



V-VICTA®

VirTra - Virtual Interactive Coursework Training Academy®

***HUMAN FACTORS
IN FORCE ENCOUNTERS***

Training Manual

VirTra



“VirTra’s commitment to realistic training is impressive. By referencing Force Science® research, VirTra ensured their scenarios would reflect evidence-based performance metrics. They have created opportunities for users to not only witness human performance during de-escalation and force encounters but to experience them.”

- Von Kleim
Chief Executive Officer, Force Science

VirTra

HUMAN FACTORS IN FORCE ENCOUNTERS

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TRAINING COURSE CERTIFICATION

This "Contact and Cover Concepts" training course, developed by VirTra, has been certified by the IADLEST National Certification Program™ on 7/21/2024

Certification number: 24829-2407



TOPIC

Human Factors in Force Encounters

ESTIMATED TIME

7 hours total, or 14 half-hour sections that can be modular. (Time is based on a class size up to 10 students and full class presentation.)

- Module 1:** **Introduction to Human Factors Lecture** (60 minutes or two 30 min sections) - PowerPoint provided
- Pre-test (5 minutes)
- Module 2:** **Stop Time** (60 min or two 30 min sections by splitting the discussion and training points section)
- Lecture (30 minutes) - PowerPoint provided
 - Simulation (30 minutes)
- Module 3:** **Shoot and Turn** (60 min or two 30 min sections by splitting the discussion and training points section)
- Lecture (30 minutes) - PowerPoint provided
 - Simulation (30 minutes)
- Module 4:** **Knife Charge** (60 min or two 30 min sections by splitting the discussion and training points section)
- Lecture (30 minutes) - PowerPoint provided
 - Simulation 30 minutes
- Module 5:** **Prone Subject** (60 min or two 30 min sections by splitting the discussion and training points section)
- Lecture (30 minutes) - PowerPoint provided
 - Simulation (30 minutes)
- Module 6:** **Vehicle Contact** (60 min or two 30 min sections by splitting the discussion and training points section)
- Lecture (30 minutes) - PowerPoint provided
 - Simulation (30 minutes)
- Module 7:** **Review and Takeaways** (60 min or two 30 min sections by splitting the discussion and training points and testing section)

PERFORMANCE OBJECTIVE

At the end of 7 hours, students will be able to:

1. Identify reaction and response time
2. Identify what stimulus usually results in the slowest reaction time in human performance
3. Describe how attention and memory effect the ability to recall details

CLASS SIZE

Designed maximum class size of 10. If class size is smaller than 8 (4 pairs) scenarios can be cycled through quickly.

The following training plan and lesson plan is designed to be used with the VirTra simulator. Whereas many of the techniques have been used over many years in LE, this training plan maximizes training time and leverages the strengths of the VirTra training system.

The instructor shall first ensure that students are familiar with the presented material. The outline provides the overview and is provided to supplement and provide context to the use of the simulation scenarios.

The simulation scenarios are used as a tool to facilitate the understanding of the concepts. The first scenarios will be provided in a slower tempo with the use of the PLAY/PAUSE feature to elaborate on the training points. Once the first simulation is provided in this format the remaining scenarios will be provided to each pair of officers. The Socratic methodology should be used for event debriefing.

“What did you know?”

“What did you see or hear?”

“What did you do and the reason behind it?”

“What would you do differently in the future?”

All officers will be allowed to watch the others participate in the exercise. This is done to maximize the benefit of modeling for adult learners. Students shall be allowed to ask questions at the end of every section, including at the end.

SCENARIO BANK TO BE USED

1. Stop Time
2. Shoot and Turn
3. Knife Charge
4. Prone Subject
5. Vehicle Contact

I. INSTRUCTOR INTRODUCTION

II. INTRODUCTION TO HUMAN FACTORS IN FORCE ENCOUNTERS

III. UNDERSTANDING HUMAN FACTORS

A. HARD SCIENCE

B. BEHAVIORAL AND PERFORMANCE SCIENCE

IV. HUMAN FACTORS

A. STRESS/AROUSAL

B. PERCEPTION

C. REACTION TIME AND RESPONSE TIME

D. HICKS LAW

E. DECISION MAKING



F. DECISION TRAINING

V. "STOP TIME"

A. REACTION

B. ATTENTION

C. INTERACTION

D. TRAINING OPTIONS FOR "STOP TIME"

VI. "SHOOT AND TURN"

A. SHOOTING SOMEONE IN THE BACK

B. COULD THERE BE ANOTHER EXPLANATION?

C. TRAINING OPTIONS FOR "SHOOT AND TURN"

VII. "KNIFE CHARGE"



- A. 21 FOOT RULE
- B. EFFECTIVENESS OF GUNFIRE
- C. PURPOSE OF “KNIFE CHARGE”
- D. SIMULATION OPTIONS

VIII. “PRONE SUBJECT”

- A. “THE SPEED OF A PRONE SUBJECT”
- B. VARIABLES IDENTIFIED
- C. AVERAGE DIFFERENCE
- D. TIME
- E. SUSPECT POSITIONS TESTING IN STUDY
- F. MAJOR TAKEAWAY

G. PUTTING IT INTO PERSPECTIVE

H. SIMULATION OPTIONS

IX. “VEHICLE CONTACT”

A. TRAFFIC STOP RISKS

B. TACTICAL RISK MANAGEMENT ON TRAFFIC STOP

C. ESTABLISHED THREAT ZONES AND PROVIDED IN “THE TACTICAL EDGE”

D. MITIGATION ZONE (MZ)

E. OFFICER POSITIONS TESTED IN THE LEWINSKI ET AL. STUDY

F. FINDINGS FROM THE LEWINSKY ET AL. STUDY

G. “VEHICLE CONTACT” TRAINING ENVIRONMENT

X. REVIEW

A. HUMAN FACTOR FOUNDATIONS

B. "STOP TIME"

C. "SHOOT AND TURN"

D. "KNIFE CHARGE"

E. "PRONE SUBJECT"

F. "VEHICLE CONTACT"

XI. CONCLUSION



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I. INSTRUCTOR INTRODUCTION

The instructor will introduce themselves to the class. This intro should be no more than 2-3 minutes long and establish why they are qualified to teach the course and how long they have been with the organization. This not a moment to brag, but to build confidence and trust from the attending students.

II. INTRODUCTION TO HUMAN FACTORS IN FORCE ENCOUNTERS

Humans have realistic performance capabilities that need to guide our understanding of potential threats and the training to deal with them. The purpose of the course is to show officers their realistic performance windows in some of the most challenging real-world demands. The goal is to provide a practical and scientifically-backed presentation of human performance to allow officers to understand tactics and training methodologies better and apply the lessons learned.

