic.

Ammunition used for test.

Tueller	Lewinski	Sandel	Kantor
unknown	9mm, .45	Simunition marking	Force on Force marking

Duty holster security level.

Tueller	Lewinski	Sandel	Kantor
Unknown	Level I, II, III *	Level I, II, III*	**modified Level I

*Officers own duty holster

**Safariland 6390 ALS "with two passive restraints, a compression on the weapon to hold the firearm in place, and a pattern of drawing so the firearm could only be pulled from the holster in one direction". By Safariland security level ratings a Level 0 (Wood, 2024).

It would appear that in order to facilitate a study with a large group of people that all participants were given a similar holster with no retention device to avoid any possible problems caused by unfamiliarity with the security devices on a standard duty holster.

The research findings from a holster worn on the belt that has no retention device and is not concealed would only apply to permitted civilians or law enforcement officers that carry their weapons in the open. The addition of a retention device increases draw times. In the Advanced Force Analyst class Dr. Lewinski cited a comparison of average draw and firing times of a level II holster at 1.50 secs and a Level III at 1.70 secs.

Time to move 21 feet timing method.

Tueller	Lewinski	Sandel	Kantor
Stopwatch	**not tested**	laser gate	video

Mean time to move 21 feet.

Tueller	Lewinski	Sandel	Kantor
1.5 sec.	not tested	1.5 sec.	1.49 sec.

All of the timing methods indicated the same mean time.

Stationary Target distance.

Tueller	Lewinski	Sandel	Kantor
21 feet	4.5 meters (14 ft, 9 inches)	21 feet	not tested

Time to draw and fire on stationary target.

Tueller	Lewinski	Sandel	Kantor
1.5 sec.	1.80 sec.	1.80 sec	RNR

**Recorded not reported (RNR) The subject executed a firearm draw with two simulation rounds under no attack to act as a control trial. The distance is not noted, and the results were not reported.

While the Tueller time is faster it was recorded with a less accurate stopwatch. Lewinski and Sandel attain the same average times using the same measurement method which indicates a more accurate average time.

***for comparison of an unmodified ALS holster draw and fire time at 3 yards 1.71 (Blake, et al., 2018)

Number of rounds fire at stationary target.

Tueller	Lewinski	Sandel	Kantor
2	1	1	2

Hit rate on stationary target silhouette at 21 feet.

Tueller	Lewinski	Sandel	Kantor
Not reported	not reported	86%	not reported

Most importantly a 14% miss rate at a stationary paper target in a low stress situation at 21 feet illustrates the higher likelihood of officers missing an attacking deadly force threat.

The Sandel and Kantor studies used marking cartridges which allowed for a one-on-one comparison between the attacker and the officer in the scenarios so those two studies will be compared.

Method of measuring time on attacking scenario suspect starting at 21 feet scenario.

Sandel	Kantor
Video	video, kinetic motion sensors placed on officers firing arm.

Method of recording draw and fire times on an attacking suspect starting at 21 feet.

Sandel	Kantor
Video	video and kinetic motion sensors

Time from reaction to touching the gun, drawing the gun, and presenting and firing the gun at an attacking suspect at 21 feet.

	Sandel	Kantor
Avg. time to touch	0.32 sec	recorded, but not reported
Avg. time to draw	0.68 sec	
Avg. time to present and fire	0.43 sec	

Time to draw and fire one round on attacking suspect starting at 21 feet.

Sandel	Kantor
1.43 sec.	1.03,* 0.80 sec**

*time for two shots as reported in the study

**adjusted time by subtracting the recorded average time for a stationary second shot at attacker from 21 feet (0.23 sec) in the Kantor study from the 2 shot time (1.03 sec).

The average time recorded in both the Lewinski and Sandel study to draw and fire a single round at a stationary target was 1.80 sec. Why is there a decrease in time on an attacking target? The addition of the stress of a live attack might account for a faster response.

Unlike the stationary target a charging target wouldn't be at 21 feet when the shot was fired. The closer a target is the less time it takes to draw, present and fire. That closer distance may also result in the use of a combat tuck, or only one hand being used to draw which can reduce draw times (Lewinski et al., 2015) and noted in Kantor's study.

It should be noted that in the Kantor study there is a graph (Figure 2) depicting a timeline from a single officer for a single draw, presentation and firing but it does not include precise times. It is marked in half-second increments. The graph indicates that the draw took significantly less than a half second.

Number of rounds fired during the attacking suspect starting at 21 feet.

Sandel	Kantor
1	2

Hit ratio on attacking suspect.

Sandel	Kantor
76%	"did not address"

Draw success on attacking suspect.

Sandel	Kantor
88%	not reported

When officers demonstrate a 12% failure rate on drawing their weapons in time to respond to an attack in the lower stress research scenario it indicates a potential for a higher failure rate in a deadly force encounter. It also clearly indicates a need for officers to practice their draws more frequently to retain that motor skill and it demonstrates the need for officers to maintain as much distance as possible from an armed subject to give them more time to accomplish that draw.

Criteria for success in the 21-foot charging suspect scenario.

