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THESIS

THE EFFECTS OF HYPERVIGILANCE ON DECISION-MAKING DURING CRITICAL INCIDENTS

by

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While law enforcement defines the term "hypervigilance" in its training and operations to describe awareness of a potentially dangerous situation, research describes hypervigilance as a state of panic that often results in regrettable decision-making. The disconnect between academic conceptualization and the applied use of hypervigilance results in a lack of understanding in police contexts, a deficit of what accounts for the phenomenon, and a deficiency in mitigation. This thesis breaks hypervigilance into its three relevant constructs: anxiety, fear, and acute stress, and examines interrelated effects on critical incident decision-making by conducting a rigorous literature review of each field. Current training, through repetition, builds false expertise by automating responses without applying rational thought. Changing law enforcement's training curriculum to one that is built on cognitive conditioning through exposure training may enable better, more efficient intuitive decisions that are grounded in relevant experience and expertise. This thesis suggests a transformation in law enforcement training as a foundation to optimize intuitive decision-making in critical incident situations.

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THE EFFECTS OF HYPERVIGILANCE ON DECISION-MAKING DURING CRITICAL INCIDENTS

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ABSTRACT

While law enforcement defines the term “hypervigilance” in its training and operations to describe awareness of a potentially dangerous situation, research describes hypervigilance as a state of panic that often results in regrettable decision-making. The disconnect between academic conceptualization and the applied use of hypervigilance results in a lack of understanding in police contexts, a deficit of what accounts for the phenomenon, and a deficiency in mitigation. This thesis breaks hypervigilance into its three relevant constructs: anxiety, fear, and acute stress, and examines interrelated effects on critical incident decision-making by conducting a rigorous literature review of each field. Current training, through repetition, builds false expertise by automating responses without applying rational thought. Changing law enforcement’s training curriculum to one that is built on cognitive conditioning through exposure training may enable better, more efficient intuitive decisions that are grounded in relevant experience and expertise. This thesis suggests a transformation in law enforcement training as a foundation to optimize intuitive decision-making in critical incident situations.

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LIST OF ACRONYMS AND ABBREVIATIONS

CPT	cold pressor stress test
DPD	Dallas Police Department
HPA	hypothalamic-pituitary-adrenal
IVE	immersive virtual environment
OODA	observe, orient, decide, act
PERF	Police Executive Research Forum
PTSD	post-traumatic stress disorder
SAM	sympathetic-adrenal-medullary
TCOLE	Texas Commission on Law Enforcement
TSST	Trier social stress test

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EXECUTIVE SUMMARY

Every year police are involved in deadly force encounters that mortally wound citizens. Several high-profile incidents, like the fatal shooting of Michael Brown in Ferguson, Missouri, the fatal chokehold of Eric Garner by a New York City police officer, and the fatal shooting of James Boyd killed by an Albuquerque, New Mexico police officer, have propelled law enforcement's critical incident decision making into the media spotlight and caused civil unrest.

It is not the intention of law enforcement to wound citizens mortally. Officer Johannes Mehserle shot and killed Oscar Grant while Grant was lying in a prone position at a public transit station.[1] Mehserle's encounter began while responding to a disturbance that ended when he mistakenly shot Oscar Grant with a pistol, while intending to use his Taser instead. During Mehserle's trial, a 31-year law enforcement consultant and forensic criminologist specializing in force testified that the officer's confusion was evidence of the phenomenon known as *hypervigilance*. Hypervigilance, as defined in academic literature, is a panic-like state in which decision-making processes break down.[2] Officer Mehserle initially thought he had shot Grant with his Taser, not his firearm, implying he overreacted out of fear of being injured or killed by Grant, which resulted in his confusion between his Taser and firearm. Throughout this thesis, examples, such as the Mehserle shooting, are referenced by linking real-world examples of hypervigilance to its underlying constructs.

These examples highlight how hypervigilance can affect decision making in critical situations. It is important for law enforcement to understand this condition better to avoid deadly mistakes. Unfortunately, the misapplication of the term hypervigilance in courtroom testimony, media headlines, and police training during acute stress warrants

[1] Ron Martinelli, "Murder-or-Stress-Induced-Hypervigilance," *Porac Law Enforcement News*, December 2010, 36, http://www.cti-home.com/wp-content/uploads/2014/01/Murder-or-Stress-Induced-Hypervigilance.pdf.

[2] Irving L. Janis and Leon Mann, *Decision Making: A Psychological Analysis of Conflict, Choice, and Commitment* (New York: Free Press, 1977), 51.

the need to define it. In fact, police training often uses the terms *vigilance* and *hypervigilance* to describe levels of awareness in the survival mechanism. Law enforcement training describes hypervigilance as a desired state of increased awareness. This description is very different from the academic definition, which defines hypervigilance as a state of panic resulting in hasty decision making that can end with regrettable outcomes.[3] This disconnect can preclude law enforcement from understanding hypervigilance (the panic-like state) in police contexts, what accounts for the phenomenon, and what mitigation and training techniques may help to prevent adverse reactions.

This thesis conceptualizes the term hypervigilance. It examines relevant studies of anxiety, fear, and acute stress for interrelated effects on decision making by conducting a rigorous literature review. Existing research is analyzed to examine whether training or personnel selection can mitigate the adverse effects of hypervigilance.

This thesis finds that current literature on hypervigilance fails to consider how expertise and overconfidence, created during training, affects decision making. This thesis suggests a transformation in law enforcement training as a foundation to optimize intuitive decision making based on expertise while maintaining an analytical approach. After a review of the literature, a more appropriate teaching method is recommended, as rote training, without stress exposure and cognitive conditioning, can contribute to overconfidence in officers' ability when using force.

This thesis recommends exploring real-world experiences and theoretical applications of how appropriate training can diminish improper critical decision making and may lead to less susceptibility to hypervigilance. Perfecting the ability to differentiate when it is inappropriate to apply a learned response in training similar to the officers' current situation is critical, or if the officers need to take better appraisal of the situation because of novel or ambiguous circumstances. It also recommends changing the training

[3] Irving L. Janis and Leon Mann, "Coping with Decisional Conflict: An Analysis of How Stress Affects Decision-Making Suggests Interventions to Improve the Process," *American Scientist* 64, no. 6 (November–December 1976): 658, http://www.jstor.org/stable/27847557.

curricula to those built on cognitive conditioning through exposure training to enable better, more efficient intuitive decisions grounded in relevant experience and expertise.

Cognitive conditioning through an awareness of officers' stress responses can shape automated responses (intuitive) based on their higher skill levels (expertise). The more officers make decisions during stressful environments, the more familiar they become with their decision-making processes and performance during a crisis (expertise) until they do it without deliberatively thinking (intuitively).[4] Research on expertise-based intuition serves as the foundation for cognitive conditioning through officers' awareness to stress. Salas and colleagues define expertise-based intuition as, "The intuitions occurring at these later stages of development where the decision maker has developed a deep and rich knowledge base from extensive experience within a domain."[5] The objective is to enable officers to make optimal intuitive decisions, while being familiar with high-stress reactions, thereby making them less susceptible to hypervigilance.

This thesis also suggests future research on *if* receiving a radio-call primes officers' responses before getting to the situation. It suggests that the comments made by a dispatcher during a call may serve as an anchoring effect that starts a cognitive bias that can result in officers' overreliance on their own bias during their decision-making processes.[6] If officers receive calls that primes their expectations of a situation (e.g., a call about a man with a gun), the officers are going to see cues in the environment that confirm these preexisting beliefs, even if they may not be accurate (e.g., the man had a pipe in his hand and not a gun).

[4] Eduardo Salas, Michael A. Rosen, and Deborah DiazGranados, "Expertise-Based Intuition and Decision Making in Organizations," *Journal of Management* 36, no. 4 (July 2010): 944, https://doi.org/10.1177/0149206309350084.

[5] Salas, Rosen, and DiazGranados, 944.

[6] Daniel Kahneman, *Thinking, Fast and Slow* (New York: Farrar, Straus, and Giroux, 2011), 119.

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Dr. Mollie McGuire, I am not sure if you were more my psychologist, counselor, or cheerleader during the past 18 months. I cannot thank you enough for your support,

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I. THE NEED TO FIND A BALANCED SENSE OF AWARENESS

Don't let your emotions get in the way of rational decision making.

~ Roy L. Bennett

A. BACKGROUND

In January 2009, in Oakland, California, a routine encounter between a Bay Area Rapid Transit police officer responding to a fight in the subway ended with an officer-involved shooting and a dead citizen. Officer Johannes Mehserle shot and killed Oscar Grant while Grant was lying in a prone position at a public transit station.[1] This incident sparked nationwide controversy over the officer's apparent use of excessive force. Ron Martinelli, a law enforcement consultant with over three decades of experience and forensic criminologist specializing in force, testified that the officer's confusion was evidence of the phenomenon known as *hypervigilance*. Officer Mehserle initially thought he had shot Grant with his Taser, not his firearm. According to Martinelli's testimony, Mehserle did not intentionally set out to use lethal force. Martinelli's testimony implied Mehserle reacted out of fear for his own life, which resulted in his confusion between his Taser and firearm. Martinelli testified:

> I have also found a clear nexus between a lack of appropriate force training, officer maturity and situational awareness with the occasional tragic consequences of accidental and excessively applied force. I find a big difference between an intentional and excessive quantum of force and force applied mistakenly during a period of acute hypervigilance that causes death. When threatened, humans will only react in one or more of five separate states: (1) assume a defense posture (fight); (2) disengage from the threat (flee); (3) posture-raise a voice, puff up their chest, aggressive gestures; (4) hypervigilance-defined as panic, confusion, freezing and/or performing an irrational act; and (5) submit surrender.[2]

[1] Ron Martinelli, "Murder-or-Stress-Induced-Hypervigilance," *Porac Law Enforcement News*, December 2010, 36, http://www.cti-home.com/wp-content/uploads/2014/01/Murder-or-Stress-Induced-Hypervigilance.pdf.

[2] Martinelli, 36.

This example highlights how hypervigilance can affect decision making in critical situations. Regrettably, the use of the term hypervigilance in courtroom testimony (as with this example), media headlines, and police training is misapplied, as it relates to critical incident performance and justifies the need to define it. In fact, police training often uses the terms *vigilance* and *hypervigilance* to describe levels of awareness in the survival mechanism, but this description may be an inappropriate application of the term. Hypervigilance, as defined in academic literature, is not an increased state of awareness, but instead a panic-like state in which decision-making processes break down.[3] This disconnect in academic conceptualization and applied use results in a lack of understanding in police contexts. It is important to understand what accounts for the phenomenon, and what mitigation and training techniques may help to prevent adverse reactions under conditions that may also give rise to hypervigilance.

B. PROBLEM STATEMENT

Law enforcement training conditions officers to anticipate threats by teaching them to operate in an elevated state of awareness. Responding to an incident in an elevated state of awareness is imperative to officers' survival. Law enforcement teaches awareness mirrors training from U.S. military combatants. Colonel Jeff Cooper, a combat Marine Corps veteran, developed a combat mindset to describe four states of awareness:

1. White: officers are unprepared to take lethal action.
2. Yellow: officers understand their lives may be in danger and [they] may have to act if circumstances warrant.
3. Orange: officers have identified specific adversaries and are prepared to act for their survival. The orange awareness state does not warrant lethal force.
4. Red: lethal force is warranted and the officers will shoot if circumstances warrant.[4]

[3] Irving L. Janis and Leon Mann, *Decision Making: A Psychological Analysis of Conflict, Choice, and Commitment* (New York: Free Press, 1977), 51.

[4] "Jeff Cooper's Awareness Color Code Chart," BSR, March 19, 2017, http://www.bsr-inc.com/awareness-color-code-chart/.

Police officers train to operate in the yellow awareness mindset, always prepared to defend their own lives or the lives of innocent citizens. Operating in an elevated state of awareness serves a purpose in law enforcement; it keeps officers alive. However, a constant state of awareness may keep officers alive at the expense of others by making improper decisions.

The term *vigilance* in Marine Corps and police officer training refers to a mental state of awareness relevant for survival during a tour of duty. This training cultivates a prolonged state of vigilance, which can subjectively escalate to hypervigilance in acute stress situations and cloud the decision-making ability. Vigilance can transform into hypervigilance through an overwhelming amount of stress and emotional arousal. Hypervigilance is a panic-like state experienced in a perceived life-threatening situation, which can leave officers unable to resolve a situation like the one described in the Bay Area Transit situation. Hypervigilance needs to be better understood and studied in terms of a dynamic concept. All officers' cognitive processes, emotional perceptions, and biases are diverse and impact critical incident decision making differently. Since critical incident decision making is extremely diverse, the definition should be more of a concept that changes with the individuals and is curtailed to a specific situation. Understanding hypervigilance as a dynamic concept helps understand the officers' mental state at the time of a critical incident. This discrepancy, between law enforcement's use of the terminology and the scholars' definition, may suggest a mischaracterization of hypervigilance in applied contexts. A common theme, however, are three constructs that serve as the foundation of hypervigilance: acute stress, fear, anxiety, and decision making.

Additionally, current police teaching fails to connect theoretical aspects of stress on the body into practical worst-case training scenarios, which accounts for the phenomenon of overconfidence. Overconfidence is the officers' beliefs they are mentally prepared for critical incident decision making and the effects of stress, when in reality, they are ill-prepared for them.

C. RESEARCH QUESTIONS

How do stress and emotional arousal alter the decision-making capability when officers fear imminent danger?

Can the concept of overconfidence caused by law enforcement's current inappropriate repetition during training explain hypervigilance in some instances where officers mistakenly use too much force?

D. RESEARCH DESIGN

This thesis conceptualizes the term hypervigilance. It examines relevant studies of anxiety, fear, and acute stress for interrelated effects on decision making by conducting a rigorous literature review. This thesis does not evaluate hypervigilance resulting from post-traumatic stress disorder (PTSD). For the purposes of this study, (a) hypervigilance is limited to the phenomenon that can occur during acute stress, regardless of previous exposure to traumatic events, and (b) a critical incident is defined as any acute stress situation, up to and including using deadly force. This study explains hypervigilance and its effect on decision making in terms of the underlying constructs identified in the relevant literature. The three constructs that serve as the foundation of hypervigilance, acute stress, fear, and anxiety are examined separately. It also uses existing research to examine whether training or personnel selection can mitigate the adverse effects of hypervigilance. Lastly, this study proposes a different mode of training to reduce the effects of hypervigilance in unavoidable situations.

E. SIGNIFICANCE OF RESEARCH

The pursuit for this research began for the author after living through the deadliest attack on law enforcement since September 11, 2011, when an ambush killed five Dallas officers. The perception of excessive deadly force encounters between minorities and white police officers resulted in the motivation for the officers' deaths. Micah Johnson, the gunman identified as the shooter in the Dallas attack, spoke to police negotiators before officers used an improvised explosive device to neutralize him. According to Dallas Police Chief David Brown, Johnson told negotiators "he [Johnson] was upset at

white people. He stated he wanted to kill white people, especially white officers" in response to deadly encounters against unarmed minorities killed by law enforcement.[5]

Most law enforcement training and policies serve as the foundation of police legitimacy. Increased scrutiny of officers' use-of-force performance happens through public scrutiny and erodes confidence in trust of the police. Improving performance during critical incidents is vital to help protect this nation's citizens and law enforcement legitimacy.

Sports medicine researchers study professional athletes to improve how they perform in highly stressful situations.[6] Understanding the rigorous demands put on fighter pilots or surgeons improve their performance under extremely stressful and life-threatening conditions.[7] Life-threatening situations encountered by police officers are no different. Understanding and mitigating hypervigilance may enhance decision making by police officers during critical incidents that can lead to safer outcomes for all involved. Professionals with emotional self-control make better decisions and save lives by offsetting the effects of fear, anxiety, and acute stress.

This thesis conceptualizes hypervigilance and synthesizes mitigation techniques during training to counter its effects on decision making during imminent critical stress incidents that happen without warning.

F. CHAPTER OUTLINE

The remainder of this thesis consists of four chapters. First, this research focuses on existing evidence supporting the construct of hypervigilance broken down by its parts of anxiety, fear, acute stress, and their effects on decision making. The second aim of this

[5] Manny Fernandez, Richard Pérez-Peña, and Jonah Engel Bromwich, "Five Dallas Officers Were Killed as Payback, Police Chief Says," *New York Times*, sec. U.S., July 8, 2016, https://www.nytimes.com/2016/07/09/us/dallas-police-shooting.html.

[6] Jocelyn Faubert, "Professional Athletes Have Extraordinary Skills for Rapidly Learning Complex and Neutral Dynamic Visual Scenes," *Scientific Reports* 3, no. 1 (December 2013): 2, https://doi.org/10.1038/srep01154.

[7] Roger G. Green, "Stress and Accidents," *Aviation, Space, and Environmental Medicine* 56, no. 7 (1985): 639.

research is to focus on an analysis of the individual constructs to define and mitigate hypervigilance. Finally, this research proposes training techniques to reduce the harmful consequences of hypervigilance by incorporating awareness and meditation during stress-induced training scenarios.

Chapter II examines an in-depth literature review of the two independent variables, which are the emotional effects and acute stress influence on physical, cognitive and decision-making processes. This chapter concludes with evidence of how fear and anxiety, two emotional constructs, affect the physical and cognitive process.

Chapter III delves into evidence from literature on how anxiety, fear, and acute stress affect the decision-making process. These concepts describe how stress affects the body and decision making. Additionally, the chapter examines vigilance and hypervigilance in terms of awareness and a lack of cognitive resources during critical decision making. The chapter ends by contrasting vigilance, where the officers' awareness levels should function, and hypervigilance, which is an awareness level, described as a panic-like state that overwhelms cognition.

Chapter IV provides an in-depth look at training, experience, and expertise and their effects on hypervigilance. It includes a proposal that integrates stress-induced worst-case scenario training with meditation and awareness to reduce the negative effects of a stress response during a critical incident.

Finally, Chapter V ends with a review of hypervigilance, which includes the constructs of stress, emotional reactions, and decision making, and how training techniques can mitigate the effects of hypervigilance.

II. THE EFFECTS OF ANXIETY, FEAR, AND ACUTE STRESS ON AWARENESS AS A SURVIVAL MECHANISM

Understanding the effects of hypervigilance begins with understanding how anxiety, fear, and acute stress affect physiological and cognitive processes. Acute stress and emotional arousal are overlapping bio-psychological responses to a threat, and these responses affect the decision-making processes. The following sections examine the literature pertaining to stress and the emotional arousal of anxiety and fear. The first section analyzes the effects of stress on critical decision making by examining physiological and cognitive responses. The next section discusses the emotional response in critical decision making by comparing anxiety and fear. Lastly, a qualitative review of emotional arousal and stress models are examined for how they intersect, specifically during critical incident decision making.

A. ACUTE STRESS

The Officer Down Memorial Page, a website dedicated to honoring law enforcement officers killed in the line of duty, shows 230 law enforcement officers killed in the line of duty from January 1, 2017 to August 15, 2018.[8] During the same time, the *Washington Post* reported 1,627 shootings during which people had been shot and killed by a police officer.[9] While the decision making of civilians in critical incidents is outside the scope of the current thesis, understanding the effects of acute stress in critical incidents is an imperative first step to mitigate the unnecessary deaths of both the civilian and the officer involved.[10]

[8] "The Officer Down Memorial Page (ODMP)," Officer Down Memorial Page, Inc., accessed April 21, 2018, https://www.odmp.org/.