III. UNDERSTANDING HUMAN FACTORS

To provide the best training and to correctly evaluate the performance of LE skill sets we have to look at science to understand how the mind (brain) collects, processes and uses information. As well as, how the body is directed by that information and what factors are influential.

A. HARD SCIENCE

Hard Science has been used extensively in law enforcement. DNA, fingerprints, blood splatter are all examples of hard science application in Law Enforcement.

B. BEHAVIORAL AND PERFORMANCE SCIENCE

Behavioral and Performance Science has also started to influence the evaluation of police encounters. It will also play an increasingly important role in training paradigms.

IV. HUMAN FACTORS

A. STRESS/AROUSAL

(Slides 4 & 5)

1. What is Stress?

A. *“Like beauty, stress is in large part, in the eye of the beholder.”*

1. Roller coasters
2. Competition - viewed differently by many

B. Stress happens when the perceived demands of an event exceed (challenge) the perceived ability to meet those demands, specifically when your safety is at stake.²

2. What Does Stress Do?

- A. Survival stress response is well documented on the effect on the body.
- B. Increases in HR, BP, breathing rate, pupil size, muscle tension are all typical responses.
- C. Less well known - The narrowing of the attentional process and limiting one's ability to perceive and then remember all of the elements of an event.³

3. What is Arousal?

- A. Definition
 - 1. Senses are stimulated to the point of perception.
 - 2. The act of stimulating readiness or to action.

4. Arousal Effects

- A. Regulation of consciousness, attention, and alertness
- B. Fight, Flight and Freeze responses are initiated by this
- C. Yerkes-Dodson Law - **"Inverted U-principle"** - As arousal increases performance increases to a point. Past the apex is where more arousal causes a decrease in performance. This curve is different for different people and is different for different skills or tasks.⁴
 - 1. **Cognitive Tasks** - Lower arousal is better
 - 2. **Strength/Endurance Tasks** - Higher arousal is better
 - 3. **Weightlifting vs. Chess**

B. PERCEPTION

1. Visual Perception

(Slide 6) As an example, Visual Perception is a complex interaction between the receiving of photons of light via our eyes, collection and transmission via the optic nerve and then how our mind processes of that information.

2. Basic Term

In the most basic terms, visual perception is a two-part process that involves the information from the environment and how our systems then interpret that information.

3. Factors that Affect Perception

- A. Quality/complexity/interference of information from the environment (Signal)
 - 1. Light
 - 2. Sound
- B. Attention - (Directional antenna)
 - 1. Focus of attention - (selective attention/inattentive blindness sometimes incorrectly referred to as tunnel vision)

- I. Internal vs. External
 - II. Narrow vs. Broad
2. Attention is limited - as we focus intently on one aspect we do so to the exclusion of others.⁵
 3. You cannot perceive that which you do not provide attention.
- C. Arousal/Stress - Higher arousal allows us to focus intently on facets of events our brain establishes as important to our survival, but it does so at the detriment of other facets.
- D. Schema⁶ (Slides 7 & 8)
1. “Mental model of aspects of the world or of the self that is structured in such a way as to facilitate the process of cognition and perception.”
 2. “General, basic knowledge regarding a concept or entity which serves to guide perception, interpretation, imagination, and problem-solving skills.”
 3. Four-legged animals, with fur, ears and a tail
 - I. “Doggie” - says a child
 - II. Horse or Cat
 4. Other schema
 - I. Stop signs
 - II. Subjects in the process of
 - a. Throwing a football
 - b. Drawing a weapon

4. Process and Perceive Information

(Slide 9) Behavioral and Performance Science has also started to influence the evaluation of police encounters. It will also play an increasingly important role in training paradigms.⁷

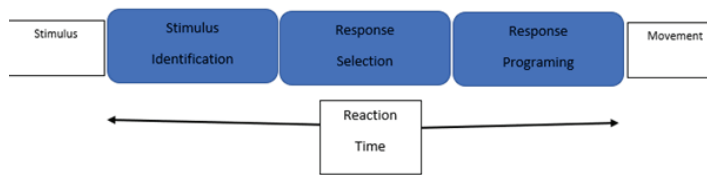
- A. Officer's being human cannot perceive two elements of equally high significance at the same time.⁸
- B. Training and experience may lead to better visual attention and acuity.⁹
- C. We can only respond to what we perceive.
- D. Our perception is our reality.¹⁰

C. REACTION TIME AND RESPONSE TIME

(Slides 10-12)

1. Reaction Time

- A. **Reaction Time (RT)** - “The interval of time that elapses following a suddenly presented, often unanticipated stimulus until the beginning of the response.”¹¹
 1. **Auditory** - .140-.160 seconds¹²
 2. **Visual** - .180-.220 seconds¹³



- B. **Movement Time (MT)** - “Period of time, from the end of RT until the completion of the movement.”¹⁴
- C. **Response Time** - RT+MT

2. In Action

An officer is standing on the firing line waiting for the signal to fire one round.

- A. ¹⁵ When the signal is given the hand starts to move to draw the weapon. This is reaction time.
- B. From the first movement of the hand to when it reaches the weapon, draws it and then fires the gun is Movement time.
- C. Response time is how long it took from the signal being given to the round being fired.
- D. It is highly common for people to incorrectly use the term reaction time when they really mean response time.

D. HICKS LAW

1. When Choices Are Added It Takes Longer to React

(Slide 13) In 1952 W.E. Hick established going from one response choice to two increased the response time by roughly 50%. When we go to 4 choices the RT is double. The additional time taken follows a linear pattern that increases as the number of choices increase.

- A. Visual RT of 0.2s with one additional choice now takes 0.3
- B. If we have 4 choices it now doubled and takes 0.4s
- C. With 8 choices it is 0.6s
- D. LE application- Do you duck, shoot, hold, or move (4 choices)

E. DECISION MAKING

1. Heuristic

(Slides 14 & 15) “Mental shortcut that allows people to solve problems and make judgments quickly and efficiently. These rules-of-thumb strategies shorten decision-making time and allow people to function without constantly stopping to think about the next course of action.¹⁶ They are also fallible.

- A. No time to weight all of the options
- B. No one to consult
- C. Faulty input (misperception) = faulty output

F. DECISION TRAINING

(Slide 15)

1. Importance of Decision Training

Importance of decision training- It is not uncommon to hear in LE circles that you cannot teach/train decision making. This is contrary to what the sports performance world started to know since the late 1970's.^{17,18}

2. Cognitive and Critical Decision Making

“Since cognition and critical decision making under high stress is also typically the least practiced and yet critical skill an officer needs, the officer’s ability to accurately perceive and process information in the heat of battle is there for further impaired through this lack of practice.”¹⁹

3. Stimulus-Response vs. Decision-Response

A. Most firearms training protocol follow a pattern of “stimulus-response.”

1. The stimulus is the buzzer, a verbal command or a turned target.
2. The response is the officer then shoots the intended target.