Sandel	Kantor
Not touched by the blade prior to the shot being fired	No contact prior to the 2nd shot being fired*

*contact was considered to have occurred if the attackers knife passed the position of the officers extended firearm

What stopped the scenario?

Sandel	Kantor
The shot	The second shot

It should be of extreme importance to note each one of these scenarios was stopped not by an impact indicating a lethal hit, but the sound of a gunshot. In real world deadly force attacks the suspects actions determine when the encounter is done. While there are times noted for stopping the scenario, they bear no resemblance to what the actual time could be. Factors including whether the suspect is hit by the rounds fired, what and where the rounds strike, and the determination and momentum of the attacker are just a few of the factors that would contribute to that outcome. To put it simply, the shot stopped the scenario, it may not stop the attack.

Pattern of movement success rates on attack from 21 feet.

	Sandel*	Kantor
Stationary	67%*	90%
Lateral	94.7%*	99%**
Back	92.3%*	100%
45 degree forward	74.4%*	not tested

*the study reported the failure rate 33%, 5.3%, 7.7%, 25.6%, respectively.

**only movement in the direction of the shooting hand

It should be noted that the person engaged in the role of the office in the Sandel study was "The same highly experienced officer completed all runs of the study" (Sandel et al., 2021) It would be safe to say that one person responding to the attacks of 137 different participants with repetitions of moving offline would have a much higher level of practice and performance than the average police officer facing a, hopefully, once in a lifetime event. That lack of experience could have serious consequences that would dramatically lower an officer's success rate when attempting to deal with an edged weapon attack at 21 feet.

The Kantor study compared the movement patterns at four distances, 10 feet, 15 feet, 21 feet and 30 feet. While staying stationary at 10 feet there was a 0% success rate, and the testing was stopped at that distance.

Serious consideration needs to be made when referencing the Safety Rate in the Kantor study, "The highest Safety Rate (SR) from the knife attack (KA) was 30 feet away or 21 feet away with the LEO backpedaling"(Kantor et al., 2023).

What stopped the attack in the study was the second shot of the gun, with no indication that the shot would have stopped a determined attacker, let alone struck them. Backpedaling may have given the 0.24 sec needed for the second shot to be fired (Kantor et al., 2023). However, like train A leaving the station at 30 mph, followed by train B traveling at 60 miles an hour, train A may have time to toot its' horn twice as a warning, but train B will crash into train A with catastrophic results if it doesn't decide to stop.

By the time the average person running forward sprints 20 feet their strides are at 5 feet. A person backpedaling in response to the attack would be traveling less than 3 feet per stride at their maximum (Dysterheft et al., n.d.) . Unless the attacker stops of their own accord, or one of the two bullets fired stops the attack, a collision will take place with potentially deadly results.

An officer with a duty holster according to the studies, would not be able to achieve the same draw time and would not achieve the same Safety Rate as the person with an open carry Level 0 holster. In a random pairing of individual officer draw and fire times at 21 feet and individual running times at 21 feet 78% showed "they would not shoot before the suspects reached them" (Sandel et al., 2021). The draw and fire times may approximate the time an officer under stress in a real situation might achieve.

Recommended minimal distance for officers for edged weapon encounters.

Sandel	Kantor
32 feet	30 feet
Projected based on the data of the study	Based on the results of the research
at 21 feet an expected 95% success rate.	100% success rate using stationary and movement.

Neither distance guarantees a safe outcome for an officer for all the reasons stated in this paper. To put it simply, the more distance the officer can create the safer they will be.

Average time to draw and fire at 30 feet while stationary.

Kantor

1.15 sec using modified Level 1 holster

The purpose of this comparison is to look at those factors found in the research both their similarities and their differences. Research results can always inform us, but we must remember that research is almost always done in sterile, controlled, safe environments.

In each of the studies the officer is in a well-lit area, having been given a set of instructions on how to respond to what is about to happen. Deadly force encounters occur in tense, uncertain, and rapidly evolving circumstances and officers must rely on their training. In the lab there are a limited number of decisions the officers can make, while in the field the possibilities are much greater, and decisions must be made based on the totality of the circumstances.

"Reaction times are the fastest in simple reaction time studies and slowest in choice reaction time experiments" (Sandel et al., 2021). We also need to remember that each officer is different in how fast they see, react, and respond to a threat. While research provides us with a starting point of understanding, it rarely provides a rule chiseled in granite.

As previously mentioned, after Tueller had his article published the meaning of the results were misunderstood, misapplied, and misstated. The foundation of his work provided law enforcement with a better understanding of action versus reaction which was his intent, and it served that purpose well, helping make law enforcement officers safer when properly applied.

Any research conducted can have the same things occur. We need to look carefully at the conclusions that we draw from the results by examining the methodology and comparing, when possible, to similar research or risk making the same mistakes made with the Tueller drill.

Ultimately, officer safety in edge weapons attack come down to the use of an understanding of reaction and action, time, distance, cover, movement and the environment as Dennis Tueller advised back in 1983 (Wallentine & Tueller, Dennis, n.d.)

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