[9] John Muyskens, "Police Shootings 2017 Database," *Washington Post*, sec. Investigative, July 1, 2017, https://www.washingtonpost.com/graphics/national/police-shootings-2017/.

[10] This thesis considers only acute stress and not the consequences of chronic stress. Specifically, it considers acute stress caused by a perceived life-threatening event that induces emotional, physiological, and cognitive responses.

Starcke and Brand define stress as when "a demand exceeds the regulatory capacity of an organism, particularly in situations that are unpredictable and uncontrollable. Stress elicits psychological, physiological and behavioral reactions that differ substantially across individuals."[11] Building on this definition, Latack and McGrath conceptualize stress as a struggle between perceived demands and the perceived ability to cope with those demands.[12] This thesis primarily focuses on stress as a perceived threat meeting individuals' perceived ability to cope with or escape a situation. Using these concepts, the following section analyzes the physiological and psychological responses resulting from the stress response elicited by the perceived inability to cope.

1. Physiological Effects of Stress

In response to a stressor, a fast-acting sympathetic-adrenal-medullary (SAM) system and a slower-acting hypothalamic-pituitary-adrenal (HPA) axis are activated. The activated SAM and HPA activity prompts the release of catecholamines and glucocorticoids, respectively. The catecholamines released include adrenaline (epinephrine), noradrenaline (norepinephrine), and dopamine. In humans, the glucocorticoid released is cortisol (cortisol is the term used going forward). Each hormone serves a unique function. Adrenaline enters into the bloodstream quickly for an immediate survival response whereas cortisol prolongs the stress response by appearing later in the cycle.[13] Collectively, the release of catecholamines results in both rapid and prolonged increase in heart rate, breathing, and blood pressure.[14] Both catecholamines and cortisol have been shown to affect activity in different parts of the brain, including

[11] Katrin Starcke and Matthias Brand, "Effects of Stress on Decisions under Uncertainty: A Meta-Analysis," *Psychological Bulletin* 142, no. 9 (2016): 911, https://doi.org/10.1037/bul0000060.

[12] Janina C. Latack and J. E. McGrath, "Coping with Job Stress: Measures and Future Directions for Scale Development," *Journal of Applied Psychology* 71, no. 3 (1986): 377.

[13] Stephan Pabst, Matthias Brand, and Oliver T. Wolf, "Stress and Decision Making: A Few Minutes Make All the Difference," *Behavioural Brain Research* 250 (August 2013): 40, https://doi.org/10.1016/j.bbr.2013.04.046.

[14] E. Ron de Kloet, Marian Joëls, and Florian Holsboer, "Stress and the Brain: From Adaptation to Disease," *Nature Reviews Neuroscience* 6, no. 6 (June 2005): 464, https://doi.org/10.1038/nrn1683.

those associated with decision making.[15] The changes in the body and the brain due to catecholamine and cortisol release affect physical and cognitive performance in preparation for survival.[16]

a. Sympathetic-Adrenal-Medullary System

Literature indicates a correlation between the emotional reaction to perceived threat and the body's SAM response to acute stress.[17] According to stress literature, once the body releases adrenaline and noradrenaline in a response to a perceived threat, the heart rate, breathing, and blood pressure increase rapidly, which then affects performance in preparation for survival.[18] Increased blood flow to major muscle groups and organs, along with increased muscle tension, provides strength for fighting or running. Increased energy, breathing, and heart rate prepare the body for survival if an injury occurs. Blood clotting functions in the body speed up to prevent excessive blood loss in the event of injury. Depletion of cognitive resources caused by the body's SAM response can have both beneficial and damaging consequences, such as pupil dilation, auditory exclusion, tunnel vision, and shaking.[19] Tunnel vision and auditory exclusion ensues when vision narrows and hearing diminishes by focusing intensely on a threatening cue.[20] Since vision and hearing is affected by a threatening cue, peripheral vision, and hearing is drastically reduced, which creates the possibility of missing other details.[21] This concept is important in understanding what may affect decision making in life threatening situations. The physiological effects of SAM activity serve as the basis for the survival response known as fight, fright, or freeze.

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[15] de Kloet, Joëls, and Holsboer, 469.

[16] de Kloet, Joëls, and Holsboer, 464.

[17] Starcke and Brand, "Effects of Stress on Decisions under Uncertainty," 911.

[18] de Kloet, Joëls, and Holsboer, "Stress and the Brain," 464.

[19] Laurie Kelly McCorry, "Physiology of the Autonomic Nervous System," *American Journal of Pharmaceutical Education* 71, no. 4, art. 78 (September 2007): 1, https://doi.org/10.5688/aj710478.

[20] McCorry, 7–8.

[21] McCorry, 7–8.

The hypothalamus initiates the SAM, which consists of the adrenal medulla. The adrenal medulla produces adrenaline, noradrenaline, and dopamine.[22] The SAM is fast-acting, starting on onset of the acute stressor, and not returning to baseline until about 10 minutes post-stressor.[23] Adrenaline prepares the body to stay and fight or run away from the threat for survival.

For years, the fight, flight, or freeze survival response was known as the fight-or-flight response.[24] The fight-or-flight response is a physiological response that prepares individuals to (a) fight—to stay and defend themselves during an attack, or (b)—flight—to run from the dangerous situation. The fight-or-flight response stems from catecholamines released as part of the SAM response in preparation for a violent muscular action for fighting or running.[25]

Relatively new research indicates freezing, a third response to a threat, stems from noradrenaline. The act of freezing is the inability to fight or flee by simply freezing and doing nothing and is referred to as tonic immobility. Schmidt et al. suggest freezing, or tonic immobility, may occur when the competing actions of fleeing or fighting are likely to be ineffective in the situation.[26] They illustrate the evolutionary concept in the wild where some animals "play dead" as the best option to avoid being attacked since escaping or winning a fight is unlikely.

The noradrenaline released during a stress response is also associated with arousal, hyper-alertness, increased panic, or dread.[27] High levels of noradrenaline are associated with panic attacks, an overwhelming feeling of shortness of breath, and

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[22] Starcke and Brand, "Effects of Stress on Decisions under Uncertainty," 912.

[23] Starcke and Brand, 912.

[24] Norman B. Schmidt et al., "Exploring Human Freeze Responses to a Threat Stressor," *Journal of Behavior Therapy and Experimental Psychiatry* 39, no. 3 (September 2008): 292, https://doi.org/10.1016/j.jbtep.2007.08.002.

[25] de Kloet, Joëls, and Holsboer, "Stress and the Brain," 464.

[26] Schmidt et al., "Exploring Human Freeze Responses to a Threat Stressor," 2.

[27] Jack M. Gorman et al., "Neuroanatomical Hypothesis of Panic Disorder, Revised," *American Journal of Psychiatry* 157, no. 4 (2000): 495, http://ajp.psychiatryonline.org/doi/abs/10.1176/appi.ajp.157.4.493.

feelings of suffocation, numbness, and chest pain, which may be detrimental during critical incident decision making.[28]

b. Hypothalamic-Pituitary-Adrenal Axis

The HPA consists of the hypothalamus, anterior pituitary, and the adrenal cortex. The HPA impacts memory and cognition. As the physiological effects of stress initiated by the body's SAM response to acute stress begin, a similar reaction to fear is initiated by the body's HPA response. The hypothalamus in the brain starts the process by sending signals to the pituitary gland and the adrenal cortex.[29] The HPA releases cortisol that results in changes in the brain that then affects cognitive performance in preparation for survival.[30] Cognitive perception is processed in the limbic brain structures that consist of the hippocampus and amygdala, and is closely linked to the prefrontal cortex.[31] Cortisol is responsible for increased energy by releasing supply of glucose from the liver.[32] Cortisol also aids in survival by controlling swelling during a life-threatening situation.

Cortisol negatively impacts long-term memory, but can be beneficial in short-term, immediate recall memory. Excessive cortisol can impair the hippocampus's ability to recall memories. De Kloet et al.'s review found that cortisol creates "increased arousal, alertness, vigilance, focused attention and cognitive processing."[33] Peak concentrations in cortisol levels occur in 21–40 minutes and lasts for up to 90 minutes.[34] Cortisol levels can take over an hour to return to baseline levels when higher levels of stress are experienced.

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[28] Gorman et al., 497.

[29] de Kloet, Joëls, and Holsboer, "Stress and the Brain," 464.

[30] de Kloet, Joëls, and Holsboer, 464.

[31] de Kloet, Joëls, and Holsboer, 463.

[32] de Kloet, Joëls, and Holsboer, 464.

[33] de Kloet, Joëls, and Holsboer, 463.

[34] Starcke and Brand, "Effects of Stress on Decisions under Uncertainty," 912.

2. Stress and Cognition

Acute stress has an impact on cognition, memory, and decision making.[35] Executive functions refer to higher-level cognitive activities including thinking, reasoning, understanding, and learning.[36] The duration and intensity of acute stress during critical incidents impact attention and learning functions.

A review of existing literature by Sandi examines the relationship between the magnitude and duration of stress on cognition.[37] The purpose of her meta-analysis was to delve into the stress effects of "implicit or explicit memory, working memory, goal-directed behavior and habit learning."[38] The findings from Sandi's review indicate habit-forming tasks, or training, can mitigate the negative effects of stress through preparedness. This review supports the idea that decision making during acute stress occurs using either the prefrontal cortex for analytical thinking or the amygdala for intuitive thinking.[39] Luksys, Gerstner, and Sandi suggest that complex and flexible reasoning occurs in the hippocampus and prefrontal cortex whereas implicit memory and well-rehearsed tasks occur in the amygdala.[40] Sandi's review indicates that overwhelming stress weakens explicit memory and impairs decision making when an individual is performing functions that have not been well rehearsed. Her review also finds the impact of acute stress on well-rehearsed tasks is not as profound. During a lecture, LeDoux supports the idea of two separate ways of thinking, intuitively or heuristically. LeDoux explained that signals processed through the cortex are a top-down

[35] Carmen Sandi, "Stress and Cognition," *Wiley Interdisciplinary Reviews: Cognitive Science* 4, no. 3 (June 2013): 254, https://doi.org/10.1002/wcs.1222.

[36] Grant S. Shields, Matthew A. Sazma, and Andrew P. Yonelinas, "The Effects of Acute Stress on Core Executive Functions: A Meta-Analysis and Comparison with Cortisol," *Neuroscience & Biobehavioral Reviews* 68 (September 2016): 651, https://doi.org/10.1016/j.neubiorev.2016.06.038.

[37] Sandi, "Stress and Cognition," 254.

[38] Sandi, 245.

[39] Sandi, 255.

[40] Gediminas Luksys, Wulfram Gerstner, and Carmen Sandi, "Stress, Genotype and Norepinephrine in the Prediction of Mouse Behavior Using Reinforcement Learning," *Nature Neuroscience* 12, no. 9 (September 2009): 1185, https://doi.org/10.1038/nn.2374; Gediminas Luksys and Carmen Sandi, "Neural Mechanisms and Computations Underlying Stress Effects on Learning and Memory," *Current Opinion in Neurobiology* 21, no. 3 (June 2011): 505, https://doi.org/10.1016/j.conb.2011.03.003.

process, are more accurate but slower, taking about 150–250 milliseconds or more. In contrast, bottom-up signals are processed through the amygdala and are quicker, responding in about 20–80 milliseconds, but are less accurate.[41]

Starcke and Brand's study on decision making in stressful situations examined whether individuals take chances under stress.[42] Their research stemmed from a study of decision making involving financial gain and loss after inducing stress. Starcke and Brand found that individual stress reaction, not stress induction, affects decisions; a concept that differs from most stress literature.[43] Starke and Brand describe a stress reaction by triggering the two biological systems associated with stress, the SAM and the HPA. The purpose of Starke and Brand's research examines the effects of individuals' stress reactions on performance after a stress induction.

Pabst, Brand, and Wolf studied prolonged stress and biological reactions in response to stress and the subsequent effects on performance. They theorized that the longer people are exposed to stress, the higher the deterioration of their ability to decide and adequately perform. Pabst, Brand, and Wolf studied performance of the Game of Dice Task after undergoing the Trier social stress test (TSST). The Game of Dice Task gives constant information about gains and losses using a computerized decision-making task.[44] It incorporates the TSST, which is the most accepted method for stress induction in a laboratory setting. Pabst, Brand, and Wolf's study indicated that pre-frontal cortex-dependent functions (i.e., functions that support deeper thinking) are affected by the release of norepinephrine and dopamine. Their study found that noradrenaline and dopamine cause an improvement in decision making by elevating alertness to a certain point.[45] Once noradrenaline and dopamine exceed a maximum threshold, decision making degrades. The relationship between stress and performance reflects an inverted

[41] "Why You Might Be Scared of X," Big Think, video, 5:21, Joseph LeDoux, May 5, 2010, http://bigthink.com/videos/why-you-might-be-scared-of-x.

[42] Starcke and Brand, "Effects of Stress on Decisions under Uncertainty," 909.

[43] Starcke and Brand, 913.

[44] Pabst, Brand, and Wolf, "Stress and Decision Making," 40.

[45] Pabst, Brand, and Wolf, 41.

U-shaped relationship. Pabst, Brand, and Wolf suggest some stress-induced hormones enter the bloodstream quickly and increase awareness whereas effects of other hormones, like cortisol, appear later during the stress-related incident and have an adverse effect on decision making. Pabst, Brand, and Wolf's research fails to determine whether cortisol itself creates risky decision making or if the cortisol is a result of the situation itself. Pabst's findings are like other literature; the group exposed to the minimal amount of stress showed improved decision making and performance in relation to the group exposed to stress for a prolonged time.[46]

Stress literature frequently describes the relationship between the increasing intensity of stress and its effects on performance as inverted U-shaped relationship.[47] Figure 1 illustrates the inverted U-shaped relationship and shows an optimal level of arousal on performance commonly referred to as the Yerkes-Dodson Law.[48] Moderate stress intensity can be healthy, can sharpen alertness, and can allow individuals to perform at an optimal level. Increased stress intensity, up to a certain threshold, can focus attention by limiting the attentional resources to only relevant stimuli and leaving irrelevant stimuli unattended. Thus, individuals can attend solely to cues perceived to be a threat to their survival. In the inverted U-shaped relationship, exceeding the optimal level of stress then starts to deteriorate performance by overloading peoples' ability to process incoming information.[49]

[46] Pabst, Brand, and Wolf, 40.

[47] Pabst, Brand, and Wolf, 40; Shields, Sazma, and Yonelinas, "The Effects of Acute Stress on Core Executive Functions," 663.

[48] Karl Halvor Teigen, "Yerkes-Dodson: A Law for All Seasons," *Theory & Psychology* 4, no. 4 (November 1994): 527–28, https://doi.org/10.1177/0959354394044004.

[49] Pabst, Brand, and Wolf, "Stress and Decision Making," 40.

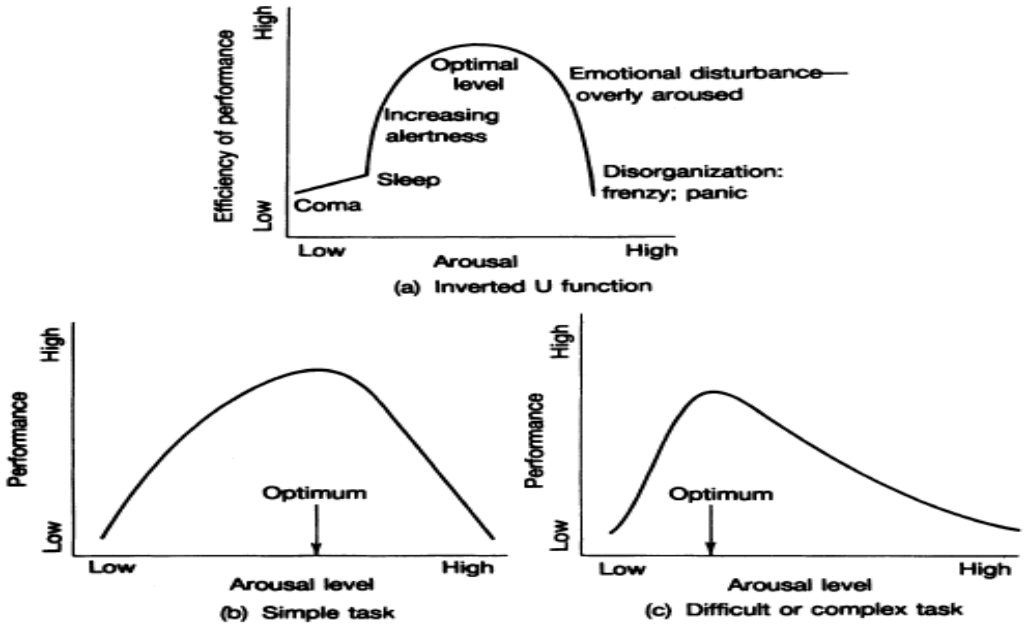

Figure 1. U-Shaped Relationship[50]

a. Attention Narrowing and Focus

Wessel and Merckelbach define attention narrowing "as a physiological arousal resulting in attention being directed towards central rather than peripheral characteristics of the situation."[51] Artwohl and Grossman studied law enforcement officers' attention and found attention narrowing is common during critical incident decision making. Artwohl studied 72 officers involved in deadly force encounters and found that almost 90 percent of the officers sensed "tunnel vision," and 65 percent reported, "heightened visual clarity."[52] In a separate study, Grissom interviewed 458 respondents on survival stress to examine what causes tunnel vision and heightened visual clarity. Grissom surmised that the narrowing of attention or heightened visual clarity might be due to stress limiting

[50] Source: Karl Halvor Teigen, "Yerkes-Dodson: A Law for All Seasons," *Theory & Psychology* 4, no. 4 (November 1994): 534, https://doi.org/10.1177/0959354394044004.

[51] Ineke Wessel and Harald Merckelbach, "The Impact of Anxiety on Memory for Details in Spider Phobics," *Applied Cognitive Psychology* 11, no. 3 (June 1997): 223.

[52] Loren W. Christensen and Alexis Artwohl, *Deadly Force Encounters: What Cops Need to Know to Mentally and Physically Prepare for and Survive a Gunfight* (Boulder, CO: Paladin Press, 1997), 252.

cognitive resources during critical incidents. His interviews found that "48 percent experienced tunnel vision during the event, 19 percent experienced issues with depth perception, 10 percent lost the ability to focus on close objects, 15 percent lost the ability to perform precision hand/eye coordination and 55 percent perceived time to slow down."[53]

These reactions due to attention narrowing (i.e., alterations in sensory perception, such as tunnel vision, tunnel hearing, time distortion, loss of depth perception, and visual dominance) continue to degrade under acute stress until they begin to break down.[54] Incoming information within visual and audible fields are ignored or are not processed unless they threaten survival.[55] Haanstad presented the idea of perceptual alterations that occur during traumatic events. His research was based on Thai police involved in terrorism who perceived temporal and spatial distortions during life-threatening events.[56] The research describes *tachypsychia*, a perceptual phenomenon known to speed up or slow down the mind, which creates time distortion.[57] According to the study, individuals experiencing tachypsychia during stressful incidents describe its effects as moving in slow motion while others describe time passing in a blur. The study found that tachypsychia occurs when a stimulus overwhelms perceptual performance and the mind focuses on nothing else.[58]

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[53] James Cullen Grissom, "Visual Distortion during Periods of Survival Stress and the Implications for Survival Skills Training" (master's thesis, Sam Houston State University, 2002), 11, https://shsu-ir.tdl.org/bitstream/handle/20.500.11875/1242/0853.pdf?sequence=1&isAllowed=y.