B. Officer involved shootings do not follow this pattern, the officer’s response is typically preceded by a decision or evaluation of threat.

1. Decision (evaluation) - response

V. “STOP TIME”

(Slides 17-19) “*Stop Time*” - If it takes time to start, it takes time to stop.

A. REACTION

Reaction (RT) is the time to start a response after a given stimulus. When it takes time to start something it also takes time to stop.

1. The stop stimulus must be “**strong**” enough for us to notice while engaged in the original behavior. A weak of signal may go undetected.
2. The “**Stop Time**” event allows officers to see this and train attentional focus shifts to minimize this aspect. It is highly unlikely that it can be eliminated.

B. ATTENTION

1. We can only “see” what we attend to. Without attention, there is no perception.
2. Attentional shifting takes time. Research has shown that it can take between 0.20s and 0.60s to completely shift attention.^{20, 21}
3. If an officer is focused on sight alignment (attention to the sights) it may require a dramatic change in the subject’s behavior/position for the officer to change attentional focus and then analyze if the subject is no longer a threat.²²
4. A delay in recognizing the change in the level of threat of a subject could then result in additional rounds fired.

C. INTERACTION

Dr. Lewinski from Force Science Institute has attempted to lay some of the initial foundation of this interaction between attention and a response time to stop a behavior.²³ In his study, police officers were tested on a simple stimulus light board.

1. When the correct lights were activated the officers were to start shooting as fast as they could.
2. They were then to stop shooting when the light was turned off.
3. The average time over 5 trials was ranged between 0.12s and 0.46s.
4. It should be noted that the first trial was found to be significantly slower than the rest (0.35+ 0.25). It was established with a median of 0.31s, a mode of 0.33s
5. The number of trigger presses complete after the light shut off was 1.06 + 0.52.
6. Of the 102 experienced officers tested only 6 of them did not fire off a round after the stop signal was provided.

D. TRAINING OPTIONS FOR “STOP TIME”

Levels - Selectable tests with different stimuli. Each student should be evaluated on all levels.

1. **Level 1** - Student is to start shooting as fast as possible when the target turns green and stop shooting as soon as the target turns red.
2. **Level 2** - Student is to start shooting as fast as possible when the lights turn green and stop shooting as soon as the lights turn red.
3. **Level 3** - Student is to start shooting as fast as possible when the target flashes green and stop shooting when the target flashes red.
4. **Level 4** - Student is to start shooting as fast as possible when the lights flash green and stop shooting when the lights flash red.
5. **Level 5** - Student is to start shooting as fast as possible when the target continuously flashes green and stop shooting when the target continuously flashes red.

VI. “SHOOT AND TURN”

(Slides 21-25)

A. SHOOTING SOMEONE IN THE BACK

Old Western film canon consists of crying out about the cowardice of shooting someone in the back and how it was self-evident in establishing guilt. Many in our society imagine only a person of evil intent shooting someone that is facing away. This idea has been used as an accusation levied against officers in law enforcement shootings.

B. COULD THERE BE ANOTHER EXPLANATION

1. The Police Marksman Vol. XXIV no. 5 in 1999

The Police Marksman Vol. XXIV no. 5 in 1999²⁴ offered a possible explanation. Authors, Bill Lewinski and Dave Grossi provided insight into what could be occurring. Multiple factors play into this event.

- A. Once the mental program to pull trigger starts it is extremely rare for it to stop.

1. Lewinski looked at 600 shootings and only found one case where the officer claimed they were able to stop after he decided to fire.
2. The officer still fired the weapon but managed to jerk his wrist so that the round did not strike the subject but instead went into traffic.

B. Humans can turn fast - In Lewinski's research he was able to establish the average person could turn 180 degrees in .5 second (1/2 a sec) and some were as fast as .33 (1/3 of a second).

2. Starting to Pull the Trigger

- A. Think of the mental program to start pulling the trigger as a marble that is released down a plastic pipe. That marble carries the message the brain wants the body to carry out. Once it is released, it rolls through the pipe, hits the end and is then carried out.
- B. You can release another marble with a different message (don't shoot, move the gun, etc) but it still arrives after the first.

3. Interactivity

- A. The time that it takes for an officer to perceive a threat and then respond to that threat can coincide with a subject that either fires at the officer and turns away or turns and runs.
- B. The suspect could turn and take 2-4 steps before the officer discharges their own weapon.
- C. It should be noted that human beings turn around quickly. When they do they use their arms to help complete the turn. An officer attentively looking at a weapon in a subject's hand could see the weapon lift during this turn and interpret it as a threat.

C. TRAINING OPTIONS FOR "SHOOT AND TURN"

1. "Race"

The instructor can select the race of the subject the officer is responding to.

- A. It is suggested to vary this in accordance with the demographics of your jurisdiction.
- B. This option is also a potential method for agencies to evaluate implicit bias.
- C. Options
 1. "Black" - Black subject with a gun
 2. "White" - White subject with a gun

2. Selectable Behavior

These behaviors were provided to provide not only variety but also samples of potential behaviors.

- A. "Shoot and run-away"
- B. "Shoot and surrenders"
- C. "Surrenders"
- D. "Restart"

VII. “KNIFE CHARGE”

(Slides 27-33) “*Knife Charge*” - Provides instructors a means to demonstrate how fast a subject armed with a touch weapon (knife in this case) can close the distance on an officer.

A. 21 FOOT RULE

There has been much discourse in LE on the phrase “*21-Foot Rule.*”

1. In reality, there is no “*21-Foot Rule,*” there was a drill that was created by Dennis Tueller in 1986 who wrote an article on it in SWAT magazine.²⁵
2. Many have taken his drill and then misshaped it into a “*21-Foot Rule.*”
 - A. In his article he claimed that the average officer was able to draw and fire his weapon twice (2 rounds) in the time it takes the average person to run 21 feet.
 - B. “Time of about one and one-half seconds is acceptable for that drill”²⁵
 - C. The average person could run 21 feet in the same amount of time.
 - D. Many have taken this to mean that someone with an edged weapon or impact weapon in 21 feet provides justification for deadly force.
 - E. Reality is more complex than that.
3. Action v. Reaction - What we know
 - A. Tueller’s original data was collected with stopwatches and subject to human error on measurement.
 - I. Error to start with a “go” command at same time.
 - II. Error to stop with the “testers” RT and MT.
 - B. Tueller’s has also stated - “*I’m sure that the 1.5 second time was a bit enthusiastic on my part...as I recall, the times for running that at 7-yard distance were consistently between 1.5 and 2.0 seconds.*”
 - C. Other researchers have established draw times with a single round fired slightly different than Tueller.
 - I. Bartel and Blake (2018) 1.78 seconds (SD= .31)²⁶
 - II. Lewinski et al (2015)
 - a. Snapped holster – 1.82s (SD=.31)
 - b. Unsnapped holster – 1.68s (SD=.27)
 - D. Compare that to movement times on sprinting.
 - I. Dysterheft et al. 2013
 - a. 30 feet in 2.06 seconds
 - b. 25 feet in 1.79 seconds
 - c. 20 feet in 1.57 seconds
 - d. 15 feet in 1.28 seconds
 - II. It should be noted that 1.78s (Bartel and Blake) to 1.82s (Lewinski et al) coincides with not 21 feet but actually 25 feet.
 1. These tests were conducted with an auditory stimulus.
 2. There is a greater delay in RT with simple visual stimulus as previously noted (.04s-.06s).