[54] Mark A. Staal, *Stress, Cognition, and Human Performance: A Literature Review and Conceptual Framework* (Moffett Field, CA: NASA Ames Research Center, 2004), 25, https://ntrs.nasa.gov/search.jsp?R=20060017835.

[55] Staal, 22.

[56] Eric J. Haanstad, "Violence and Temporal Subjectivity: Violence and Temporal Subjectivity," *Anthropology and Humanism* 34, no. 1 (June 2009): 72–73, https://doi.org/10.1111/j.1548-1409.2009.01025.x.

[57] Haanstad, 73.

[58] Haanstad, 72–74.

Alomari et al. conducted a study on acute stress and its effects on sustained attention.[59] The study consisted of a control group and a test group of 33 total participants. Stress was introduced in the test group using two methods. Stress was induced by subjecting the study group to a cold pressor stress test (CPT), where participants submerge their hand in 3ºC water for one minute and measuring changes in blood pressure and heart rate, and by viewing traumatic images. After the induction of the CPT, the participants provided a saliva sample that was used a baseline. The participants were tested three times during the experiment in three blocks, 1–15 minutes, 15–30 minutes, and 30–40 minutes, respectively. The second stress induction consisted of 105 pictures randomly shown to each participant that totaled 35 negative, 35 neutral, and 35 positive images. Stress induction was measured by collecting salivary cortisol levels and EEG readings. The performance measure was sustained attention to task-related thoughts. The study found that continuous attention degrades after experiencing acute stress. The study also found that a heightened emotional state remained consistent for both emotional and non-emotional pictures. The study suggests that acute stress causes a reduction in sustained attention.[60]

The process of attention narrowing can be advantageous for increased threat detection. Henckens et al. conducted a study on selective attention and emotional interference to determine whether attention narrowing is associated with threat detection. The purpose of the study was to examine how a stressful situation shifted processes in the brain into a mode of hypervigilant processing to detect and assess potential threats prioritized by peoples' senses.[61] Seventy-two healthy males participated in the study and were split into three groups: a control group, slow cortisol group, and a rapid cortisol group. The slow cortisol group was given a capsule containing 10 mg of cortisol, a

[59] Rima Alomari et al., "Acute Stress Dysregulates the LPP ERP Response to Emotional Pictures and Impairs Sustained Attention: Time-Sensitive Effects," ed. Derek Mitchell, *Brain Sciences* 5, no. 2 (May 14, 2015): 202–203, http://dx.doi.org/10.3390/brainsci5020201.

[60] Alomari et al., 218.

[61] Marloes J. A. G. Henckens et al., "Time-Dependent Effects of Cortisol on Selective Attention and Emotional Interference: A Functional MRI Study," *Frontiers in Integrative Neuroscience* 6, no. 66 (August 2012): 1, https://doi.org/10.3389/fnint.2012.00066.

scientifically tested dosage that raises cortisol levels, followed by a placebo after a controlled amount of time.[62] The fast cortisol group was given two capsules of cortisol at two separate times in the controlled amount of time. The control was administered two placebos during the same time. Each group was exposed to an emotional interference task that consisted of colored words. The participants observed words, written in different colors, and then were immediately required to press one of four buttons corresponding to the colors displayed. The words represent a neutral or an aversive category to incite an emotional reaction. Cortisol levels were measured at specific intervals during the experiment; a baseline was collected, 30, and 60 minutes, after the start of the experiment. According to Henckens et al., "Although one may benefit from sensitive sensory processing, it comes at a cost of unselective attention and increased distraction by irrelevant information." They found that acute stress releases cortisol, a hormone that intensifies emotional interference and selective attention. Henckens indicates acute stress can "induce a state of hypervigilance."[63] The significance of this experiment suggests the rapid effects of cortisol heighten selective attention during threatening situations, which illustrates the concept that some stress is beneficial to performance.[64]

Thackray and Touchstone examined the "startle response" and how it affects performance to sudden aircraft emergencies. Immediately after being threatened, an "initial orienting response to an unexpected stimulus" occurs.[65] This startle reflex is a common reaction related to fear or anger. Crawford and Cacioppo examined the reflex response after experiencing fear or anger. They found that, "with survival, it is more important to escape from danger than to pursue an opportunity…it's easier to recover from a missed opportunity than from a failed escape."[66] These findings, along with

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[62] Henckens et al., 3.

[63] Henckens et al., 1.

[64] Henckens et al., 11.

[65] Richard I. Thackray, *Performance Recovery Following Startle: A Laboratory Approach to the Study of Behavioral Response to Sudden Aircraft Emergencies*, DOT/FAA-AM-88/4 (Washington, DC: Office of Aviation Medicine: Federal Aviation Administration, 1988), 2.

[66] L. Elizabeth Crawford and John T. Cacioppo, "Learning Where to Look for Danger: Integrating Affective and Spatial Information," *Psychological Science* 13, no. 5 (September 2002): 449, https://doi.org/10.1111/1467-9280.00479.

attentional narrowing, suggest that a hurried decision for survival is more important than exploring every available option. Attention narrowing has been described as a top-down and bottom-up process.[67] A top-down process, according to Eysenck, is a controlled process. Top-down processes are synonymous to analytical decision making. A bottom-up process, on the other hand, is automatic orientation, or a reaction to a stimulus. Bottom-up processes are largely responsible for reactionary decision making. These concepts form the basis of the attentional control theory, which associates in what capacity people allot their attention.

A hasty decision for survival is the focus since some attentional resources are taken away from executive functioning by orienting towards a threat. Refocusing attentional resources towards a threat means not paying attention to anything else, which can result in missing other critical stimuli.

b. Executive Resources

Executive resources include cognitive processes, such as cognitive flexibility, thinking, attention, and working memory.[68] Singer and Bashir define cognitive flexibility as a process that acts as a control function that switches between different ideas and tasks easily.[69] They define inhibition control as emotional management and control, even during stressful situations. Working memory, according to Singer and Bashir, is the process of managing information from auditory and visual cues. Flexible thinking, inhibition, and working memory allow individuals to plan, focus attention, control short-term memory and execute multiple tasks.

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[67] Michael W. Eysenck and Nazanin Derakshan, "New Perspectives in Attentional Control Theory," *Personality and Individual Differences* 50, no. 7 (May 2011): 959, https://doi.org/10.1016/j.paid.2010.08.019.

[68] Bonnie D. Singer and Anthony S. Bashir, "What Are Executive Functions and Self-Regulation and What Do They Have to Do with Language-Learning Disorders?," *Language, Speech & Hearing Services in Schools; Rockville* 30, no. 3 (July 1999): 266.

[69] Singer and Bashir, 266.

Working memory allows an individual to hold and manipulate information, and is limited in its capacity.[70] Baddeley introduced a Working Memory Model that suggests working memory consists of four components. The four components are the central executive, phonological loop, visiospatial sketchpad, and episodic buffer.[71] The model describes the phonological loop and the visiospatial sketchpad as the short-term store for holding auditory information and visual-spatial information, respectively. The episodic buffer serves as the short-term store between both long-term memory and working memory's phonological loop and visiospatial sketchpad. The central executive function manages attention and coordinates activities between all the different components. Deeper level of analytical thinking requires a higher degree of resources to be directed to the central executive. Managing several tasks at once that are not intuitive can overload working memory since attentional resources must be devoted to each task.[72]

During critical incidents, an individual's working memory engages the same processes. Using an officer-involved shooting for example, the officer uses the visuospatial sketch pad when the officer sees the situation unfolding; the threat of a firearm for example. The visuospatial sketch pad is responsible for storing perceptual imagery momentarily for possible use by the central executive function.[73] The phonological loop is responsible for momentarily storing audible information (threats) made by a citizen holding a deadly weapon, for example. The phonological loop can hold speech-based information for up to two seconds until working memory derives meaning from those words.[74] While the officer is observing and hearing the actions and words of the citizen, the episodic buffer retrieves and holds relevant knowledge and past experiences from long-term memory that can be applied to the current situation. The episodic buffer stores relevant references or experiences temporarily. The central executive attempts to manage the situation by directing where attention is focused. The

[70] Alan Baddeley, "Working Memory," *Science* 255, no. 5044 (1992): 566.

[71] Baddeley, 567.

[72] Baddeley, 557.

[73] Baddeley, 559.

[74] Baddeley, 259.

central executive directs what information, stored temporarily either in the visuospatial sketch pad, phonological loop, or episodic buffer to pay attention to, and subsequently, is used when making decisions. Since cognitive resources are limited, non-threatening stimuli are ignored. The process where the central executive directs attention and resources is known as a top-down process. Also, a threshold can be reached at which the central executive becomes overwhelmed from too much stress that can create issues by distorting attention. Janis and Mann refer to this restriction of resources and loss of attention as hypervigilance, which results in reactionary decisions.[75]

Shields, Sazma, and Yonelinas examined the overall effect of acute stress on memory. Their research supports the concepts that a manageable level of stress improves cognition. The purpose of this study was to examine how acute stress impaired the core cognitive functions of "working memory, inhibition and cognitive flexibility."[76] They found that acute stress affected working memory differently in individuals and that acute stress negatively impacted cognition in more ways than the injection of cortisol alone.[77]

c. Memory

The basic memory process has three phases: encoding, storage, and retrieval process.[78] Encoding is a process to convert stimuli into information that individuals can use.[79] The storage process files memories into the brain for later use. The types of memory consist of (a) episodic memory that is specific episodes or events, procedural memory, which is information on how to do things (repetition is a key), and (b) semantic

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[75] Janis and Mann, *Decision Making*, 50–51.

[76] Shields, Sazma, and Yonelinas, "The Effects of Acute Stress on Core Executive Functions," 652.

[77] Shields, Sazma, and Yonelinas, 666.

[78] Baddeley, "Working Memory," 556; Alan D. Baddeley, Michael Kopelman, and Barbara Wilson, eds., *The Essential Handbook of Memory Disorders for Clinicians* (Hoboken, NJ: John Wiley & Sons, 2004), 2.

[79] Randall Engle and Natalie Oransky, "Multi-Store-Versus-Dynamic-Models-of-Temporary-Storage-in-Memory," in *The Nature of Cognition*, ed. Robert Sternberg (Cambridge, MA: Massachusetts Institute of Technology, 1999), 521, http://englelab.gatech.edu/1999/multi-store-versus-dynamic-models-of-temporary-storage-in-memory.pdf.

memory that is generalized knowledge.[80] The last step in memory is the retrieval of information.[81] Retrieval is the process of recalling specific memory from storage and bringing it into working memory.[82] Baddeley illustrates a human memory model in Figure 2.

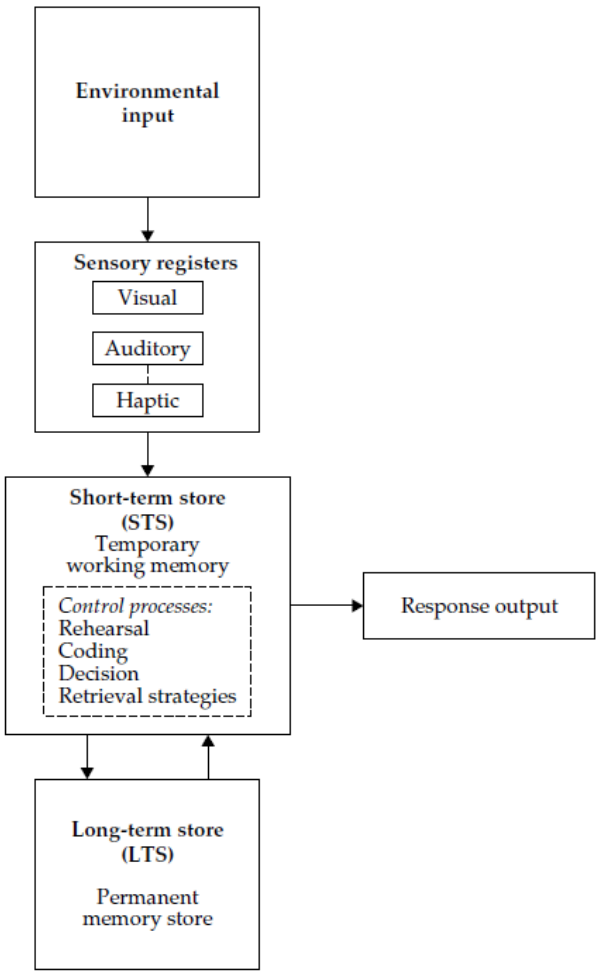

Figure 2. Model of Human Memory[83]

[80] Baddeley, Kopelman, and Wilson, *The Essential Handbook of Memory Disorders for Clinicians*, 4.

[81] Baddeley, "Working Memory," 556.

[82] Baddeley, Kopelman, and Wilson, *The Essential Handbook of Memory Disorders for Clinicians*, 2.

[83] Source: Baddeley, Kopelman, and Wilson, 2.

The levels of the processing model suggest that recalling information that has been rehearsed is easier than information that is not rehearsed due to a deeper level of encoding.[84] It suggests two types of rehearsal, (a) maintenance, which is rehearsing information continuously, and (b) elaborate rehearsal, which is using mental techniques to make connections between ideas. The parallel distributed processing model suggests memories exist in networks.[85] New experiences alter network relationships that change individuals' knowledge base. The information processing model suggests that the brain recognizes cues from a situation that pass through sensory registers consisting of sight, sound, and touch. Those cues are processed by working memory where an executive controller determines what sensory register to devote attention to and retrieve information stored in long-term memory. According to literature, short-term memory lasts 18-seconds. Studies indicate recall accuracy drops significantly over delays of 18 seconds without rehearsal.[86]

Memory and perceptual distortion during critical incidents create issues of inaccurate recollections during follow-up investigations. Artwohl debriefed 157 officers involved in shootings and found that many of them were not fully aware of how inaccurate their memory and perceptual distortions of the incident were.[87] An example of memory and perceptual distortion was illustrated during one of Artwohl's interviews, when the officer said:

> I told the SWAT team the suspect was firing at me from down a long dark hallway about 40 feet long. When I went back to the scene the next day I

[84] Fergus I. M. Craik and Robert S. Lockhart, "Levels of Processing: A Framework for Memory Research," *Journal of Verbal Learning and Verbal Behavior* 11, no. 6 (December 1972): 682–83, https://doi.org/10.1016/S0022-5371(72)80001-X.

[85] Marsel Mesulam, "Large-Scale Neurocognitive Networks and Distributed Processing for Attention, Language, and Memory," *Annals of Neurology* 28, no. 5 (November 1, 1990): 610, https://users.aalto.fi/~eglerean/readings/Mesulam_1990_Large-Scale%20Neurocognitive%20Networks%20and%20Distributed%20Processing%20for%20Attention,%20Language,%20and%20Memory.pdf.

[86] Engle and Oransky, *Multi-Store-Versus-Dynamic-Models-of-Temporary-Storage-in-Memory*, 518.

[87] Alexis Artwohl, "Perceptual and Memory Distortions during Officer Involved Shootings," *AELE Lethal & Less Lethal Force Workshop*, June 2008, 19–4.

> was shocked to discover he had actually been only about five feet in front of me in an open room. There was no hallway.[88]

Rivard and colleagues conducted a study of 115 police officers for dissociation, acute stress, and posttraumatic stress related to shootings involved in deadly force confrontations.[89] The study retrospectively surveyed officers for dissociative responses during their shooting. According to Rivard et al., 90 percent of the respondents indicated experiencing dissociation during the critical incident that can explain inconsistencies when recalling the incident. Additionally, 19 percent of the responses indicated varying forms of memory impairment for details of the shooting.

Luethi explored the impact of stress on human memory to study the complex effects on different types of memory. Luethi evaluated working memory, explicit memory, and implicit memory for emotional threats. Luethi studied 35 adult males by assessing their cortisol levels during an experiment on stress.[90] The experiment consisted of three parts: a 25-minute relaxation phase, a 25-minute social stressor phase, and a one-hour memory-testing phase. During the relaxation phase, the subjects completed a socio demographic-questionnaire. For the social stressor, phase participants were subjected to the TSST as a simulated job interview. The TSST consisted of stress anticipation and mental arithmetic tasks performed in front of an audience.[91] The explicit memory tests consisted of two standardized tests. The first explicit memory test presented subjects with 20 German and Turkish words to memorize their translations.[92] The second explicit memory test was a spatial memory test. The spatial memory test involved learning a route on a map.[93] Working memory tests were conducted using a reading span task.[94] The test

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[88] Artwohl, 19–1.

[89] J. Michael Rivard et al., "Acute Dissociative Responses in Law Enforcement Officers Involved in Critical Shooting Incidents: The Clinical and Forensic Implications," *Journal of Forensic Science* 47, no. 5 (2002): 2, https://doi.org/10.1520/JFS15504J.

[90] Mathias Luethi, Beat Meier, and Carmen Sandi, "Stress Effects on Working Memory, Explicit Memory, and Implicit Memory for Neutral and Emotional Stimuli in Healthy Men," *Frontiers in Behavioral Neuroscience* 2 (January 2009): 2, https://doi.org/10.3389/neuro.08.005.2008.

[91] Luethi, Meier, and Sandi, 2.

[92] Luethi, Meier, and Sandi, 2.

[93] Luethi, Meier, and Sandi, 2.

required participants to read sentences and determine whether they were trivial or not.[95] In addition, the subjects had to memorize the correct order and last word of each sentence.[96] The study assessed priming, or influencing thoughts by activating associated ideas, in both the perceptual and contextual aspects.[97] In this study, perceptual priming was induced by showing known objects before recognition tests to determine how performance was influenced. Reliance on intuitive processes was encouraged by applying time pressure during object recognition. Perceptual priming was assessed using 100-line drawings of easily identifiable objects by naming each object. If the subject inaccurately named the object, the object was shown as a more complete image. The level of picture fragmentation identified correctly by the subject was used to calculate priming. "Priming was calculated as the difference between the fragmentation levels at which old (i.e., previously seen) and new drawings were identified."[98] Ninety search displays presented in a "T" formation by a computer aided in measuring contextual priming. Each display had 12 colored patters in a small square made up of red, green, blue, and yellow items. The "T" formation was rotated with different orientation, spatial, and color configurations. "Subjects were instructed to indicate as quickly and accurately as possible the direction of the T-base" configuration.[99] Contextual priming was assessed measuring the speed of their answers (i.e., reaction times).[100] Luethi collected saliva after the relaxation phase as a baseline, again 15 minutes after the stress phase, and after the memory phase. Luethi's results indicate a noticeable working memory reduction associated with stress while improving episodic memory. The study finds, "the degree of stress and the enhanced cortisol levels induced by experimental conditions were sufficient to impair working memory, enhance spatial episodic memory, and to facilitate classical conditioning for aversive stimuli" and "stress did not seem to negatively affect

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[94] Luethi, Meier, and Sandi, 2.

[95] Luethi, Meier, and Sandi, 3.

[96] Luethi, Meier, and Sandi, 3.

[97] Daniel Kahneman, *Thinking, Fast and Slow* (New York: Farrar, Straus, and Giroux, 2011), 53.

[98] Luethi, Meier, and Sandi, "Stress Effects on Working Memory," 3.

[99] Luethi, Meier, and Sandi, 4.

[100] Luethi, Meier, and Sandi, 4.

hippocampal processing, as required for explicit memory and implicit memory tasks."[101] The relevance of this research suggests that people naturally prefer simple memory responses during stressful situations to more thought-provoking responses.[102]

B. EMOTIONAL AROUSAL: ANXIETY AND FEAR

"Shots fired, we need help" screamed Sevier County Sheriff's Deputy Justin Johnson over his police radio. A news report from the *Knox News* reported that Johnson was answering a call in a mobile home park and just finished chasing a subject through a field.[103] After a short struggle with the female subject, Johnson sees a man on a patio of a nearby trailer holding what he perceives is a weapon in his hand. Johnson fires at the man, shooting four rounds towards a set of mobile homes, pauses, and fired three more rounds. Four minutes later Johnson is hyperventilating, holding his pistol in his hand, and retreating from the female subject still lying on the ground. Two paramedics on scene were detaining the female subject while Johnson was hyperventilating. Paramedic Michael O'Connor saw Johnson and said, "Pull it together. Look at me." As Johnson continued to hyperventilate, O'Connor said, "Give me your gun. Let go of it," as he wrestled the gun away from Johnson. "Easy, buddy. I got it under control. Calm down. It's ok." Johnson later wrote in his report that he had seen a second subject on the porch of a trailer pacing quickly back and forth. Johnson thought he heard the subject on the porch say he had a gun and thought he saw a gun in his hand. Johnson fired at him. The subject had a cellphone in his hand videotaping Johnson's handling of the female suspect. The investigation revealed the man on the porch did not have a gun. Johnson's emotional response to acute stress caused him to panic and hyperventilate, which led to an inaccurate assessment of the situation.

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[101] Luethi, Meier, and Sandi, 7.

[102] Luethi, Meier, and Sandi, 7.

[103] Jamie Satterfield, "Sevier Deputy Suffered Panic Attack While Armed, Couple Charged with Causing It," *Knoxville News Sentinel*, October 16, 2017, https://www.knoxnews.com/story/news/crime/2017/10/16/sevier-deputy-suffered-panic-attack-while-armed-couple-charged-causing/759465001/.

Literature describes the anxiety and fear responses as having similar emotional reactions during a threat and uses them interchangeably. Despite their similarities, small distinctions exist between them. The aim of this section is to compare the nuances of anxiety and fear, as they largely overlap.

The definition of anxiety is a feeling or worry, nervousness, or unease that happens when individuals anticipate an uncertain threat or critical incident.[104] Researchers have also associated anxiety as a "readiness and preparation to deal with potentially negative events."[105] Negative events, or critical events, can initiate the stress response that can interfere with decision making and produce physiological responses.

Beilock and Carr examined the effects of anxiety on working memory.[106] The study analyzed relational patterns between performance under time pressure and working memory capacity. The groups were arranged into two groups separating those with the highest working memory from those with lower working memory. A main objective of the study was to determine what effect off-task thoughts caused by anxiety, which can interfere with attentional recourses needed for working memory, have on performance between high versus low working memory capacity individuals.[107] The participants performed math problems under high-pressure and low-pressure conditions that were influenced by specific demands on working memory. Group 1 consisted of the higher working memory capacity group, as well as a strong desire to excel. A higher working memory allows individuals to manage and process more information in their heads than the average person. Group 2 consisted of participants with lower working memory capacities, with a desire to succeed, but not defined by their successes. Beilock and Carr wanted to determine if added pressure affected all the participants equally. They study

[104] Scott O. Lilienfeld et al., "50 Differences That Make a Difference: A Compendium of Frequently Confused Term Pairs in Psychology," *Frontiers in Education* 2 (July 2017): 3, https://doi.org/10.3389/feduc.2017.00037.

[105] Nazanin Derakshan and Michael W. Eysenck, "Anxiety, Processing Efficiency, and Cognitive Performance: New Developments from Attentional Control Theory," *European Psychologist* 14, no. 2 (2009): 173, https://doi.org/10.1027/1016-9040.14.2.168.

[106] Sian L. Beilock and Thomas H. Carr, "When High-Powered People Fail: Working Memory and 'Choking Under Pressure' in Math," *Psychological Science* 16, no. 2 (2005): 101.

[107] Beilock and Carr, 101.

found that time pressure affected the performance of participants with a higher working memory capacity and a higher desire to succeed.[108] "Choking under pressure" in those with higher working memory capacities is associated with anxiety-driven off-task thoughts that cause lower performance than expected given their capabilities.[109] Beilock and Carr suggest that participants with higher working memory use their working memory (analytical thinking) to answer math problems under no pressure situations.[110] She suggests that the participants in the lower working memory group use rules of thumb (intuitive thinking) to answer their questions rather than analytically working through the problem. They suggest that in high-pressure situations, the higher working memory group employ rules of thumb (intuitive thinking) rather than working through the problem (analytical thinking).[111] Whereas, the lower working memory group employ the same strategy as they do under no pressure. This result, they suggest, explains why the higher than average working memory group's scores dropped (to the performance level of low working memory capacity individuals) while the other group remained consistent.[112]

According to Beilock and Carr, anxiety and pressure "create mental distraction that competes for and reduces working memory capacity that would otherwise be allocated to skill execution."[113] Anxiety uses attentional resources that leave less available working memory to the skills needed to solve the task by consuming mental resources with off-task thoughts. These off-task thoughts cause maladaptive thinking by over thinking or becoming consumed with how people are performing rather than on performing the task itself. The results of this research "carry significant implications for interpreting performance in high-pressure situations" like critical incidents.[114] The study

[108] Beilock and Carr, 101.

[109] Beilock and Carr, 101.

[110] Beilock and Carr, 103–4.

[111] Beilock and Carr, 103–4.

[112] Beilock and Carr, 104.

[113] Beilock and Carr, 101.

[114] Beilock and Carr, 102.

recognizes individuals with high working memory capacity did not perform to the best of their abilities because attentional resources were redirected by off-task thoughts.

Additionally, Berggren, Curtis, and Derakshan found that anxiety takes up cognitive resources and interferes with visual memory.[115] Berggren, Curtis, and Derakshan provide evidence that highly anxious people have an "attentional bias" toward threatening stimuli and this attentional bias can consume cognitive resources needed for optimal performance, and therefore, may degrade performance on other tasks.[116] Their study concluded that anxiety interferes with visual memory through threatening cues that force the subject to focus solely on the threat and impairs individuals' ability to notice other factors and their surrounding environment. Berggren, Curtis, and Derakshan's research concluded that anxiety and the threat of danger attracts attention even when the danger is irrelevant to the task. Neutral stimuli can be interpreted as threatening even when it is not. When the mindset expects a threat, and is presented with a neutral stimulus, the stimulus is perceived as a threat.

Schwabe and Wolf examined the effects stress played on habit-forming behaviors in humans. The purpose of their study was to explore how stress affects learning and memory strategies in humans. The study consisted of spatial learning tasks allowing for stimulus-response learning in humans. Two groups consisting of 44 participants each had to locate an item in a virtual reality room. One group was subjected to the TSST to initiate a stress response.[117] The other group did not participate in the experiment under stress. Schwabe and colleagues suggest, "prior stress facilitates the use of a dorsal striatum-dependent 'habit' learning strategy at the expense of a flexible, elaborated, 'cognitive' way of learning based on medial temporal lobe structures."[118] They found

[115] Nick Berggren, Hannah M. Curtis, and Nazanin Derakshan, "Interactions of Emotion and Anxiety on Visual Working Memory Performance," *Psychonomic Bulletin & Review* 24, no. 4 (August 2017): 1274, https://doi.org/10.3758/s13423-016-1213-4.

[116] Berggren, Curtis, and Derakshan, 1274.

[117] Lars Schwabe et al., "Stress Modulates the Use of Spatial Versus Stimulus-Response Learning Strategies in Humans," *Learning & Memory* 14, no. 1–2 (2007): 109, https://doi.org/10.1101/lm.435807.

[118] Schwabe et al., 112.

training creates habits, or automatic responses, to specific situations.[119] Habitual behaviors originating from a foundation that includes stress mitigation techniques can reduce inappropriate responses to a situation during which individuals are experiencing tunnel vision and cognitive constriction.[120]

Dickerson and Kemeny's meta-analysis identified a distinction between anxiety and fear. Dickerson and Kemeny's study examined acute stress and the cortisol response. This meta-analysis reviewed mostly salivary cortisol samples since it is released in response to stress and is a common measure of individuals' stress response. This meta-analysis was limited to studies using acute psychological stressors like public speaking, cognitive tasks, and exposure to noise. Their study found little change in cortisol levels for individuals anticipating a non-threatening emotional stressor caused by anxiety and concluded that anxiety does not initiate a stress response as much as an imminent threat (i.e., fear) does.[121] Furthermore, Dickerson and Kemeny found that uncontrollable imminent threats elicited the greatest cortisol response.[122]

Originating from innate survival instincts, fear also affects decision making during critical incidents. Some fear seems innate while other fear is conditioned or learned.[123] LeDoux theorizes that emotions related to survival, such as fear, are common among all animals to unavoidable threats.[124] Likewise, Lilienfeld found that while anxiety is linked to uncertain anticipated threats, fear is linked to certain and "largely unavoidable threat[s]," and initiates a stress response.[125] Artwohl recognizes fear as a

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[119] Schwabe et al., 111–12; Lars Schwabe and Oliver T. Wolf, "Stress Prompts Habit Behavior in Humans," *Journal of Neuroscience* 29, no. 22 (June 3, 2009): 7195, https://doi.org/10.1523/JNEUROSCI.0979-09.2009.

[120] Schwabe et al., "Stress Modulates the Use of Spatial Versus Stimulus-Response Learning Strategies in Humans," 112.

[121] Sally S. Dickerson and Margaret E. Kemeny, "Acute Stressors and Cortisol Responses: A Theoretical Integration and Synthesis of Laboratory Research," *Psychological Bulletin* 130, no. 3 (2004): 379, https://doi.org/10.1037/0033-2909.130.3.355.

[122] Dickerson and Kemeny, 383.

[123] Joseph LeDoux, "Rethinking the Emotional Brain," *Neuron* 73, no. 4 (February 23, 2012): 656, https://doi.org/10.1016/j.neuron.2012.02.004.

[124] LeDoux, 667.

[125] Lilienfeld et al., "50 Differences That Make a Difference," 3.

survival response to a threat occurring in four dimensions: the physical, emotional, perceptual, and cognitive.[126] The reaction to a threat is based on the perception of a stimulus or circumstance as dangerous and varies from person to person.[127]

Lerner found that fear, like anxiety, can interfere with cognitive processes, including attention, memory, and judgment during imminent situations.[128] Lerner defines fear using three conceptual themes: uncertainty, unpleasantness, and lack of situational control. Christensen, a recognized author and subject matter expert in police use of force, defines fear as emotional, physical, perceptual, and cognitive responses caused by an immediately dangerous situation. LeDoux, in contrast, explains that the feeling of fear is not the same thing as being able to detect and respond to threats. LeDoux explained that survival functions of fight, flight, or freeze exist to keep organisms living, not to create emotions of anxiety or fear.[129] LeDoux explains the concept of fear as a cognitive process of *awareness* during a dangerous or threatening situation.[130] He describes the feeling of fear a person experiences as the brain instinctively determining a threat or through experiences that form associations between a stimulus and an event.[131]

The brain processes fear in several steps, which seem relevant in both the emotional response to fear and the stress response to fear. First, the brain detects a threat and its severity is based on prior training and experience. After the detection of a threat, it routes the information to the thalamus.[132] Next, the thalamus routes the information to the

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[126] Alexis Artwohl, "Perceptual and Memory Distortions during Officer Involved Shootings," (workshop, AELE Lethal & Less Lethal Force Workshop, June 2008), 19–1, http://www.aele.org/law/2008FPJUN/wb-19.pdf.

[127] Christensen and Artwohl, *Deadly Force Encounters*, 60.

[128] Jennifer S. Lerner and Dacher Keltner, "Beyond Valence: Toward a Model of Emotion-Specific Influences on Judgement and Choice," *Cognition & Emotion* 14, no. 4 (2000): 476, https://doi.org/10.1080/026999300402763.

[129] "Why You Might Be Scared of X," YouTube video, 46:56, posted by Joseph LeDoux, July 22, 2015, https://youtu.be/vbEUVC8OeCY.

[130] LeDoux, "Rethinking the Emotional Brain," 655.

[131] LeDoux, 656.

[132] Kahneman, *Thinking, Fast and Slow*, 43.

amygdala and cortex.[133] Also, at this point, an amygdala hijacking can occur if a threat emotionally overwhelms an individual.[134] This phenomenon prioritizes cognitive resources towards emotional and threat related processing in areas, such as the amygdala; thereby, leaving little cognitive resources for executive functions needed for analytical reasoning and decision making. The amygdala initiates a search for relevant information in long-term memory that may be applicable to the present threat. [135] Once the amygdala confirms a threat, the hypothalamus initiates a release of catecholamines that trigger the fight, flight, or freeze response.[136] The final step in the fear response process, according to Tsigos and Chrousos, is the secretion of the stress hormones adrenaline, noradrenaline, dopamine, and cortisol. The literature seems to indicate a correlation between the emotional reaction to fear and the body's SAM response to acute stress.

Being threatened starts an emotional response to fear, and biophysical stress response. The emotional arousal caused by anxiety closely resembles fear and are often intertwined. Fear initiates the SAM response, which produces catecholamines. These catecholamines prepare the body for survival while consuming executive resources needed for decision making. Processing the emotional and biophysical response during critical incidents can result in poor performance and poor decisions.

C. SUMMARY

Acute stress, fear, and anxiety affect cognitive resources on individuals' physiological and cognitive processes that are needed in more deliberate decision-making processes. Stress affects cognitive resources and executive functioning.

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[133] LeDoux, "Rethinking the Emotional Brain," 665.

[134] Daniel Goleman, *Emotional Intelligence*, 10th ed. (New York: Bantam Books, 2006), 14.

[135] Luiz Pessoa and Ralph Adolphs, "Emotion Processing and the Amygdala: From a 'Low Road' to 'Many Roads' of Evaluating Biological Significance," *Nature Reviews Neuroscience* 11, no. 11 (November 2010): 778, https://dx.doi.org/10.1038%2Fnrn2920.

[136] Constantine Tsigos and George P. Chrousos, "Hypothalamic–Pituitary–Adrenal Axis, Neuroendocrine Factors and Stress," *Journal of Psychosomatic Research* 53, no. 4 (October 2002): 866, https://doi.org/10.1016/S0022-3999(02)00429-4.

Generally, both stress and emotional arousal inhibit cognitive resources by focusing on what is most important to survival.[137] However, subtle distinctions exist between acute stress, fear, and anxiety. Fear is experienced in response to an imminent threat and initiates a stress response. Anxiety, on the other hand, anticipates a threat and usually does not initiate a stress response. Anxiety, however, can prime people to perceive a situation as threatening that thereby initiates the fear and stress response.

In extreme conditions, cognitive restrictions induced by emotional arousal and acute stress can limit decision making to the point cognition is purely reactionary-based. As time pressure increases, and the opportunity for escape decreases, the likelihood of entering a panicked-like state increases. Janis and Mann refer to a panicked-like state as a state of hypervigilance that impairs the decision-making process.

[137] Henckens et al., "Time-Dependent Effects of Cortisol on Selective Attention and Emotional Interference," 50.

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III. THE EFFECTS OF ACUTE STRESS, ANXIETY, AND FEAR ON DECISION MAKING

Most people do struggle in a use-of-force confrontation; police recruits and young officers are no different. Officers frequently enter situations with little knowledge of the people or conditions they will encounter and must respond to every situation with their best judgement, regardless of the effects of stress, anxiety, or fear. Throughout these encounters, they must remember their departmental policies, as well as state and federal laws. In reality, officers' sensemaking processes, and rationalization of a given situation influence their decision making; the perception of a threat may prompt a state of hypervigilance where perception and decision making are affected. On the other hand, the perception of a threat overlaid with the awareness of public perception that necessary action may be misconstrued as excessive force can lead to underreacting to a threat. Stress, anxiety, and fear not only take their toll on the body but affect decision making as well.

As previously stated, law enforcement uses the term *hypervigilance* in its training and operations to describe awareness of a potentially dangerous situation. Janis and Mann, on the other hand, describe hypervigilance as a state of panic that often results in regrettable decision making.[138] This discrepancy, between law enforcement's use of the terminology and the scholars' definition, may suggest a mischaracterization of hypervigilance in applied contexts.

Law enforcement's current use of the term is more reflective of *vigilance*. David Barlow describes vigilance as identifying the next potential threat to human survival.[139] Vigilance may be advantageous in situations requiring critical performance, whereas hypervigilance is mostly synonymous with panic, which can be detrimental to

[138] Irving L. Janis and Leon Mann, "Coping with Decisional Conflict: An Analysis of How Stress Affects Decision-Making Suggests Interventions to Improve the Process," *American Scientist* 64, no. 6 (November–December 1976): 658, http://www.jstor.org/stable/27847557.

[139] David H. Barlow, *Anxiety and Its Disorders: The Nature and Treatment of Anxiety and Panic* (New York: Guilford Press, 2004), 64.

performance and decision making. An understanding of hypervigilance and its effects are critical in split-second life or death situations, which may lead to hasty decision making and unintentional officer-involved shootings. Appreciation for hypervigilance and the contexts under which it occurs is the first step in learning how to develop techniques and training that prevent tragedies.

Hypervigilance is commonly seen during acute stress situations, such as police-involved shootings, major disturbance calls, or responses to mass shootings. For example, hypervigilance may have led to the unintentional discharge of a pistol instead of a Taser in the Mehserle shooting, as described in Chapter I.[140] Martinelli, a forensic criminologist specializing in force, testified in court that hypervigilance caused Mehserle's confusion between his Taser and pistol. In another example, as described by the *Washington Post*, a sheriff's deputy stood outside a school during a 2018 school shooting. Deputy Peterson, one of the first responding deputies on scene, ordered responding officers to remain outside the school as 19-year-old Nikolas Cruz killed several students inside classrooms. Deputy Peterson made these decisions knowing entering the school while Cruz was actively killing students inside could jeopardize his own life. Deputy Peterson was experiencing acute stress during his decision to wait outside rather than enter the school, which could be the result of a reactionary decision based on the stress response initiated by the perceived life-ending threat. Deputy Peterson's active-shooter directives state that responding officers "may enter the area and/or structure to preserve life."[141] In the latter example, the school shooting resulted in the deaths of 17 people. These examples highlight inadequate performance from officers that can arise out of hypervigilance in contexts characterized by threats that induce anxiety, fear, and acute stress.