B. EFFECTIVENESS OF GUNFIRE

1. The discussion on how fast a subject can move and how fast an officer can draw and fire are only two facets that need to be evaluated. Additionally:
 - A. How effective can the officer place those rounds?
 - B. How quickly do the placed rounds stop the behavior of the subject?
2. Different rounds also have different effect rates.
 - A. Caliber (wound channel)
 - B. Velocity (related to kinetic energy and momentum)
 - C. Mass (related to energy)
 - D. Expansion (wound channel)
3. Gunfire hits are not a guarantee. Examples:
 - A. Sergeant Timothy Gramin hits subject 14 times with .45 ACP and subject was still fighting²⁷
 - B. FBI Miami Shootout 1986 - Both subjects were hit and agents were still killed. 145 rounds were fired. Subjects were hit and toxicology showed no chemicals in their system.
 - C. The “North Hollywood Bank Robbery”- Body armor and barbiturates were factors in this historic event.

C. PURPOSE OF “KNIFE CHARGE”

The purpose of “Knife Charge” is to show officers the realities of action vs reaction as it applies to a subject running directly at them with a contact weapon. (knife, bat, etc.)

D. SIMULATION OPTIONS

1. “Race”

The instructor can select the race of the subject the officer is responding to:

- A. It is suggested to vary this in accordance with the demographics of your jurisdiction.
- B. This option is also a potential method for agencies to evaluate implicit bias.
- C. Options
 - I. “Black” - A black subject with a knife
 - II. “White” - A white subject with a knife

2. Distances

- A. Multiple distances are provided. This is done to allow students to experience the realities of linear moving threats.
- B. Options
 1. “30 feet”
 2. “25 feet”
 3. “21 feet”
 4. “15 feet”
 5. “10 feet”
 6. “6 feet”

3. Commands

- A. "Launch" - Start event
- B. "Reset" - Start from the beginning
- C. "Skip" - go to the end

VIII. "PRONE SUBJECT"

(Slides 35-39) "*Prone Subject*" - It is a common practice for LE to prone subjects out. A study from 2016 has established that prone does not equate to being completely non-threatening.

A. "THE SPEED OF A PRONE SUBJECT"

Lewinski et al. (2016) in an article titled "The Speed of a Prone Subject" evaluated how fast armed subjects could fire a weapon that was concealed under them.

B. TWO VARIABLES IDENTIFIED AS:

1. Movement Time

Time from the first movement to weapon discharge.

- A. Target angle - 0.61s (0.18 SD) - for all positions
- B. Feet angle - 0.66s (0.20 SD) - for all positions

2. Object Time

First point in time where a detectable foreign object in subject's hand.

- A. Target angle- 0.36s (0.17 SD) - for all positions
- B. Feet angle- 0.24s (0.17 SD) - for all positions

C. AVERAGE DIFFERENCE

The average difference between when the foreign object is first potentially detectable to when the weapon discharged was .25 seconds.

D. TIME

Even if an officer violated acceptable weapon safety rules and had their finger on the trigger it would take them 0.37s to fire their weapon with a simple stimulus.²⁸

E. SUSPECT POSITIONS TESTED IN STUDY

1. To the Right

- A. Waist right
 - I. Target angle

- a. Movement time - 0.63 (0.17)
 - b. Object time - 0.41 (0.14)
 - II Feet angle
 - a. Movement time - 0.69 (0.24)
 - b. Object time - 0.30 (0.19)
- B. Chest right
 - I. Target angle
 - a. Movement time - 0.59 (0.18)
 - b. Object time - 0.30 (0.16)
 - II. Feet angle
 - a. Movement time - 0.63 (0.20)
 - b. Object time - 0.24 (0.14)

2. To the Left

- A. Waist left
 - I. Target angle
 - a. Movement time - 0.71 (0.17)
 - b. Object time - 0.48 (0.16)
 - II. Feet angle
 - a. Movement time - 0.77 (0.17)
 - b. Object time - 0.33 (0.14)
- B. Chest left
 - I. Target angle
 - a. Movement time - 0.61 (0.16)
 - b. Object time - 0.37 (0.15)
 - II. Feet angle
 - a. Movement time - 0.67 (0.20)
 - b. Object time - 0.27 (0.16)

3. Chest Up

- A. Target angle
 - I. Movement time - 0.52 (0.15)
 - II. Object time - 0.24 (0.11)
- B. Feet angle

- I. Movement time - 0.55 (0.17)
- II. Object time - 0.79 (0.98)

F. MAJOR TAKEAWAY

1. Chest up - fastest - head and upper body moved first.
2. All other positions the feet and lower body moved first.

G. PUTTING IT INTO PERSPECTIVE

1. From a prone position, subjects were able to complete movements in an average of 0.52s to 0.77s.²⁹
2. Some tested were able to complete the movements in 0.27s.³⁰
3. Officers can easily take 0.68s to fire a drawn weapon in response to a simple stimulus.³¹
4. It takes the human brain to consciously perceive, evaluate, and classify a visual cue, instead of simply reacting to its first detection 300ms (0.300s).³²

H. SIMULATION OPTIONS

1. **“Race”** - The instructor can select the race of the subject the officer is responding to.
 - A. It is suggested to vary this in accordance with the demographics of your jurisdiction.
 - B. This option is also a potential method for agencies to evaluate implicit bias.
 - C. Options
 - I. “Black”
 - II. “White”
 - III. “Skip Segment”
2. **“Action Options”** - The instructor can select the actions the on-screen subject takes.
 - A. It is suggested to vary this to ensure to minimize any negative training artifacts. Not every training event should be the application of a force option. This also allows students to have to quickly evaluate all forms of behavior.
 - B. Options
 - I. “Suspect Draw” - Subject draws weapon and fires
 - II. “Suspect Comply” - Subject complies with commands
 - III. “Reset” - Reset to the beginning to allow for reselection of options
 - IV. “Skip Segment” - Fast forward to the end
3. **“Suspect Draw”** options - Provided to demonstrate the physiological movement and timing of various and typical attacks from prone positions.
 - A. White Male
 - I. “White Male - Left Draw” - White suspect draws to the left
 - II. “White Male - Right Draw” - White suspect draws to the right
 - III. “White Male - Head Draw” - White suspect draws head up
 - IV. “Reset” - Reset to the beginning to allow for reselection of options
 - V. “Skip Segment” skips to the end
 - B. Black Male
 - I. “Black Male - Left Draw” - Black suspect draws to the left
 - II. “Black Male - Right Draw” - Black suspect draws to the right

- III. “Black Male - Head Draw” - Black suspect draws head up
- IV. “Reset” - Reset to the beginning to allow for reselection of options
- V. “Skip Segment” - Fast forward to the end

4. **“Suspect Comply”**

A. White Male

- I. “White Male - Left Comply” - White suspect complies to the left
- II. “White Male - Right Comply” - White complies to the right
- III. “White Male - Head Comply” - White complies head up
- IV. “Reset” - Reset to the beginning to allow for reselection of options
- V. “Skip Segment” - Fast forward to the end

B. Black Male

- I. “Black Male - Left Comply” - Black suspect draws to the left
- II. “Black Male - Right Comply” - Black suspect draws to the right
- III. “Black Male - Head Comply” - Black suspect draws head up
- IV. “Reset” - Reset to the beginning to allow for reselection of options
- V. “Skip Segment” - Fast forward to the end

5. “Launch Option”

- A. “Launch” - Start the training event selected
- B. “Reset” - Reset to the beginning to allow for reselection of options
- C. “Skip Segment” - Fast forward to the end

IX. “VEHICLE CONTACT”

(Slides 41-47)

A. TRAFFIC STOP RISKS ³³

1. From *“The Tactical Edge”* written by Charles Remsberg (1986). The breakdown of assaults on an officer while conducting a traffic stop.
 - A. 17% while vehicle still in motion
 - B. 28% after vehicle stopped but officer had not exited patrol car
 - C. 22% while exiting or making approach
 - D. 43% after making contact, while investigating, writing citation or returning to patrol car
2. Mindsets
 - A. High Risk vs. Low Risk
 - I. There is no “Low Risk” only unknown risk.
 - II. If it is High Risk then those procedures should be used.
 - B. Reality that traffic stops are an unknown risk until it is finished
 - I. Typically, there is no prior knowledge of the occupants or the threat they represent.

- II. If the occupants are known unless they are confirmed friendlies their behavior can always change.
- III. The specific traffic violation is not usually a reliable indicator of the potential risk of the occupants. (aggressive driving or signs of impairment are examples of potential exceptions).

B. TACTICAL RISK MANAGEMENT ON TRAFFIC STOP CONSIDERATIONS

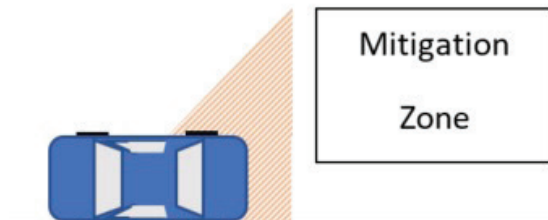
- 1. Nature of the Stop - Is this a moving violation or a subject involved in a domestic violence event?
- 2. Vehicle Contents - What is in the passenger compartment?
 - A. Occupants - How many? Size? Sex? Age? History?
 - I. Attitudes - What are they conveying with words or facial expression?
 - II. Actions - Threatening gestures or questionable actions?
 - III. Abilities - Weapons?
 - B. Dogs - Often overlooked as a consideration
 - C. Exposure Risks - Chemical? Explosive? Biological?
- 3. Environmental Consideration - Traffic, logistical issues with location, high crime area?
- 4. Vehicle Type - What can the vehicle do? Motorcycle, passenger van, RV, Semi-truck?

C. ESTABLISHED THREAT ZONES AS PROVIDED IN “THE TACTICAL EDGE”

- 1. **Crisis Zone** – a 10-degree angle, extending out from the B-pillar and moving back to the rear of the vehicle.
- 2. **Additional Zones** - Remsburg established 3 other zones but will not be further discussed because of the lack of application to the vehicle as a tool to mitigate risk.
 - A. Reach Zone
 - B. Point Reflex
 - C. Target Zone

D. MITIGATION ZONE (MZ)

- 1. In a study “*The Influence of Officer Positioning on movement During a Threatening Traffic Stop Scenario*” by Lewinski et al. a MZ was evaluated.³⁴
- 2. This was done by combining the “*crisis zone*” established by Charles Remsburg on the driver side and additionally on the passenger side a 45-degree angle from the B-pillar to the rear of the vehicle.
- 3. This MZ was a position where the officer is at a reduced risk because of the vehicle construction and relative position of the officer to the **DRIVER**. It impairs or restricts the visual tracking or weapon alignment.



E. OFFICER POSITIONS TESTED IN THE LEWINSKI ET AL. STUDY

1. Drivers side 90-degree
2. Driver's side 45-degree
3. Driver's side 180-degree
4. Driver's side behind B-Pillar 180-degree
5. Passenger side 45-degree

F. FINDINGS FROM THE LEWINSKI ET AL. STUDY

1. The vehicle occupant was able to present and fire a firearm in the range of 0.50s (0.17)-0.57s (0.14) at all positions that officers made their approach.
2. The officers reached the mitigation zone the fastest 1.5s (0.52) from the 45-degree passenger side position.
3. The fastest that an officer could bring a weapon to target and fire it was from the driver side 45-degree position at 1.99s (0.59) which is about 1.45 seconds after the occupant had already presented the weapon and fired at the officer.
4. The slowest was from the Driver side behind the B-Pillar 180-degrees and took 2.44s (1.47).
5. Officers that moved to the MZ before attempting to draw their weapon were able to get there on average 0.39s faster than those who tried to draw and move at same time.

G. "VEHICLE CONTACT" TRAINING EVENT

"Vehicle Contact" Training Event - Is presented to illustrate how quickly the weapon can be presented and fired at the officer and illustrate environmental options. Officers should quickly realize that it is critical to utilize structural and environmental opportunities when possible.