This chapter begins by discussing a dual decision-making process and then applies it to differences in decision-making processes between vigilance and

[140] Martinelli, "Murder-or-Stress-Induced-Hypervigilance," 36.

[141] Mark Berman, "'Can You Play Dead?' New Details about the Chaos and Fear that Surrounded the Parkland Massacre," *Washington Post*, sec. Post Nation, March 9, 2013, https://www.washingtonpost.com/news/post-nation/wp/2018/03/09/can-you-play-dead-new-details-about-the-chaos-and-fear-that-surrounded-the-parkland-massacre/.

hypervigilance.[142] After a discussion on the dual decision-making process, the relationships among hypervigilance, acute stress, and emotions are discussed. Finally, this chapter concludes with an analysis of Janis and Mann's hypervigilance definition that highlights the benefits of vigilance against the pitfalls of hypervigilance in law enforcement.

A. DUAL DECISION-MAKING PROCESS

Daniel Kahneman, a Princeton University psychologist who was awarded the Nobel Prize, is known for his research on judgement and decision making.[143] Kahneman describes a decision-making process that consists of two systems. System 1 is fast and intuitive while System 2 is slow and deliberate.[144] As the default system, System 1 makes intuitive judgments based on previous experience and knowledge.[145] System 2 is a deliberate thinking process involving the prefrontal cortex. Kahneman explains that understanding performance, specifically in decision making, involves studying individuals' abilities to override System 1 with System 2.[146] Kahneman's dual decision-making model suggests one of two pathways:

1. An intuitive judgment or intention is initiated and
    a. endorsed by System 2,
    b. adjusted (insufficiently) for other features that are recognized as relevant,
    c. corrected (sometimes overcorrected) for an explicitly recognized bias, or
    d. identified as violating a subjectively valid rule and blocked from overt expression.

[142] Kahneman, *Thinking, Fast and Slow*, 20–30.

[143] Kahneman, 5–7.

[144] Daniel Kahneman, "A Perspective on Judgment and Choice: Mapping Bounded Rationality," *American Psychologist* 58, no. 9 (2003): 716, https://doi.org/10.1037/0003-066X.58.9.697.

[145] Kahneman, *Thinking, Fast and Slow*, 83–132.

[146] Kahneman, "A Perspective on Judgment and Choice," 716.

2. No intuitive response comes to mind and the judgment is computed by System 2.[147]

Kahneman suggests one of the key functions of System 2 is to oversee and override System 1 thinking (i.e., intuitive thinking) when an error based on the intuitive response is likely.[148] However, engaging in System 2 thinking requires effort, and is therefore, mostly avoided. Kahneman expands on this concept by stating, "many people are overconfident, prone to place too much faith in their intuitions" and suggests cognitive effort requires work, so it is avoided as much as possible.[149] The amygdala is associated with more intuitive thinking processes in response to fear as a survival response. Kahneman illustrates this concept using an example of a math puzzle often answered with intuition, not analytical thinking.

> A bat and ball cost $1.10.
> The bat costs one dollar more than the ball.
> How much does the ball cost?[150]

The intuitive answer, $.10, and is wrong. System 2 does not override System 1 because confidence is so high, based on how easily the answer came to mind that it results in overconfidence in the initial answer. Analytical thinking most likely concludes that the ball is $.05 because the bat is a $1.00 *more* than the ball. Kahneman explains that, "If the ball costs $.10, then the total cost will be $1.20 ($.10 for the ball and $1.10 for the bat), not $1.10."[151] Overconfidence in initial intuitive responses plays a huge role in relying on System 1 thinking without analytical engagement, as illustrated by the bat and ball question.[152] Overconfidence is overestimating what people believe they know, while underestimating what they are ignorant of and what part chance has in

[147] Kahneman, 717.

[148] Kahneman, *Thinking, Fast and Slow*, 44.

[149] Kahneman, 45.

[150] Kahneman, 44.

[151] Kahneman, 44.

[152] Kahneman, 44–45.

circumstances.[153] Furthermore, Kahneman explains intuition as recognition of, "a cue, this cue has given [the] expert access to information stored in memory, and the information provides the answer. Intuition is nothing more and nothing less than recognition."[154] Expertise and training serve as the foundation of a magical performance (a sixth sense), which is nothing more than an ability to recognize subtle signs and insight.

The dual decision-making construct is shared among other psychologists.[155] In a meta-analysis of brain networks in response to acute stress, Hermans et al. reviewed animal and human studies to examine how acute stress reallocates cognitive resources from analytical thinking (*executive control network*) to intuition (*salience network*).[156] Hermans et al. propose that excessive stress and moderate acute stress cause "a dynamic reallocation of cognitive resources to systems responsible for *attentional vigilance* (salience network) from the executive control network."[157] They found that excessive stress interferes with attention and cognition, which results in slower information retrieval from memory and decision-making impairment. Hermans et al.'s intuitive (salience network) theory aligns with Kahneman's System 1. Hermans et al.'s analytical (executive control network) theory aligns with Kahneman's System 2.

Hermans et al. refer to the SAM and HPA, reviewed previously in Chapter II, in relation to how they affect the two separate networks, executive control and salience. The first wave of hormones is released instantly into the body after a perceived threat and lasts up to 60 minutes, and then cognition is shifted from the executive control network to the salience network. Attention is oriented in a bottom-up process, whereby the most salient threats receive attention that enable individuals to detect threats rapidly, respond

[153] Kahneman, 13.

[154] Kahneman, 11.

[155] Erno J. Hermans et al., "Dynamic Adaptation of Large-Scale Brain Networks in Response to Acute Stressors," *Trends in Neurosciences* 37, no. 6 (June 2014): 305, https://doi.org/10.1016/j.tins.2014.03.006.

[156] Hermans et al., 305–8.

[157] Hermans et al., 305.

adequately, and prepare for future threats.[158] A second wave of hormones activates the HPA axis with the production of cortisol. The long-term effects of cortisol, known as the genomic effects of cortisol, are not realized for at least an hour after the stress response and last several hours.[159]

According to Hermans et al., "the early phase of the acute stress response triggers a sensory hypervigilant state accompanied by an increased reliance on rapid, but more rigid, stimulus-response behaviors."[160] In other words, stress primes the salience network for responding to threats in an intuitive, habit-based manner. The more salient a threat is, the more it captures individuals' attention and influences behavior. Selective attention to a threat in police work can mean the difference between life and death. Police recruit training may, by extension, be unintentionally priming the body for intuitive or System 1 thinking, which relies more on the salience network for responding.[161] Recruits are taught to constantly scan for threating cues that threaten their survival. Selective attention to threatening cues speeds up threat identification and reduces officers' reaction time, which prepares their bodies for survivability.[162] Anxious people may recognize danger quicker by shifting their attentional bias to a threat at a higher proportion than non-anxious individuals.[163] Anxious people may also misinterpret neutral stimuli as threatening, who may thus misread a situation.

B. HOW ACUTE STRESS AND EMOTIONS AFFECT DECISION MAKING

Vigilance stems from awareness of the environment in anticipation of a threat that has yet to happen. The amount of attention individuals devote to a threat determines the level of vigilance. If the attention placed on a potential threat is too low, individuals may be subject to complacency and caught off guard by the threat. As discussed in Chapter II,

[158] Hermans et al., 304.

[159] Hermans et al., 306.

[160] Hermans et al., 308.

[161] Kahneman, *Thinking, Fast and Slow*, 52–58.

[162] Richards et al., "Exploring the Function of Selective Attention and Hypervigilance for Threat in Anxiety," *Clinical Psychology Review* 34, no. 1 (2014): 3–4.

[163] Richards et al., 4.

when awareness to a threat increases, physiological processes in the brain automatically focus on important or threatening queues.[164]

Understanding the effects of acute stress on decision making and performance during critical incidents is vital to understanding hypervigilance. The effects of stress can alter peoples' perception of a situation, the intensity of cognitive recourses dedicated to a threat, and the risks, if any, they may take to resolve the threatening situation safely. Although the biophysical stress response caused by fear and anxiety is similar for most individuals, everyone processes a stressor differently since degrees and intensities vary from person to person.[165] Several factors, such as training, experience, genetics, and proficiency, can influence the degree to which the stress response affects individuals. Nevertheless, when emotional and biophysical intensity reach a certain threshold, the cognitive resources needed for deliberative thinking are scarcer, overconfidence causes a reliance on intuitive thinking, and a state of hypervigilance can contribute to hasty decision making.[166]

The amount of time individuals experience stress influences their performance. According to controlled studies, prolonged stress during incidents degrades decision making and results in more risky decisions.[167] The longer officers experience life-threatening situations, the more likely they are to take risks that provide a way out of their situations, even at the cost of making undesirable decisions. In addition, research shows that suspense narrows attention. The longer officers are engaged in life-threatening situations, the greater the attention-narrowing effects. Prior experience and training may not mitigate the attention-narrowing effects.[168] The effects of stressor intensity, attentional control, tunnel vision, tunnel hearing, and distortion of time influence officers' decision-making abilities. Attention-narrowing can play a role in intentional blindness.

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[164] Staal, *Stress, Cognition, and Human Performance*, 60.

[165] Starcke and Brand, 913.

[166] Kahneman, "A Perspective on Judgment and Choice," 717.

[167] Pabst, Brand, and Wolf, "Stress and Decision Making," 40.

[168] Pabst, Brand, and Wolf, 43.

Mack explains the concept of inattentional blindness as a phenomenon caused by an inability to perceive a stimulus because they were focused on something else.[169]

As described by Janis and Mann, once individuals begin to feel time-pressure and perceive their chances for survival are decreasing, they start to panic for a way out of the situation. When people begin to panic, their comprehension of the situation declines because they no longer fully understand the situation. Individuals tend to make decisions based on intuitive thinking because it is quick and easy. Nevertheless, once individuals process information based on their emotions, it is difficult to change their thought processes to slower, more thorough analytical processes. The inability to understand and process a life-threatening situation fully causes individuals to make impulsive decisions to ensure their survival. Janis and Mann propose, "when people are warned about oncoming danger that will materialize within a very short time interval, their fear mounts to such a high level and they act so inappropriately that they would be better off with no warning at all."[170] They support their argument with evidence from tornado responses where limited forewarning of the oncoming disaster ended in higher death and injury rates.[171] Janis and Mann agreed that, "people who had only brief forewarning took action with a protective intent, but...the actions taken may have actually increased their danger or they may have been caught unprotected during the process of taking [inappropriate] protective action."[172] They conclude that people with brief forewarnings performed worse than those given no forewarning at all.[173] Challenging Janis and Mann's model, stress alone, without time pressure, has been found to affect scanning patterns adversely even when no time constraints are present.[174] Keinan suggests that familiarity with the problem can improve the scanning of choices, which can lead to better solutions. On the

[169] Arien Mack, "Inattentional Blindness: Looking without Seeing," *Current Directions in Psychological Science* 12, no. 5 (October 2003): 183–84, https://doi.org/10.1111/1467-8721.01256.

[170] Janis and Mann, *Decision Making*, 59.

[171] Janis and Mann, 59.

[172] Janis and Mann, 60.

[173] Janis and Mann, 60.

[174] Giora Keinan, "Decision Making Under Stress: Scanning of Alternatives Under Controllable and Uncontrollable Threats," *Journal of Personality and Social Psychology* 52, no. 3 (1987): 643.

other hand, familiarity can bias scanning patterns and perception when considering alternatives in the decision-making process.[175] Familiarity can act as a hindrance when officers are presented with a neutral cue (e.g., cell phone) but because of expectations of a threatening cue (e.g., gun), the officer perceives the cue as a threat. Applying this concept to training may suggest that suboptimal training can lead officers into a false sense of confidence; going into a situation that seems familiar based on overgeneralized training, but in reality, is different and requires unbiased scanning and perception to understand the scene adequately.

As with most situations in law enforcement, critical incidents usually catch police officers off guard. Rarely are police officers given any forewarning of peoples' intention to harm them. The lack of forewarning causes some officers to start at a disadvantage since the luxury of time to reason through a good decision is not usually an option. Lack of time, or time pressure, causes an accelerated decision-making process that excludes non-threatening cues and requires less cognitive effort to adapt to the situation.[176] A breakdown in cognition caused from an increased emotional and biophysical intensity contributes to poor performance. A transition to the intuitive system of thinking may explain the disparity between individuals' anticipated reaction and their hastily executed actions in life-threatening incidents. The results of such a disparity may be disastrous.

C. VIGILANCE AND HYPERVIGILANCE: THE PHENOMENON

Few scholars have examined hypervigilance. Janis and Mann have written the most research on the phenomenon of hypervigilance. According to Janis and Mann, vigilance, occurs when "the decision-maker searches painstakingly for relevant information, assimilates information in an unbiased manner and appraises alternatives carefully before making a choice."[177] Hypervigilance, in contrast, occurs when a "hasty,

[175] Keinan, 643.

[176] John W. Payne, James R. Bettman, and Eric J. Johnson, "Adaptive Strategy Selection in Decision Making," *Journal of Experimental Psychology: Learning, Memory, and Cognition* 14, no. 3 (1988): 551, http://dx.doi.org/10.1037/0278-7393.14.3.534.

[177] Janis and Mann, *Decision Making*, 73.

disorganized and incomplete evaluation of information leads to faulty decisions and post-decisional regret."[178] Their work examines hypervigilance as it pertains to catastrophic disasters with warning of the impending event. The context in which they studied hypervigilance, although different from police work, is still relevant since both situations pertain to acute stress and potential loss of life. However, an important difference existed in applying their work to police work in that critical incidents that trained officers encounter often occur with no warning. The remainder of this chapter focuses on decision making during critical incidents. The chapter examines Janis and Mann's emergency decision-making model, including hypervigilance. The final section in the chapter examines critical incidents without any warning.

Janis and Mann explore the concept of emergency decision making based on the psychological stress response. The emergency decision-making model uses assumptions based on field studies and experiments on which testable predictions can be made.[179] Janis and Mann start with a detailed description of hypervigilance:

> The state of hypervigilance, which in its most extreme form is called panic, arises when time is short for escaping from oncoming threat. A person in this state experiences so much cognitive constriction and preservation that his thought processes are disrupted. The person's immediate memory span is reduced and his thinking becomes more simplistic in that he cannot deal conceptually with as many categories as when he is in a less aroused state.[180]

Their research on hypervigilance focuses on emotional arousal, initiated by an emergency warning of an imminent disaster situation, its effects on decision making, judgment, and individuals' actions.[181] Emotional arousal initiated by the warning of an oncoming emergency also starts a stress response, intertwining emotional, and stress responses. Janis and Mann define psychological stress as "a generic term to designate

[178] Janis and Mann, 51.

[179] Janis and Mann, 52.

[180] Janis and Mann, 51.

[181] Janis and Mann, 54.

unpleasant emotional states evoked by threatening environmental events or stimuli."[182] Janis and Mann suggest emotional arousal initiated during critical situations impairs thinking when compared to routine decision making of everyday life.[183]

Janis and Mann's hypervigilance research focused on peoples' abilities to make decisions during impending life-threatening situations.[184] They analyzed individuals' decision-making performances when escaping from a disaster after being given warnings. Janis and Mann delve into four main variables of hypervigilance: (a) seriousness of risk to the individuals confronted with a decision, (b) seriousness of risk if a response to the threat is taken, (c) realistic hope to find a more appropriate means to escape a disaster, and (d) time to search for and scrutinize all possible escape options available.[185] A positive correlation between time pressure and hypervigilance exists. The greater the time pressure, the higher the intensity of hypervigilance experienced by individuals.

Janis and Mann's conflict theory model is illustrated in Figure 3.

[182] Janis and Mann, 55.

[183] Janis and Mann, 54.

[184] Janis and Mann, 53.

[185] Janis and Mann, 59.

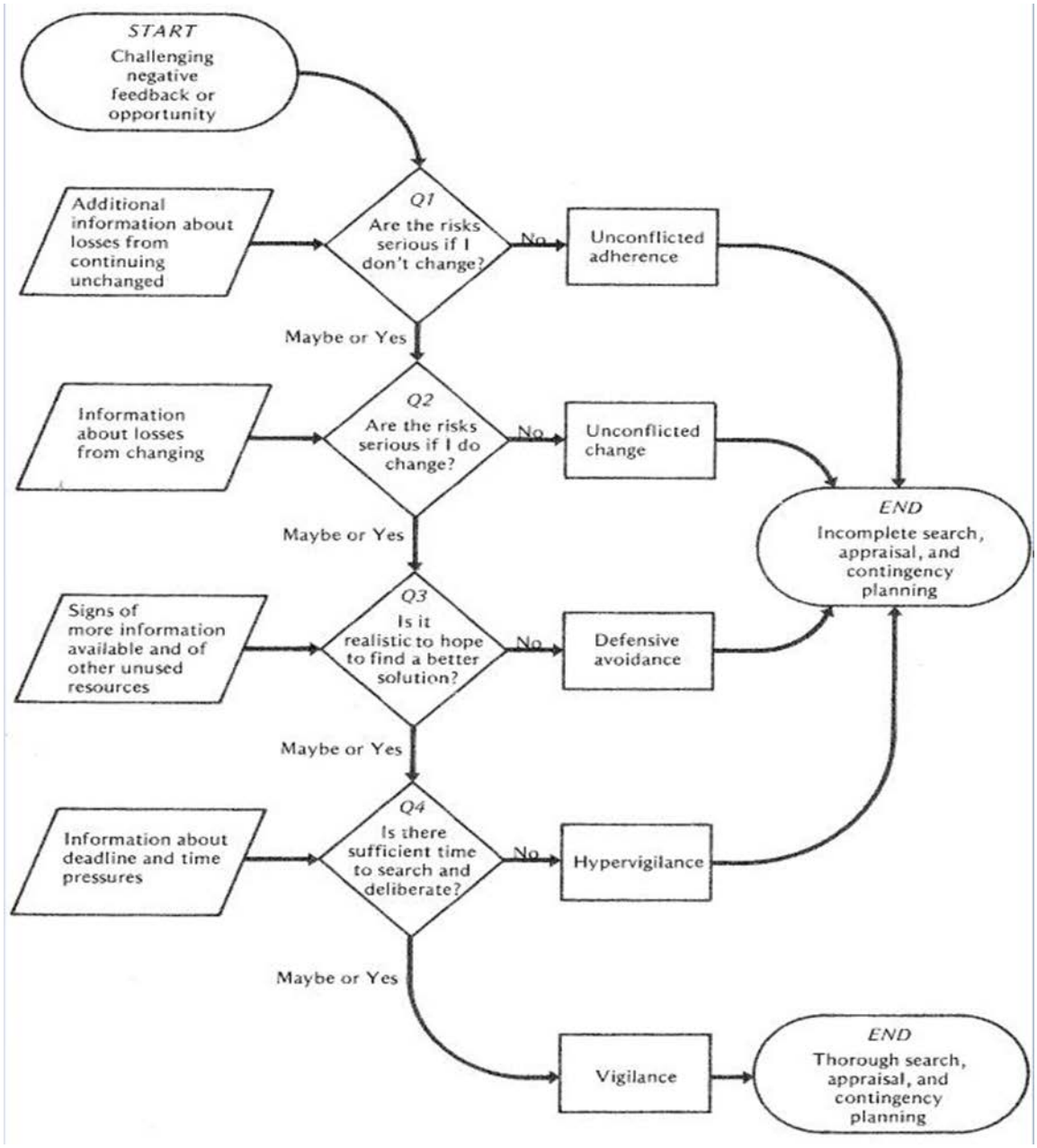

Figure 3. Conflict Theory Model[186]

The theory suggests five possible scenarios are associated with psychological stress and decisional conflict:

[186] Source: Janis and Mann, 55.