1. Approach Options - This allows the instructor to select the side of the vehicle that the student will view.
 - A. "Driver Side Approach"
 - B. "Passenger Side Approach"
 - C. "Skip Segment"
2. Occupant Race Options - It is suggested to vary this in accordance with the demographics of your jurisdiction.
 - A. This option is also a potential method for agencies to evaluate implicit bias.
 - B. Options include
 - I. "White Male"
 - II. "Black Male"
 - III. "Reset"
 - IV. "Skip Segment"
3. Occupant Behavior - This allows the instructor to select various starting positions or actions for the student to respond to.
 - A. "Quick Draw"
 - B. "Hand on Wheel"
 - C. "Both Hands on Wheel"
 - D. "Reset"
 - E. "Skip Segment"

4. Subject Response to Commands - It is possible for the instructor to terminate the subjects potential attack. This may be done as an example if effective verbal commands are provided.
 - A. "Comply"- Subject does not shoot the officer and places hands on the steering wheel.
 - B. "Skip Segment"

X. REVIEW

A. HUMAN FACTOR FOUNDATIONS

1. **Stress** - Stress happens when the perceived demands of an event exceed(challenge) the perceived ability to meet those demands, specifically when your safety is at stake.
2. **Arousal** - The act of stimulating readiness or to action.
3. **Perception** - In the most basic terms, visual perception is a two-part process that involves the information from the environment and how our systems then interpret that information.
4. **Human performance measurements**
 - A. **Reaction Time** - The interval of time between a stimulus and the start of a response.
 - B. **Movement Time** -Time from the end of the reaction time to the completion of a movement.
 - C. **Response Time** - The sum of reaction time and movement time.
5. **Decision Training** - Decision-Response should be the focus of training.

B. "STOP TIME"

1. **Response Time** - If it takes time to start it takes time to stop.
2. **Attention** - What you attend to affects your ability to perceive a change.
3. **Interaction** - If you are delayed in perception you are delayed in your response (stop pulling the trigger).

C. "SHOOT AND RUN"

1. **Motor Programs** - Once the program is started it is highly unlikely to be stopped.
2. **Interactivity** - A rapid turn to run away by an armed individual could create similar movement patterns that simulate the presence of a threat. This can allow a decision to fire, which takes time. During the time to fire the subject can finish their turn and take steps.

D. "KNIFE CHARGE"

1. **AvR** - Action time versus the time it takes for a reaction.
2. **"21 Foot Drill"** - It is a drill not a rule, and distance is only one of many critical components in evaluating it.
3. **Draw Times** - 1.68s to 1.82s
4. **Sprint Times** - 25 feet in 1.79 seconds
5. **Effectiveness of Gunfire** - Various factors can limit or mitigate the effect of stopping someone with gunfire. They can be hit and continue to fight.

E. "PRONE SUBJECT"

1. How fast?
 - A. Prone subject to turn and fire takes 0.61s

- B. Officer to fire a drawn weapon takes 0.68s
- 2. Relationships - The officer can take longer to perceive and act than it takes the subject to turn over and fire.

F. “VEHICLE CONTACT”

- 1. Unknown risk not “*low risk*”
- 2. Traffic stop or not:
 - A. Why am I stopping them?
 - B. Who is in the vehicle?
 - C. Where is a good place to stop them?
- 3. MZ - Mitigation Zone was reached the fastest on a passenger side approach.

XI. CONCLUSION

The course material provided the science behind human performance in tense, uncertain, and rapidly evolving situations and an opportunity for participating individuals to see their performance. We intend that the lessons learned provide scientifically backed knowledge to guide the use of tactics and the training to teach these tactics.

XII. QUESTIONS?

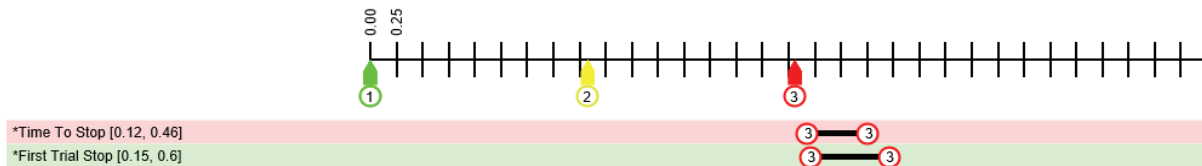
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XIV. APPENDIX

A. STOP TIME

Total shots fired: 0
1 Target Visible: 0.000 sec
2 Start Stimulus: 2.079 sec
3 Stop Stimulus: 4.059 sec
Shots After Stop: 0
First Shot After Stop: N/A sec
Time Until Stop Shooting: N/A sec



*: Lewinski, W.J., Hudson, W.B., Dysterheft, J.L. (2014) Police Officer Reaction Time to Start and Stop Shooting: The Influence of Decision-Making and Pattern. Law Enforcement Executive Forum • 2014 • 14(2)

LEGEND

“Total shots fired”	Is the total number of shots fired by the student. This will not record shots that are command fired by the instructor using the mouse.
“1 Target Visible”	The timer starts at the is moment at 0.000 seconds.
“2 Start Stimulus”	This is when the signal to start shooting is provided.
“3 Stop Stimulus”	This is when the signal to stop shooping is provided.
“Shots After Stop”	The number of rounds fired after the “3 Stop Stimulus” is provided.
“First Shot After Stop”	The time interval between “3 Stop Stimulus” and the first of any additional shots.
“Time Until Stop Shooting”	The time interval between “3 Stop Stimulus” and the last round fired.

B. SHOOT AND TURN

Total shots fired:	0
1 Subject appears:	0.000 sec
2 Subject's first action:	2.000 sec
3 First indication of item:	2.100 sec
4 Subject completes action:	2.267 sec
Subject's total action time:	0.267 sec
Initial use of force:	N/A sec
Initial use of force after subject's first action:	N/A sec
Use of force (hit) after subject's first action:	N/A sec
Initial use of force after first indication of item:	N/A sec
Use of force (hit) after first indication of item:	N/A sec



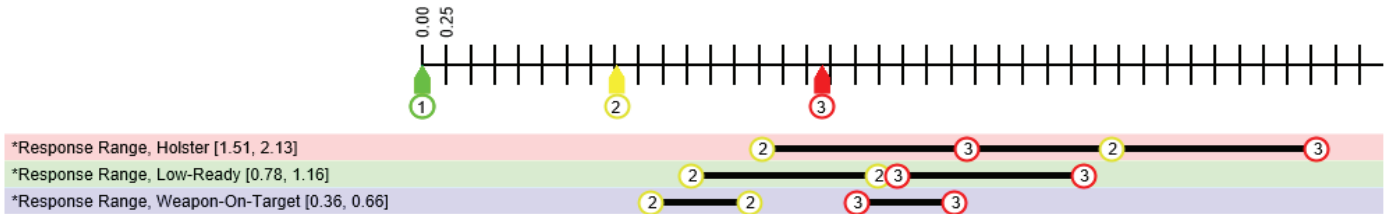
* Lewinski, W. J., Dysterheft, J.L., Bushey, J.M., Dicks, N.D. (2016) Ambushes Leading Cause of Officer Fatalities-When every Second Counts: Analysis of Officer Movement from Trained Ready Tactical Positions. Law Enforcement Executive Forums 15(1), 1-15.

LEGEND

“Total shots fired”	The total amount of rounds fired in the event by the student. Instructor command fired rounds via the mouse will not be recorded.
“1 Subject appears”	The on-screen subject first appears and the timer starts at 0.000 seconds.
“2 Subject’s first action”	The first possible discernable motion of the subject concealed arm and hand. This is based on an analysis of the frames of film done at VirTra.
“3 First indication of item”	This is the first frame where any portion of the item in the subject’s hand is visible. This is based on an analysis of the frames of film done at VirTra.
“4 Subject completes action”	The moment in time where the subject fires weapon/drops weapon/goes hands up. This is based on an analysis of the frames of film done at VirTra.
“Subject’s total action time”	This is the time interval between “2 Subject’s first action” and “4 Subject completes action”.
“Initial use of force”	The time interval between “1 Subject appears” and the officers first use of weapon platform.
“Initial use of force after subject’s first action”	Time interval between “2 Subject’s first action” and the officers “Initial use of force”- This includes missed shots.
“Use of Force (hit) after subject’s first action”	This is the time interval between “2 Subject’s first action” and the officer first actuate hit.
“Initial use of force after first indication of item”	Time interval between “3 First indication of item” and the officers “initial use of force”. This includes missed shots.
“Use of force (hit) after first indication of item”	This is the time interval between “3 First indication of item” and the officers first accurate hit.

C. KNIFE CHARGE

Total shots fired:	0
1 Subject appears:	0.000 sec
2 Subject's first action:	2.024 sec
3 Subject completes action:	4.161 sec
Subject's total action time:	2.137 sec
Initial use of force:	N/A sec
Initial use of force after subject's first action:	N/A sec
Use of force (hit) after subject's first action:	N/A sec



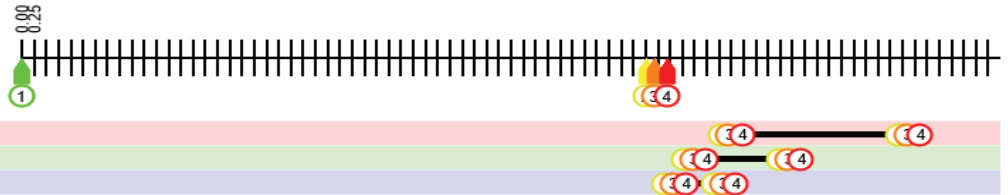
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LEGEND

“Total shots fired”	The total amount of rounds fired in the event by the student. Instructor command fired rounds via the mouse will not be recorded. The nature of this drill is to track only the first round fired. This is based on the research that has been done on the action/reaction relationship in this area. The reality is that one round may or many not stop someone’s actions.
“1 Subject appears”	The on-screen subject first appears and the timer starts at 0.000 seconds.
“2 Subject’s first action”	The first possible discernable motion of the subject. This is based on an analysis of the frames of film done at VirTra.
“3 Subject completes action”	The time interval between “1 Subject appears” and the completion of the subjects run.
“Subject’s total action time”	The time interval between “2 Subject’s first action” and “3 Subject completes action”
“Initial use of force”	The time interval between “1 Subject appears” and the officers first use of weapon platform.
“Initial use of force after subject’s first action”	Time interval between “2 Subject’s first action” and the officers “Initial use of force”- This includes missed shots.
“Use of Force (hit) after subject’s first action”	This is the time interval between “2 Subject’s first action” and the officer first actuate hit.

D. PRONE SUSPECT

Total shots fired:	0
1 Subject appears:	0.000 sec
2 Subject's first action:	12.767 sec
3 First indication of item:	12.934 sec
4 Subject completes action:	13.201 sec
Subject's total action time:	0.434 sec
Initial use of force:	N/A sec
Initial use of force after subject's first action:	N/A sec
Use of force (hit) after subject's first action:	N/A sec
Initial use of force after first indication of item:	N/A sec
Use of force (hit) after first indication of item:	N/A sec



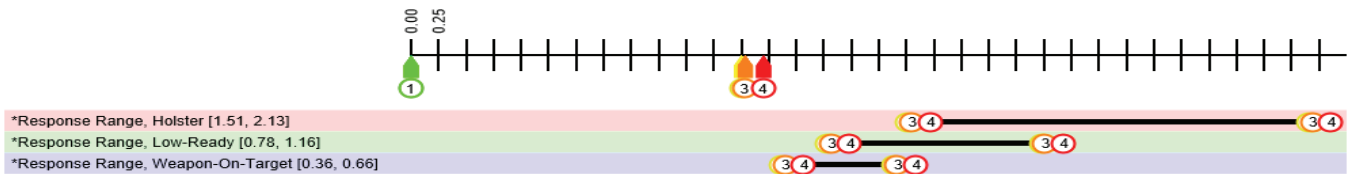
*: Lewinski, W. J., Dysterheft, J.L., Bushey, J.M., Dicks, N.D. (2015) Ambushes Leading Cause of Officer Fatalities-When every Second Counts: Analysis of Officer Movement from Trained Ready Tactical Positions. Law Enforcement Executive Forums 15(1), 1-15.

LEGEND

“Total shots fired”	The total amount of rounds fired in the event by the student. Instructor command fired rounds via the mouse will not be recorded.
“ 1 Subject appears”	The on-screen subject first appears and the timer starts at 0.000 seconds.
“ 2 Subject's first action”	The first possible discernable motion of the subject concealed arm and hand. This is based on an analysis of the frames of film done at VirTra.
“ 3 First indication of item”	This is the first frame where any portion of the item in the subject's hand is visible. This is based on an analysis of the frames of film done at VirTra.
“ 4 Subject completes action”	The moment in time where the subject fires weapon/drops weapon/ goes hands up. This is based on an analysis of the frames of film done at VirTra.
“Subject's total action time”	This is the time interval between “ 2 Subject's first action” and “ 4 Subject completes action”.
“Initial use of force”	The time interval between “ 1 Subject appears” and the officers first use of weapon platform.
“Initial use of force after subject's first action”	Time interval between “ 2 Subject's first action” and the officers “Initial use of force”- This includes missed shots.
“Use of Force (hit) after subject's first action”	This is the time interval between “ 2 Subject's first action” and the officer first accurate hit.
“Initial use of force after first indication of item”	Time interval between “ 3 First indication of item” and the officers “initial use of force”. This includes missed shots.
“Use of force (hit) after first indication of item”	This is the time interval between “ 3 First indication of item” and the officers first accurate hit.