1. The degree of stress generated by any decisional conflict is a direct function of the goal strivings that the decision makers expect to remain unsatisfied: the more goals expected to be unfulfilled and the more important the needs to which those goals correspond, the greater the stress.

2. When people encounter new threats or opportunities that motivate them to consider a new course of action, the degree of decisional stress is a function of the degree to which they are committed to adhere to their present courses of action.

3. When decisional conflict is severe because each alternative poses a threat of serous risks, the loss of hope about finding a better solution than the least objectionable one will lead to defensive avoidance of threat cues.

4. In a severe decisional conflict, when threat cues are salient and the decision makers anticipate having insufficient time to find an adequate means of escaping serious losses, their levels of stress remain extremely high and the likelihood increases that their dominant patterns of response will be hypervigilance.

5. A moderate degree of stress in response to a challenging threat induces a vigilant effort to scrutinize the alternative courses of action carefully and to work out a good solution, provided the decision makers expect to find a satisfactory way to resolve the decisional dilemma.[187]

This model indicates individuals' response for a pattern of *awareness* of a threat in relation to the amount of *time* used with the possibility of a successful escape from the perceived threat (*hope*). Janis and Mann found that a threatening situation starts a cognitive process that accesses the memory for adequate ways to deal with a threat.[188] Janis and Mann's findings describe the effects of hypervigilance as cognitive congestion and simplistic thinking, which are similar to Hermans et al.'s reliance on salience network and Kahneman's System 1 thinking experienced during acute stress.

Keinan tested Janis and Mann's model of decision making under stress to determine if vigilance allows sound and rational judgment. Keinan assessed whether deficient decision making resulted from a failure to consider all relevant alternatives

[187] Janis and Mann, 50–51.

[188] Janis and Mann, 57.

systematically.[189] Specifically, it was tested whether hypervigilance replaces vigilance under severe stress. Keinan suggests three ways decision making breaks down under stress:

1. Premature closure: decision making without considering all the alternatives

2. Nonsystematic scanning: a panic-like state, searching for a frantic way out of a dilemma without shifting between alternatives

3. Temporal narrowing: with insufficient time, impulsively seizing a solution that *seems* to promise immediate relief[190]

Keinan tested Janis and Mann's hypervigilance theory by studying a group of 100 college students under stress manipulation by administering an anxiety inventory. The procedure consisted of three conditions: uncontrollable stress, controllable stress, and no stress. Under each stress condition, the participants answered 50 questions at a computer terminal. To manipulate uncontrollable stress, electrodes were applied to the participants, and they were told an electric shock, although harmless, could be given during the experiment.[191] The uncontrollable stress consisted of the threat of the electrical shock that might have occurred at any time during the study.[192] The controllable-stress procedure mirrored the uncontrollable-stress condition except that the participants' performance determined when they received a shock.[193] Participants subjected to no-stress were not exposed to the threat of electrical shock or attached to electrodes during participant questioning. All students solved logical analogies on a computer terminal while they were measured in the four areas. The first measure scored the number of questions the participants answered without reviewing alternative answers. The second score measured non-systematic scanning. Temporal narrowing and correct answers were scored as the third and fourth measurements, respectively. Keinan's study suggested stress had an

[189] Keinan, "Decision Making under Stress," 639.

[190] Keinan, 639.

[191] Keinan, 641.

[192] Keinan, 641.

[193] Keinan, 641.

effect on the decision maker's scanning patterns and choices available to them.[194] Additionally, the study suggested that stress impairment occurred even without time constraints.[195]

Weymar et al. tested the relationship between fear, vigilance, and stress levels. Weymar et al. manipulated stress using the CPT. The purpose of exposing the test group to stress is to test whether stress will increase awareness of negative images quicker than an individual in a control group who is not in a stressful state. The design of this physiological stressor causes the similar biological changes to the body as experienced during an acute stress response, such as increased blood pressure, increased heart rate, and increased cortisol concentration.[196] They showed 100 images—50 neutral and 50 unpleasant images—to 40 male participants assigned to either the stress or the non-stress condition. The non-stress control group placed their hands in warm water before viewing the same images to mirror the stress groups' procedures. The participants showed a more heightened awareness of the negative images in the stressed (cold water) condition. This finding suggests, "that acute stress sensitizes the brain for increased processing of harmful cues in the environment."[197] The Weymar et al. study is significant since it describes vigilance as a relationship between acute stress and awareness of threatening cues in the environment.[198] The study suggests, "that stress enhances the hypervigilance toward external threat cues, hereby enhancing the (amygdala-mediated) elaborated perceptual processing in the extra striate visual cortex.[199] Acute stress, in conjunction with unpleasant images, receives more resources and attention than pleasant images.

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[194] Keinan, 642.

[195] Keinan, 643.

[196] Lars Schwabe, Leila Haddad, and Hartmut Schachinger, "HPA Axis Activation by a Socially Evaluated Cold-Pressor Test," *Psychoneuroendocrinology* 33, no. 6 (July 2008): 894, https://doi.org/10.1016/j.psyneuen.2008.03.001.

[197] Mathias Weymar et al., "Stress Sensitizes the Brain: Increased Processing of Unpleasant Pictures after Exposure to Acute Stress," *Journal of Cognitive Neuroscience* 24, no. 7 (2012): 1511.

[198] Weymar et al., 1511.

[199] Weymar et al., 1516.

Janis and Mann's study of disaster response found that people panic when they believe they are in imminent danger and feel their only opportunity to escape will soon disappear. They found that people who experience hypervigilance have a sense of urgency that they need to act immediately. As a result of their impulsive need to act, the individuals fail to consider all their options. Janis and Mann suggest that individuals' panicky searches for a solution and limited options create hasty decisions that seems to provide an instant solution.[200] Once removed from the situation, the individuals realize their decisions may not have been the best option available.[201] Largely responsible for Janis and Mann's theory is a pattern of *awareness* of a perceived threat. Janis and Mann suggest that some stress is necessary to incite vigilance, so that people are able to challenge a threat and scrutinize options carefully; therefore, elevated stress and awareness may inspire high-quality solutions to resolve a critical situation.[202] The conflict theory model suggests that a moderate degree of stress creates *vigilance*, which analyzes every resource and works out an appropriate course of action to resolve the quandary. When a threat is not imminent, vigilance is a state of awareness likely to lead to successful alternatives. When a threat is imminent, on the other hand, hypervigilance is an elevated state of awareness likely to lead to hasty decisions without considering alternatives.

D. HYPERVIGILANCE IN POLICE ENCOUNTERS

A recent incident of a police officer killing an unarmed citizen occurred on March 18, 2018, in Sacramento, California. A citizen observed someone vandalizing cars and called 911. When officers confronted the subject, Stephon Clark, he began to run on foot from them. He ran through peoples' yards, jumped fences, and stopped in his grandmother's backyard, where officers confronted the subject. When officers perceived Clark had lunged at them with a weapon in his hand, one officer—who thought his life was in danger—yelled, "Gun!" Police officers fired 20 shots at Clark. He was shot eight

[200] Janis and Mann, *Decision Making*, 51.

[201] Janis and Mann, 51.

[202] Janis and Mann, 51.

times, seven of which entered through Clark's back. Clark's body fell lifeless to the ground. The video seems to show the moment officers transitioned from vigilant to hypervigilant. The officers' hasty decision to provide immediate relief from a deadly force encounter occurs when they thought their lives were threatened. Officers instinctively defended themselves from a perceived threat of a gun and reacted the way they were trained. An investigation revealed a cellphone next to Clark's body but no weapon. Fatalities and the emotional toll of such shootings on citizens and police officers substantiate the need to study hypervigilance in police work.

This officer-involved shooting illustrates a difference between vigilance and hypervigilance. Vigilance, as described by Janis and Mann, results in good decision making that explores every option for the best possible solution. Vigilance results in awareness to a threat where the possibility of a safe outcome and time favor the individuals.[203]

Vigilance is an awareness of the possibility of a threatening situation, which prompts individuals to prepare to deal with a possible threat.[204] Individuals who experience vigilance are more controlled, and therefore, are more likely to make an appropriate decision when handling a threat. Planning and mental-preparation decrease the likelihood individuals may transition to hypervigilance. Predetermining the best course of action for survival in a life-threatening incident results in the least negative consequences for all individuals involved. Put differently, planning affords individuals the opportunity to think through worst-case scenarios in a controlled environment *before* experiencing the event in real life. Training engrains a habitual course of action given certain scenarios.[205] The benefits of vigilance erode with a perceived inability to successful resolve a threating situation. A lack of preparation can add to that perception and cause a panic-like state of hypervigilance.

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[203] Janis and Mann, 50.

[204] Sandi, "Stress and Cognition," 247.

[205] Sandi, 247.

Hypervigilance occurs when individuals experience panic upon encountering a threat that they are not prepared to handle.[206] A lack of preparation creates an overwhelming feeling when individuals are caught by surprise. Individuals, without planning, must recognize they are in a critical situation, think through a proper solution to the situation, and implement the solution all while they are experiencing it. As time passes without a practical solution, the individuals start to experience hopelessness, which added to their stress. Cognitive restriction, attention-narrowing, and reactionary decision making caused by hypervigilance may result in improper or frantic solutions to escape a life-threatening situation.[207]

E. SUMMARY

Hypervigilance is commonly accepted among professionals as a form of awareness without a formal definition.[208] Hypervigilance can be conceptualized by individuals' stress reaction, interactions with the environment, ability to evaluate a situation, and resolve the situation safely.[209] Moderate stress, on the other hand, is beneficial to a point, and serves as the basis of vigilance. Once stress crosses a maximum threshold, the effects of stress degrade performance and decision making. Individuals entering a state of hypervigilance begin to focus on a successful conclusion to the incident while trying to mitigate both emotional responses and the biophysical effects of a stress response. Biophysical effects on the body limit attention, long-term memory recall, and restrict a deeper thinking process.

[206] Janis and Mann, *Decision Making*, 59.

[207] Janis and Mann, 51.

[208] Staal, *Stress, Cognition, and Human Performance*, 8.

[209] Staal, 4.

IV. TRAINING AND INTUITION

Rarely does analytical thinking happen during a crisis; therefore, most decisions are based on intuition. While Chapter III presented how decision making usually happens during a crisis, Chapter IV discusses recommendations on how to train recruits better in how to make better intuitive decisions under stress. There is no substitution for experience, but training most closely approximates experience for new officers, so they may start building the foundation for their eventual expertise. Optimal intuitive decisions begin with good training that embeds the right kind of instincts into individuals, and overrides the instincts that lead to bad decisions. Through training that features repeated exposure to high-stress situations, officers start to build expertise and prepare for worst-case scenarios. This expertise, built from cognitive conditioning through exposure training, may enable intuitive decision making grounded in relevant experience and expertise. Cognitive conditioning through an awareness of officers' stress responses can shape an automated response (intuitive) based on officers' higher skill levels (expertise). The more officers make decisions during stressful environments, the more familiar they become with their decision-making process and performance during a crisis (expertise) until they do it without deliberately thinking (intuitively).[210] Research on expertise-based intuition serves as the foundation for cognitive conditioning through officers' awareness to stress. Salas and colleagues define expertise-based intuition as, "The intuitions occurring at these later stages of development where the decision maker has developed a deep and rich knowledge base from extensive experience within a domain."[211] Salas and colleagues use a Venn diagram to illustrate the relationship between intuition and expertise to form expertise-based intuition, seen in Figure 4.

[210] Eduardo Salas, Michael A. Rosen, and Deborah DiazGranados, "Expertise-Based Intuition and Decision Making in Organizations," *Journal of Management* 36, no. 4 (July 2010): 944, https://doi.org/10.1177/0149206309350084.

[211] Salas, Rosen, and DiazGranados, 944.

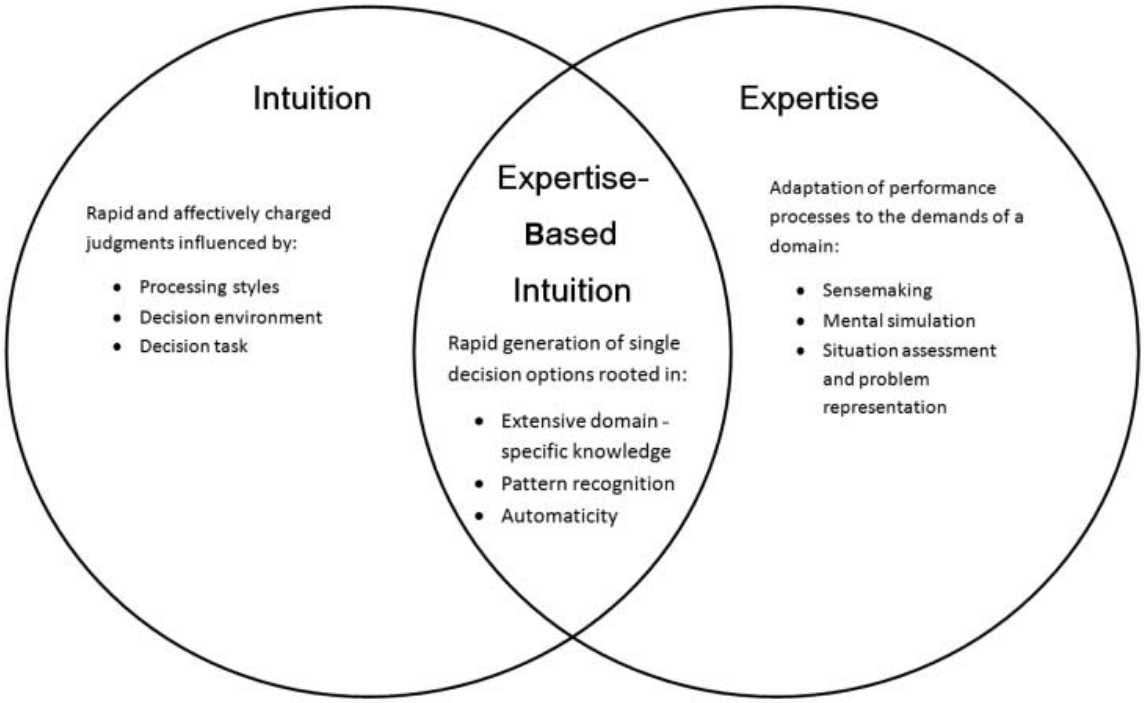

Figure 4. Venn Diagram Depicting the Overlap and Distinction between the Constructs of Intuition and Expertise[212]

The ability to make optimal intuitive decisions, along with the familiarity with high-stress contexts, may subsequently make an officer less susceptible to hypervigilance.

Officers who receive inadequate training often exhibit overconfidence, a susceptibility to hypervigilance, a tendency toward reactionary decision making, and an inability to engage analytical thinking. By not including stress recognition and mitigation exposure during worst-case scenario training, the current nationwide law enforcement-training curricula leave officers ill-prepared for the possible mental and biophysical responses encountered during a critical incident. Repetition in training alone may result in recruits being overconfident in their abilities. Repetition leads to a reactionary response without adequately understanding a situation. Cognitive training in how to function in high-stress environments helps to mitigate the reactions based on repetition without thinking first. Kahneman suggests the illusion of understanding "is [that] we

[212] Source: Salas, Rosen, and DiazGranados, 945.

believe we understand the past, which implies that the future also should be knowable, but in fact we understand the past less than we believe we do."[213] This concept seems relevant to law enforcement since training bolsters this illusion because officer training does not include functioning in high-stress environments, which results in overconfidence that the training they received has adequately prepared them for real-world encounters. This overconfidence can lead to hypervigilance and reactionary decisions without realizing the consequences of how a stress response's effects overrides optimal decisions.

Optimal training curricula that integrate recognition of how the body responds during stress may bridge the gap between rote training and understanding the appropriate context in high-stress situations, which can lead to better intuitive decisions by learning how to overcome stress reactions during critical incidents. This chapter proposes a refocusing of police training that incorporates cognitive conditioning through exposure to stress and emotional reactions during worst-case training scenarios. The benefits of refocusing police training this way may reduce susceptibility to hypervigilance and allow for more optimal decision making.

A. INTUITION

Since stress reduces the capacity for analytical thinking during critical incidents, improving intuitive decision making in training is critical. Analytical reasoning is constrained because of stress, which creates a reliance on intuitive judgement. Intuitive decision making is commonly attributed to expertise among police officers who survive life and death situations, and it is most often referred to as a "gut feeling" or a sixth sense.[214] Intuitive decision making comes to mind with little if any cognitive effort. According to Kahneman, the human ability to avoid mistakes hinges on whether analytical thinking corrects faulty intuitive thinking.[215] Experience, expertise, and training accumulate as a mental catalog full of references for officers to fall back on

[213] Kahneman, *Thinking, Fast and Slow*, 201.

[214] Bill Breen, "What's Your Intuition?" Fast Company, August 31, 2000, https://www.fastcompany.com/40456/whats-your-intuition.

[215] Kahneman, *Thinking, Fast and Slow*, 22.

during crisis decision making so that intuitive thinking is less likely to be faulty in these situations.[216] This intuition starts with awareness of signs of potential danger. However, no formal police instruction on intuition or knowledge is gained through experience, and experts often have a hard time pinpointing why first responders made the decisions they did.

Anchors and priming are two constructs that influence intuitive decision making. The anchoring effect is a heuristic based on initial information that people received and then rely too heavily upon during the decision-making process.[217] The priming effect, according to Kahneman, is "the influencing of an action by the idea."[218] Law enforcement training serves as both an anchor to and primer for officers' intuitive responses since training automates a skill that requires less cognitive effort and analytical thinking.[219]

Perception and awareness serves as the foundation for intuition during a critical incident. Kahneman suggests that, in analytical thinking, individuals may know something to be factual, but their intuition perceives the information differently.[220] He illustrates this difference between analytical knowing and intuition's perception with the following Muller-Lyer line illusion of two lines in Figure 5:

[216] Vanessa E. Ghosh and Asaf Gilboa, "What Is a Memory Schema? A Historical Perspective on Current Neuroscience Literature," *Neuropsychologia* 53 (January 2014): 110, https://doi.org/10.1016/j.neuropsychologia.2013.11.010.

[217] Kahneman, *Thinking, Fast and Slow*, 119.

[218] Kahneman, 53.

[219] Kahneman, 35.

[220] Kahneman, 27.

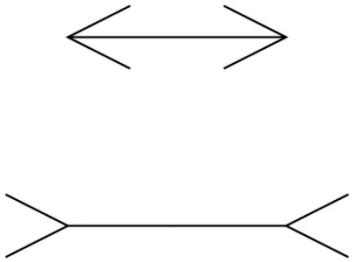

Figure 5. Muller-Lyer Line Illusion[221]

Peoples' intuition perceives the second line as longer. Few people would engage more analytical thinking, which would lead them to stop to measure the lines to validate their intuition. Critical incidents lack the time needed to validate intuition. This misperception in real-life creates an inability to comprehend a situation fully with information that does not accurately reflect a situation. Kahneman also noted that analytical thinking requires much more effort and is avoided when possible, which makes optimal intuitive decisions important.[222] The inability to process information analytically during a crisis impedes the ability to understand the current situation. The induction of a stress response and change in thinking when people are emotionally aroused can interfere with sensemaking, or how a given situation is interpreted.[223] Individuals' experiences are not defined by an objective reality; rather, individuals' experiences are defined by how reality is perceived. The narrowing of attention and perceptional biases are two separate but related constructs that result in difficulty distinguishing between the perception of reality and what is actually happening.[224] In other words, devoting all the attention on a specific task, like a threat, can lead to being blind to anything else.[225] Priming, anchoring, perception, and

[221] Source: Kahneman, 26.

[222] Kahneman, 45–46.

[223] Seymour Epstein, "Integration of the Cognitive and the Psychodynamic Unconscious," *American Psychologist* 49, no. 8 (1994): 710–11.

[224] Epstein, 710.

[225] Kahneman, *Thinking, Fast and Slow*, 23.

narrowing of attention are cognitive constructs that work together to form intuitive decisions.

When encountering a critical incident, people process information through working memory.[226] Working memory pulls information from relevant experiences stored in long-term memory. Under the best conditions, the mind detects, codes, and stores information as a series of images.[227] Under the worst conditions, stress overwhelms working memory, restricts cognitive resources, and interferes with attention, which can result in reactionary decisions.[228] Baddeley illustrates the human memory model in Figure 2 and suggests recalling well-rehearsed information, like rote training, is easier to recall because of a deeper level of encoding.[229]

Further convoluting the intuition of an experience, acute stress impedes executive functions, analytical thinking, and memory recall.[230] Once individuals experience a life-threatening situation and start to rely on the intuitive system for thinking, rarely do they revert back to the analytical way of thinking.[231] If the individuals are ill-prepared for the situation, their emotional state can become overwhelming. Hence, law enforcement needs enhanced intuitive decision-making training; training that incorporates stress awareness and recognition.

B. MODERN DAY TRAINING ENVIRONMENT

Most recruit training begins at the police academy, which operates Monday through Friday, 8 a.m. to 5 p.m. The Dallas Police Academy, for instance, is a 36-week long program, which does not house its recruits. The academy is broken down into four focus areas: academics, physical fitness training, defensive-tactics training, and worst-case training. The academic portion of the academy consists of learning local, state, and

[226] Baddeley, "Working Memory," 566.

[227] Baddeley, 557.

[228] Janis and Mann, *Decision Making*, 50–51.

[229] Craik and Lockhart, "Levels of Processing," 682–83.

[230] de Kloet, Joëls, and Holsboer, "Stress and the Brain," 469.

[231] Epstein, "Integration of the Cognitive and the Psychodynamic Unconscious," 710–11.

federal statutes, crime prevention models, community awareness training, and other theories relevant to law enforcement. Physical fitness training and defensive-tactics training incorporate proper nutritional education with a rigorous physical regime and the latest self-defense techniques. About halfway through the training regimen, a robust worst-case training program integrates theoretical knowledge learned during the academic portion of the academy into a controlled, simulated reality. Worst-case scenarios afford recruits simulations to test tactical and theoretical aspects of training. Worst-case scenarios recreate real world, high-stress situations in a controlled training environment. After graduating from the police academy, recruit officers continue their education under the supervision of an experienced officer during field training. On-the-job field training is the ultimate worst-case training with one exception; field training cannot be controlled like a worst-case training scenario.

A typical day for a recruit at the beginning of the academy starts with eight hours in the classroom learning theory and memorizing law. As the recruits' training cycle progresses, they receive less theoretical material and more worst-case application., The recruits' day transitions to a mix of half lectures and half-practical worst-case scenarios made up of physical fitness, defensive tactics, or worst-case training in the middle of the training program. Near the end of the academy, the recruits spend most of their time in practical scenarios and put theory into action. Simulated family disturbance calls, active school-shooting responses, and vehicle pursuits are a few examples of worst-case scenarios.

Current law enforcement training presents some theoretical material without integrating it into practical worst-case scenarios for a higher level of learning. Every academic setting starts at the lowest level by introducing theories and facts relevant to their profession. For example, police recruits must familiarize themselves with the Constitution, as well as state and local laws to be effective in their jobs. The intent of the academy is to foster a learning environment that encourages officers' higher levels of thinking by incorporating theories into practical scenarios rather than just remembering facts. As the recruits progress through the academy, the theoretical knowledge they learn

at the beginning of the process is progressively integrated into worst-case training scenarios.

A major shortcoming in current law enforcement training is its ineffective integration of stress management theories and techniques during worst-case scenario training. The Texas Commission on Law Enforcement (TCOLE) licenses police officers in Texas and sets statewide training curricula. The mandated curricula for statewide police academies require a 618-hour basic police officer course for licensing a recruit, as shown in Figure 6. TCOLE mandates a series of stress management courses totaling 14 hours of fitness and wellness, and a stress management training course.[232] Put into perspective, the effects of stress during a critical incident, which can lead to hypervigilance, and possibly, the unnecessary loss of life represents only 2.3 percent of TCOLE-mandated training time. Furthermore, TCOLE mandates that 16.8 percent of training time focusing on force options, mechanics of arrest, and firearms training, and 15.8 percent of training time focusing on the social aspects of community policing. TCOLE mandated material should refocus on the effects of stress on decision making during critical incidents, in addition to the aftermath that results from it. Not only would a greater focus on stress management help officers' wellness, it would potentially save lives.

[232] Texas Commission on Law Enforcement, *618-Hour Basic Peace Officer Course* (Austin, TX: Texas Commission on Law Enforcement, 2008), https://www.tcole.texas.gov/sites/default/files/Course CMU/history_of_the_bpoc_course.pdf.

618-HOUR BASIC PEACE OFFICER COURSE

(revised March 2008)

In accordance with Commission regulations, the Basic Peace Officer Course shall consist of a minimum of 618 classroom hours and shall include, but not be limited to, the subjects set forth below. This is the recommended sequence for teaching the course. Academies may change the sequence, if necessary.

#	SUBJECT	HOURS
	Introduction and Orientation	2
1.	Fitness and Wellness, and Stress Management	14
2.	Professional Policing	10
3.	Professionalism and Ethics	8
4.	U.S. & Texas Constitutions, Bill of Rights, and Criminal Justice System	12
5	Multiculturalism and Human Relations	12
6.	Code of Criminal Procedure	16
7.	Arrest, Search, and Seizure	24
8.	Penal Code	40
9.	Traffic	68
10.	Intoxicated Driver and SFST	24
11.	Civil Process	8
12.	Alcoholic Beverage Code	4
13.	Health and Safety Code – Controlled Substances Act	8
14.	Family Code – Juvenile Issues	10
15.	Written Communications	28
16.	Spanish	16
17.	Force Options	24
18.	Mechanics of Arrest	40
19.	Firearms	40
20.	Emergency Medical Assistance	16
21.	Emergency Communications	12
22.	Professional Police Driving	32
23.	Communication and Problem Solving	4
24.	Patrol/Consular Notification	42
25.	Victims of Crime	10
26.	Family Violence and Related Assaultive Offenses	20
27.	Crisis Intervention Training (CIT) and Mental Health Code	24
28.	Hazardous Materials Awareness	6
29.	Criminal Investigation Including: Introduction, General, Protection of and Crime Scene Search, Interviewing Techniques, Booking Procedures, Courtroom Demeanor and Testimony, Case Management	44
TOTAL HOURS		618

Figure 6. TCOLE 618-Hour Basic Police Officer Course[233]

[233] Source: Texas Commission on Law Enforcement.

TCOLE mandates stress recognition classes without taking these skills to a higher level of learning. Nevertheless, TCOLE's training mandates are no different than the rest of the country when it comes to their reliance—or overreliance—on force options in the academy. This conceptual overreliance on force is discussed in greater detail as how inadequate training leads to overconfidence in peoples' abilities. Two case studies, one from the Police Executive Research Forum (PERF) on de-escalation and one from the Dallas Police Department's (DPD's) internal force reports, are discussed later in this chapter to illustrate how training curricula frame police officers' decision making during critical incidents.

1. Repetition without Repeated Exposure

Police academies recognize that rote training leads to automated reactions and try to capitalize on this aspect as much as possible. In fact, recruit officers learning new defensive tactics, firearm skills, or driving techniques practice a new skill over and over. Not only are recruits told to practice the skill during training; they are also required to rehearse techniques in their mind at home. Recruit are told to dry fire their weapons at home by firing an unloaded weapon to engrain the mechanics of shooting to ensure they have a proper grip, sight picture, and trigger pull. Recruit training incorporates shoot/don't shoot scenarios that use a modified firearm and simulated munitions, or ballistically sound structures to provide realistic training and dynamic scenarios. Even though this training is needed to get used to using a gun when needed, it is not appropriate in all circumstances. Current training lacks incorporating repeated exposure in high-stress critical incidents in addition to repetition training so the officers can maintain situational awareness while also being well-trained in weapons use. This type of training is critical to decreasing the susceptibility towards hypervigilance that would lead to mindless reactions based on rote training instead of decisions based in an accurate assessment of context.

Training can automate a skill, so that execution of that skill becomes more intuitive.[234] The more recruits practice a task successfully, the easier that task becomes. For example, when teenagers first learn to drive a vehicle, their analytical thought processes needs to be engaged to coordinate all the functions necessary to drive successfully and safely. New drivers must remember to drive on the right side of the road, leave enough space between vehicles to serve as a reactionary gap, scan the roadway, and remember traffic laws. As the teenagers drive more often, the driving process moves from an analytical thought process to an intuitive one through repetition. After several years of driving, the processes becomes so automated that they can arrive at a routine destination, such as work or home, and have no memory of driving their usual route unless an unusual event happens, such as a near accident.

Other professions, such as those in the airline industry, professional sports organizations, and martial arts, use repetition to develop a skill into expertise. The airline profession attributes its safety record to intuitive responses made by pilots that they acquired during training and their expertise through experience.[235] In an examination of existing research, one study suggested the key to pilot safety is to overtrain.[236] Pilots attribute habits and conditional responses reinforced during training with flight simulators to resolving real-life emergencies successfully.[237] Flight simulator trainings induce more than just rote training; simulators induce anxiety, fear, and a stress response. "Deliberate practice tends to aid performance by automating it, enhancing the performer's ability to use pattern matching and improving the accuracy of his perceptions and expectations," according to McKinney and Davis.[238] Police officers and pilots are similar in many aspects. Both professions require hours of training to master their craft. Both professions require split-second decisions in ever-changing situations happening under extreme

[234] Epstein, "Integration of the Cognitive and the Psychodynamic Unconscious," 711.

[235] Green, "Stress and Accidents," 639.

[236] Staal, *Stress, Cognition, and Human Performance*, 59.

[237] Green, "Stress and Accidents," 639.

[238] Earl H. McKinney and Kevin J. Davis, "Effects of Deliberate Practice on Crisis Decision Performance," *Human Factors: The Journal of the Human Factors and Ergonomics Society* 45, no. 3 (September 2003): 436, https://doi.org/10.1518/hfes.45.3.436.27251.

pressure. Both professions have an obligation to prepare their personnel for what they will face while doing their duties, including the biophysical aspects of their job. This preparation starts with similar training that works together to create knowledge, which is more than just rote training.[239]

Training provides expertise, or references to fall back on, through repeated exposure of relevant situations, and not just rote training.[240] Training creates a schema by integrating knowledge and grouping like concepts together using prior knowledge and experiences to integrate new knowledge into memory.[241] Training also assists in creating a schema, which facilitates the understanding of new information.[242]

2. Intuition Starts with Awareness

Law enforcement teaches the theoretical aspects of awareness for a survival mindset. This survival mindset serves as the foundation to recognize a potential threat to officers' safety instinctually. New officers learn that intuition starts with awareness and feedback during high-pressure situations. Current law enforcement training does not integrate its theory into practice, which inhibits a higher level of thinking. Higher order thinking, on the other hand, would incorporate recognition and continuous feedback into a controlled training environment to reinforce learned theoretical knowledge.

Police training has adopted Colonel Jeff Cooper's combat mindset, which includes four states of awareness. His awareness levels provide a framework as a reference to recruits. As described in the introduction, Cooper's four states of awareness are as follows:

1. White: officers are unprepared to take lethal action.
2. Yellow: officers understand their lives may be in danger and [they] may have to act if circumstances warrant.

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[239] Ghosh and Gilboa, "What Is a Memory Schema?," 105.

[240] Epstein, "Integration of the Cognitive and the Psychodynamic Unconscious," 711.

[241] Ghosh and Gilboa, "What Is a Memory Schema?," 105, 113.

[242] Ghosh and Gilboa, 105.

3. Orange: officers have identified specific adversaries and are prepared to act for their survival. The orange awareness state does not warrant lethal force.

4. Red: lethal force is warranted and the officers will shoot if circumstances warrant.[243]

Cooper suggests the right mindset is the most important thing for surviving a deadly force encounter. The color codes are a means of setting officers' mindset to prepare for a force encounter.[244] This model provides a reference for officers to understand what level of awareness they should devote to survival while patrolling their beat.

Police officers train to work in the yellow survival mindset and to always be prepared to defend their own lives or the lives of innocent citizens. However, a continuously elevated state of awareness is impractical.[245] Officers cannot constantly question the safety of their situations. That type of emotional paranoia would likely interfere with both the analytical and the intuitive thinking processes.[246] A red state of awareness, for example, is resistance that involves active aggression with the potential of a deadly force encounter. A red state of awareness is most likely to activate a hypervigilant state. A red state of awareness is synonymous to an acute stress response that usually results in an inability to recognize all available options.[247]

Recruits also receive training on how to reevaluate feedback from situational awareness continuously for better decision making. This training incorporates a form of situational awareness that frequently reevaluates individuals' changing reality to slow down the decision-making process. The observe, orient, decide, act (OODA) loop framework teaches new recruits a mental process to reevaluate constant feedback during a dynamic situation. U.S. Air Force Colonel John Boyd developed the OODA loop for

[243] BSR, "Jeff Cooper's Awareness Color Code Chart."

[244] BSR.

[245] Kahneman, *Thinking, Fast and Slow*, 28.

[246] Kahneman, 28.

[247] Janis and Mann, *Decision Making*, 51.

fighter pilots during combat missions to slow down observation and decision making.[248] The OODA loop concept starts with being observant. After observing their situation, the next step is to orient themselves to it. Several things influence peoples' ability to orient to the situation, including prior training, experiences, and genetics.[249] Next, they decide on an action and execute a response. The entire process depends on feedback (awareness) received during the observation, orientation, and action process. Feedback obtained during the OODA loop can start the decision-making process over again. Reality can be so multifaceted that equally valid explanations from differing viewpoints can appear unpredictable during a crisis. The OODA loop attempts to understand an ever-changing situation fully to resolve these perspectives.

Research and experience teach officers the importance of slowing down situations for improved decision making during a crisis. Recruits view videos of real-life incidents where officers rush into situations blindly, which usually result in catastrophic consequences. Rather than rushing into a situation, recruits learn the principles of gaining distance from the subject and placing a barrier between the suspect and themselves, which in theory, affords more time to make better decisions. In 2016, PERF assembled 200 police chiefs, federal partners, and mental health experts in Washington, DC to discuss strategies to reduce police force in situations that did not involve suspects with firearms. The discussion focused on better decision-making strategies by slowing the momentum of police encounters. The outcome of the conference was the *Use-of-Force Guiding Principles* that outlines 30 "industry standard" concepts. PERF recognizes law enforcement needs to challenge the conventional thinking on use of force.[250] The research forum suggests a need to refocus law enforcement training on law enforcement's fundamentals of training, tactics, and equipment regarding its use of force.[251] PERF's

[248] Donald A Maccuish, "Orientation: Key to the OODA Loop—The Culture Factor," *Journal of Defense Resources Management* 3, no. 2 (2012): 67–68.

[249] Maccuish, 69–70.

[250] Police Executive Research Forum, *Guiding Principles on Use of Force*, Critical Issues in Policing Series (Washington, DC: Police Executive Research Forum, 2016), 4, http://www.policeforum.org/assets/30%20guiding%20principles.pdf.

[251] Police Executive Research Forum, 4.

research is focused on officers' responses to people with mental illness during non-gun incidents. The PERF committee admits:

> In situations where there was a threat, officers were immediately closing the gap and engaging very quickly without any structured thought or process about what they were doing. And the resulting outcomes were messy… Some were going beyond what was proportionate and engaging in physical violence, leading to them being charged with criminal offenses.[252]

However, law enforcement made some progress to reduce hasty decisions but the steps are not significant since they lack stress awareness.

PERF's research suggests two main findings. First, law enforcement curricula should reinforce slowing officers' responses to improve decision making. Second, PERF suggests law enforcement curricula should expand their efforts on how police officers make decisions when responding to a citizen experiencing a mental illness crisis. When officer rush into a crisis and execute an action without fully understanding the situation, their actions are usually an innate response to protect themselves. In reality, the officers' situations may not be as they perceive it to be and can result in unintended consequences. PERF's second finding, while on the right track of understating crisis decision making, misses the aim of correcting the underlying issues of officers' overconfidence in crisis decision making created during their training. PERF's recommendations should focus on understanding how officers should react when they experience a stress response during critical incident decision making since the only thing officers can control is their actions, not the actions of a citizen. This fundamental flaw contributes to continued inappropriate repetition during training that can lead to overconfidence in abilities or an overgeneralization of one type of response during all critical incidents, and not just incidents involving mental illness during non-gun incidents.

[252] Police Executive Research Forum, 33.

3. Worst-Case Scenarios

Good police training pushes recruits to find their limit by using worst-case scenario training. Shoot/don't shoot scenarios offer recruits an opportunity to learn from their failures while reinforcing successful behaviors. When done well, training makes tasks easier and prepares officers to make quick and effective decisions in crucial situations. Law enforcement also uses realistic operational environments to mirror worst-case scenarios and to practice skills and proficiencies in a controlled environment.

Nevertheless, increased violence against officers has transformed the law enforcement training mindset from defensive to more aggressive. Recruits now train and use advanced tactics and intimidating ballistic protection, such as heavy vests, helmets, armored vehicles, and assault rifles to defend themselves against active-shooter situations, unprovoked attacks, and ambush situations. The advanced tactics and protection integrated into training have increased the officers' aggressive combat mindsets needed to survive violent encounters. This movement has been referred to as the militarization of law enforcement. A police academy's dilemma is how to offset a combat mindset with a guardian heart. A warrior mindset suggests police officers are at war with this nation's citizens, whereas a guardian mindset suggests police officers serve and protect U.S. citizens.