E. VEHICLE CONTACT

Total shots fired:	0
1 Subject appears:	0.000
2 Subject's first action:	3.003 sec
3 First indication of item:	3.036 sec
4 Subject completes action:	3.203 sec
Subject's total action time:	0.200 sec
Initial use of force:	N/A
Initial use of force after subject's first action:	N/A
Use of force (hit) after subject's first action:	N/A
Initial use of force after first indication of item:	N/A
Use of force (hit) after first indication of item:	N/A



* Lewinski, W. J., Dysterheft, J.L., Bushey, J.M., Dicks, N.D. (2015) Ambushes Leading Cause of Officer Fatalities-When every Second Counts: Analysis of Officer Movement from Trained Ready Tactical Positions. Law Enforcement Executive Forums 15(1), 1-15.

LEGEND

“Total shots fired”	The total amount of rounds fired in the event by the student. Instructor command fired rounds via the mouse will not be recorded.
“1 Subject appears”	The on-screen subject first appears and the timer starts at 0.000 seconds.
“2 Subject’s first action”	The first possible discernable motion of the subject concealed arm and hand. This is based on an analysis of the frames of film done at VirTra.
“3 First indication of item”	This is the first frame where any portion of the item in the subject’s hand is visible. This is based on an analysis of the frames of film done at VirTra.
“4 Subject completes action”	The moment in time where the subject fires weapon/drops weapon/goes hands up/complies. This is based on an analysis of the frames of film done at VirTra.
“Subject’s total action time”	This is the time interval between “2 Subject’s first action” and “4 Subject completes action”.
“Initial use of force”	The time interval between “1 Subject appears” and the officers first use of weapon platform.
“Initial use of force after subject’s first action”	Time interval between “2 Subject’s first action” and the officers “Initial use of force”- This includes missed shots.
“Use of Force (hit) after subject’s first action”	This is the time interval between “2 Subject’s first action” and the officer first accurate hit.
“Initial use of force after first indication of item”	Time interval between “3 First indication of item” and the officers “initial use of force”. This includes missed shots.
“Use of force (hit) after first indication of item”	This is the time interval between “3 First indication of item” and the officers first accurate hit.

STUDENT NAME: _____

DATE: _____

1. Stress is like beauty...in large part, is in the eye of the beholder.
A. True
B. False

2. In the most basic of terms visual perception is a two-part process that involves the information from the environment and how our systems then interpret that information.
A. True
B. False

3. Reaction Time and Response time are the same thing.
A. True
B. False

4. You can't train decision making?
A. True
B. False

5. If it takes time to start an action it takes time to stop.
A. True
B. False

PRE-TEST KEY
1. True 2. True 3. False 4. False 5. True

All test scores must be retained in department records for at least 30 years



HUMAN FACTORS IN FORCE ENCOUNTERS

STUDENT NAME: _____

DATE: _____

1. Stress happens when perceived demands of an event exceed the perceived ability to meet those demands, specifically when your safety is at stake.
 - A. True
 - B. False

2. Stress can
 - A. Increase heart rate
 - B. Increase respiration rate
 - C. Cause muscle tension
 - D. Narrow the attentional process limiting perception
 - E. All the above
 - F. None of the above

3. Arousal is
 - A. When our senses are stimulated to the point of perception
 - B. Not an important factor in performance
 - C. The act of stimulating readiness or to action
 - D. A and B
 - E. A and C
 - F. B and C

4. Effects of arousal include regulation of consciousness, attention and alertness
 - A. True
 - B. False

5. Perception is a process
 - A. True
 - B. False

6. Visual perception is a
 - A. Complex interaction between the receiving of photons of light
 - B. Collection and transmission via the optic nerve
 - C. The mind processing and interpreting the information
 - D. All of the above

7. Schema are mental models of aspects of the world or of the self that is structured in such a way as to facilitate the process of cognition and perception.
- A. True
 - B. False
8. How we process and perceive information determines
- A. Our level of performance
 - B. Our memory
 - C. A and B
 - D. None of the above
9. Reaction time and Response time are the same thing
- A. True
 - B. False
10. Response time is sum of
- A. Reaction time
 - B. Time lag
 - C. Refraction time
 - D. Movement time
 - E. A and B
 - F. A and C
 - G. A and D
11. If it takes time to start an action it also takes time to stop it
- A. True
 - B. False
12. We can only “see” what we attend to. Without attention there is no perception.
- A. True
 - B. False
13. Attentional shifts take time. According to research this shift can take
- A. 0.20s to 0.60s
 - B. 0.50s to 1.50s
 - C. 2.0s to 3.0s
14. A sufficiently strong signal may be required for the mind to notice a “stop” stimulus. Without a strong enough signal the mind may stay engaged in previous activity.
- A. True
 - B. False

15. A delay in recognizing the change in the level of threat of a subject because of attentional focus (such as on the front sight) could result in additional rounds being fired
- A. True
 - B. False
16. As demonstrated in the “Shoot and Turn” training event a subject could shoot at an officer and turn 180-degree before the officer fires their own weapon resulting in subject being shot in the back.
- A. True
 - B. False
17. Research has shown that based on an audible signal it can take an officer between 1.68 and 1.82 seconds to draw and fire a handgun.
- A. True
 - B. False
18. Testing has shown that a human can run and cover 25 feet in that time
- A. True
 - B. False
19. Subjects in a prone position are little risk to officers.
- A. True
 - B. False
20. Mind sets on traffic stops should be that there is no such thing as “low risk” only “unknown risk.”
- A. True
 - B. False

TEST KEY

1) True 2) E 3) E 4) True 5) True
6)D 7) True 8)C 9) False 10)G 11) True
12) True 13) A 14) True 15) True
16) True 17) True 18) True 19) False 20) True

PASSING = 80% OR BETTER

All test scores must be retained in department records for at least 30 years

XVII. STUDENT ATTENDANCE ROSTER

TOPIC: HUMAN FACTORS IN FORCE ENCOUNTERS

DATE: _____

Last	First	Badge	Email	Officer's Initials

I certify that each person listed on this roster was present in class for the entire number of training hours reflected, and if not, their training hours have been adjusted and recorded accordingly.

PRINT NAME: _____

SIGNATURE: _____

XVIII. CLASS SURVEY

TOPIC: HUMAN FACTORS IN FORCE ENCOUNTERS

INSTRUCTOR: _____

DATE: _____

COMMENTS

CLASS CONTENT	Excellent	Above Average	Good	Below Average	Poor
Class organization					
Class objectives were clearly stated					
Practical activities were relevant to objectives					
All materials/resources were provided					
Topic area was important to Law Enforcement					
CLASS INSTRUCTION					
Instructor was prepared					
Instructor was knowledgeable in the content area					
Manner of presentation of the material was clear					
Effective teaching strategies were used					
Instruction met class objectives					
STUDENT PARTICIPATION					
Level of effort your put into the course					
Your skill/knowledge of the topic at start of course					
Importance of the topic to your assignment					

XIX. CONTACT VIRTRA

If you have any questions/issues with any part of this manual, please see contact below:

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Certification Program™