Training police recruits to operate in an elevated sense of awareness all the time would be physically and mentally exhausting, not to mention detrimental to their health.[253] Critics say law enforcement working in a constant state of vigilance and shoot/don't shoot training contributes to avoidable shootings and deaths. According to a National Public Radio news article, training companies like Calibre Press show videos of police officers being surprised or caught off guard by suspects to reinforce the need for the militarization of police training.[254] The article discusses the Castile shooting, stating

[253] Kahneman, *Thinking, Fast and Slow*, 28.

[254] Martin Kaste, "Are Police Being Taught To Pull The Trigger Too Fast?," National Public Radio, July 15, 2016, https://www.npr.org/2016/07/15/486150716/are-police-being-taught-to-pull-the-trigger-too-fast.

that Yanez attended Caliber Press's class in 2014 called "The Bulletproof Mind" to support its point.[255] Further contributing to the idea that police militarization went too far, President Obama banned sales of some military equipment for law enforcement after receiving criticism for a paramilitary-like response during riots following police shootings. The President's criticism came after Michael Brown, who was unarmed, was killed by police officers in Ferguson, Missouri. President Obama banned armored vehicles, weapons, some less-than-lethal weapons, and ammunition in 2015. Obama said, "We're going to prohibit some equipment made for the battlefield that is not appropriate for local police departments…There's other equipment that may be needed in certain cases, but only with proper training."[256]

During worst-case scenario training, recruits can expect to strap on battle gear, protective vests, throat protection, and a full-shield facemask. The recruits use their assigned firearms, with interchangeable barrels that allow .7mm cartridges, which are less-lethal marking projectiles. The recruits enter a wide variety of scenarios to reinforce a skill previously taught. The recruits can encounter an armed subject, armed with the same type of firearm and simunitions, or observe a subject acting intoxicated. The situation is as dynamic as real life and creates a stress response. Each situation is set out to reinforce specific training objectives; from an active shooter situation to answering a domestic disturbance. Instructors stand alongside the recruits every step of the way and feed them information as the scenario plays out. These instructions, along with the recruits' observations, help prime them to recall information from previous lessons learned to end the scenario successfully. Blanks fired from a pistol, fire alarms, simulated police radio transmissions, and fake injuries afford recruits endless situations to induce a stress response limited only to a trainer's imagination.

Some worst-case training scenarios are designed to induce a stress response from their onset. Hands-on defensive tactics training, for example, initiates the fight, flight, or

[255] Kaste.

[256] Gregory Korte, "Obama Bans Some Military Equipment Sales to Police," *USA TODAY*, May 18, 2015, https://www.usatoday.com/story/news/politics/2015/05/18/obama-police-military-equipment-sales-new-jersey/27521793/.

freeze response when a simulated suspect attempts to take a recruit's weapon during a physical altercation. Officer-down and ambush training requires officers to "square-up" to an armed suspect, step over a downed officer, square the recruit's chest and body armor toward the suspect, and then engage the suspect. Yet training academies miss the mark of integrating theoretical aspects of stress exposure during stress-induced training. Training academies focus on officer tactics; and only officer tactics. Recruits finish the academy with a sense of confidence that they are prepared for any situation because of their tactical training. A simple modification to this process by including repeated exposure to stress to understand the stress response would prove invaluable to both the officers and citizens.

4. Overconfidence

Existing law enforcement training can create overconfidence, which instills too much faith in peoples' intuition, especially if the training inadequately prepares the officers for real world situations.[257] Said differently, overconfidence is fed by the misleading certainty of training.[258]

The current training curricula are doing officers a disservice by not preparing them adequately to handle stress in critical incidents when they know the recruits will experience this stress shortly after they are released from the academy to real-life situations. Again, one of the major failures of current law enforcement training is that it creates automatic responses in recruits through repetition without an understanding of the situation. Referring to the financial community, Kahneman describes this condition eloquently:

> The illusion of validity and skill are supported by a powerful professional culture. We know that people can maintain an unshakable faith in any proposition, however absurd, when they are sustained by a community of like-minded believers. Given the professional culture. . . , it is not surprising that large numbers of individuals in that world believe

[257] Kahneman, *Thinking, Fast and Slow*, 45.

[258] Kahneman, 14.

> themselves to be among the chosen few who can do what they believe others cannot.[259]

Kahneman suggests that mistakes are likely to happen in some situations.[260] Furthermore, the pride that people have in their abilities and their unfamiliarity with their inabilities in combination with dynamic situations contribute to a false sense of security.[261] Contributing to Kahneman's argument, Kruger and Dunning also studied the concept of overconfidence. Kruger and Dunning's research summarized the phenomenon of overconfidence as a cognitive bias in individuals' superior abilities, inaccurately recognizing their inadequacies as being greater than their abilities really are:

> People tend to hold overly optimistic and miscalibrated view[s] about themselves. . . . Those with limited knowledge in a domain suffer a dual burden: Not only do they reach mistaken conclusion and make regrettable errors, but their incompetence robs them of the ability to realize it.[262]

The police culture reflects what and how it is trained. Training primes officers' thinking by setting up a framework for their responses during an incident.[263] PERF has studied law enforcement training and found it is too heavily focused on force options.[264] PERF's research shows that the majority of recruit training involves firearms, defensive tactics training, and use-of-force scenario training. PERF's study also finds that training in de-escalation and crisis intervention techniques have lagged considerably, as shown by the minimal training time spent on these skills. Figure 7 illustrates disproportionate training hours focused on force issues compared to de-escalation or crisis intervention.

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[259] Kahneman, 216.

[260] Kahneman, 28.

[261] Kahneman, 13.

[262] Justin Kruger and David Dunning, "Unskilled and Unaware of It: How Difficulties in Recognizing One's Own Incompetence Lead to Inflated Self-Assessments," *Journal of Personality and Social Psychology* 77, no. 6 (December 1999): 1132, http://dx.doi.org/10.1037/0022-3514.77.6.1121.

[263] Kahneman, *Thinking, Fast and Slow*, 52.

[264] Police Executive Research Forum, *Guiding Principles on Use of Force*, 10.

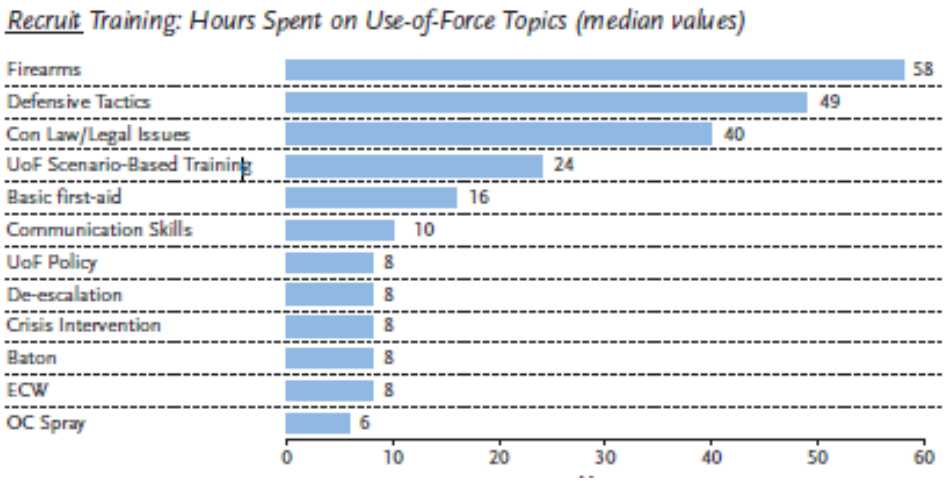

Figure 7. PERF Recruit Training Hours by Topic[265]

PERF found that officers do what they have been trained:

> It is unfair to blame individual police officers for using force in the ways they have been trained to use it. Our research revealed major shortcomings in the training that most officers currently receive. For example, a 2015 nationwide survey of PERF members found that recruit officers in responding agencies receive substantial training on firearms and defensive tactics, which is appropriate given the firearms threats that officers in the United States face. However, officers receive considerably less training on subjects such as de-escalation, crisis intervention, tactical communications, and less-lethal options.[266]

Dallas Police Chief David Brown understood that officers emulate their training philosophies and established new training protocols for the DPD in 2013. Brown's emphasis focused on a reformation aimed at reducing unnecessary deadly force after Dallas officers killed an unarmed man.[267] Brown mandated additional worst-case de-escalation training and increased deadly force training for his officers at the Academy.

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[265] Source: Police Executive Research Forum, 10.

[266] Police Executive Research Forum, *Integrating Communications, Assessment, and Tactics: Training Guide for Defusing Critical Incidents* (Washington, DC: Police Executive Research Forum, 2016), 6, https://kipdf.com/icat-integrating-communications-assessment-and-tactics_5ae5d8b57f8b9adf6c8b45d2.html.

[267] Leon Neyfakh and Inkoo Kang, "A Police Department That's Embraced Reform," Slate, July 8, 2016, http://www.slate.com/articles/news_and_politics/crime/2016/07/the_dallas_police_department_has_been_a_model_for_reducing_officer_involved.html.

Brown's efforts were followed by a drastic decrease in excessive force complaints filed against Dallas officers by its citizens, which he credits to his training mandates.[268] Gathering data from internal DPD statistics, the 2016 Internal Affairs Yearly Summary reports for the department indicated 716,001 "public contacts" for that year consisting of 87,166 traffic contacts with 628,835 calls for service.[269] The DPD's 2016 Response to Resistance Report indicates of 1,666-documented responses to resistance incidents, only .23 percent of public contacts used force greater than handcuffing; handcuffing is a reportable use of force according to the DPD's policy.[270] The U.S. Census Bureau reported an estimated population for the City of Dallas, as of July 1, 2016, as 1,317,929.[271] The chance of a citizen in Dallas being involved in a reportable incident of excessive force is .12 percent. The DPD's 2016 Response to Resistance Report shows 53,148 arrests in 2016, which account for most of the instances where force is used against Dallas citizens.[272] The percentage of reportable force used by DPD officers in arrest situations rises only to 3.14 percent. With the Internal Affairs Division reporting only 21 inappropriate force complaints in 2016, only .039 percent of arrests resulted in response to resistance instances, and of the 1,666 response to resistance incidents, only 1.26 percent of those resulted in inappropriate force complaints.[273] This data suggests that officers' use of force reflected Brown's de-escalation training philosophy and supports PERF's findings that officers' use of force reflects departmental training philosophies. An organizational training philosophy lays the foundation for recruits' training, and a belief they are adequately prepared for every situation they may encounter. This illusion of confidence in their skills leaves them ill-equipped and overconfident in their abilities.

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[268] Neyfakh and Kang.

[269] Dallas Police Department, *Internal Affairs Division Yearly Summary* (Dallas, TX: Dallas Police Department, 2017), 14.

[270] Dallas Police Department, *Response to Resistance, 2016 Annual Report* (Dallas, TX: Dallas Police Department, 2017), http://www.dallaspolice.net/reports/Shared%20Documents/Use-of-Force-Report.pdf, 29.

[271] "American Factfinder—Results," U.S. Census Bureau, Population Division, December 2016, https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk.

[272] Dallas Police Department, *Response to Resistance*, 29.

[273] Dallas Police Department, 29.

These studies show that officers reflect what they are trained in, whether it be substantial force training or in de-escalation techniques. However, training can create a bias that leads to a false sense of confidence, based on similarity, experience, and expedience.[274] Officers who associate an experience with a training scenario may execute a response that they learned during training without realizing subtle nuances in the situation or recognizing the biophysical stress response they are experiencing. Intuition based on repetition without stress exposure creates a familiarity and an overconfidence that is dangerous and leads police officers to make hasty decisions.[275] Cognitive ease, as illustrated by the bat and ball math problem, creates an unwillingness to override intuitive thinking with analytical thinking.[276] The same concepts apply during a situation where overconfident officers instinctively trust their intuition. The current law enforcement-training curricula fail to address these well-documented facts while exposing recruit officers to stress-induced scenarios through repetition without cognitive conditioning through exposure training, which increases the susceptibility of hypervigilance.

C. OPTIMAL INTUITIVE TRAINING CURRICULA

Law enforcement training has several optimal training concepts, but misses the mark of being exemplary. It currently incorporates repetition during worst-case training scenarios to create an automated response. A transitional progress occurs from pure rote memorization of theories that turns into practical applications using worst-case scenario training. Training curricula influence officers' thinking and responses in critical incidents to mirror worst-case scenario training.[277] Yet, a major drawback to current law enforcement training is not devoting training to stress recognition and mitigation through appropriate cognitive conditioning through exposure training. Stress mitigation and recognition techniques should be taught to recruit officers early in their training programs

[274] Kahneman, *Thinking, Fast and Slow*, 217.

[275] Daniel Kahneman and Gary Klein, "Conditions for Intuitive Expertise: A Failure to Disagree," *American Psychologist* 64, no. 6 (2009): 524, https://doi.org/10.1037/a0016755.

[276] Kahneman, *Thinking, Fast and Slow*, 45.

[277] Ghosh and Gilboa, "What Is a Memory Schema?," 105.

and can benefit them for life. Effective stress recognition and management helps make decision making less susceptible to the effects of hypervigilance; thereby, enabling them to make better decisions. Analytical thinking may not engage during a critical incident, but optimal stress exposure allows officers to be more prepared to handle the situation. Fourteen hours of fitness and wellness, and stress management training mandated by TCOLE are likely not enough time to engrain a new skill into an expertise. TCOLE's mandates, rather, focus on 104 hours of force related subjects. Thinking errors caused by recruits' overconfidence in their abilities to resolve a situation with force results in TCOLE mandated community engagement training. TCOLE mandates 98 hours of community engagement training to ease the public's negative perception of excessive force after law enforcement kills an unarmed citizen. As illustrated by PERF's research, recruit officers regularly emulate their training. Moreover, the training curricula set the framework for what a recruit emulates since the curricula create expertise through the repetition of police tactics, and not repeated exposure. TCOLE needs to refocus its curricula to include stress awareness and cognitive conditioning through exposure training during worst-case scenarios in an effort to increase the ability to make better decisions, as well as to reduce the susceptibility of hypervigilance during critical incidents.

Cognitive conditioning through exposure training that includes stress mitigation and recognition during worst-case scenarios paralleling the current training curricula is straightforward and relatively inexpensive. First, effective training curricula start with focusing priorities driven by academia, not by public or media perception. Then, the curricula must provide knowledge of stress and emotional recognition, management and mindfulness that eventually transform into a deeper comprehension. This knowledge should continue being reinforced during the academic setting. The missing step in current law enforcement training is applying stress and emotional recognition and mindfulness training repetitively during worst-case scenario exposure training, not just automating police tactics through repetition. Making stress and emotional recognition, management, and mindfulness exposure during worst-case scenarios a priority will allow the recruits to identify and analyze patterns within their own behavior that can reduce the negative

effects of stress to allow them to reduce their susceptibility to hypervigilance during critical incidents.

1. Refocusing Police Training to Integrate Academic Research

The law enforcement profession panders to public perception and the media. People tend to relate the importance of an issue with the extent of media coverage it gets.[278] Media headlines portray a stereotype that male police officers kill unarmed citizens, but it may be more of a consequence from inadequate law enforcement training. Legislation mandates TCOLE include cultural awareness sensitivity and de-escalation training to resolve these issues. TCOLE has mandated additional crisis intervention, racial profiling, cultural diversity, and de-escalation techniques, and limiting the use of force in public intervention during the 2018 legislative session.[279] TCOLE seems to be treating the symptoms of stress induced decision making to appease the media rather than attacking the problem at its root cause; that of the officers' stress conditioned reactions during critical incidents.

The paradigm of police officers' excessive force is shifting to factors, such as age, education, training, and experience on the job, rather than other factors.[280] Officer-involved shooting statistics indicate age and education may play a part in high-profile police-involved killings. The statistics show that a large number of officers involved in high-profile police-involved killings are 35 years old or younger. Darren Wilson, 28, killed Brown in Ferguson, Missouri. Daniel Pantaleo, 29, killed Eric Garner in New York City. Timothy Loehmann, 26, killed Tamir Rice in Cleveland. Peter Liang, 27, killed Akai Gurley in New York City. These examples are just a few of the high-profile police-

[278] Kahneman, *Thinking, Fast and Slow*, 8.

[279] "Course Curriculum Materials and Updates," Texas Commission on Law Enforcement, accessed July 16, 2018, http://tcole.texas.gov/content/course-curriculum-materials-and-updates-0.

[280] James P. McElvain and Augustine J. Kposowa, "Police Officer Characteristics and the Likelihood of Using Deadly Force," *Criminal Justice and Behavior* 35, no. 4 (April 2008): 517, https://doi.org/10.1177/0093854807313995.

involved shootings where the officers were 30 years old or younger.[281] Older officers are less likely to be involved in shootings than their younger colleagues.[282] As officers gain more seniority, their likelihood of being involved in critical incidents decreases. Older officers' experience, stress inoculation, and continual training contribute to an expertise resulting in improved decision making during critical incidents.

McElvain and Kposowa, from Loma Linda University and University of California, respectively, conducted a study of police officer characteristics and the likelihood of using deadly force. This study, unlike most previous studies, focused on deadly-force encounters only. Data collected from the Riverside County Sheriff's Department in California was examined for the purpose of this study. This study reviewed all officer-involved shootings for a 15-year span, from 1990 through 2004. Officers' demographic information for both groups, obtained through personnel files, were used for comparison purposes. Demographic information consisted of gender, race, education, age, rank, and whether the officers experienced a prior shooting.[283] The statistics for the variables of this study are summarized in Table 1. The statistics indicate almost 98 percent of the officers involved in shootings were male, less than 25 percent of officer-involved shootings were minorities, and officers with only a high school diploma comprised more than 75 percent of the shootings.[284] The average age of the officers involved in shootings for this study was younger than 34.5 years old, with 78 percent of the sampling with the rank of deputy.[285] College-educated officers use less force than colleagues without formal education according to the study.[286]

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[281] Mary Ann Georgantopoulos, "Younger Police Officers Are More Likely to Shoot People than Older Ones," BuzzFeed, March 11, 2015, https://www.buzzfeed.com/maryanngeorgantopoulos/age-of-police-officers-who-kill-people-a-little-discussed-fa.

[282] McElvain and Kposowa, "Police Officer Characteristics and the Likelihood of Using Deadly Force," 505.

[283] McElvain and Kposowa, 511.

[284] McElvain and Kposowa, 511.

[285] McElvain and Kposowa, 512.

[286] McElvain and Kposowa, 514.

Table 1. Descriptive Statistics of the Covariates[287]

Variable	*Total Size*	*Control Group*	*Study Group*	*% in Shooting*	*Mean*
Race					
Hispanic	133	82	51	7.9	.162
White	473	231	242	37.4	.771
Black	23	14	9	1.4	.029
Other	19	7	12	1.9	.038
Gender					
Female	45	38	7	1.1	.022
Male	603	296	307	47.4	.978
Education					
High school	432	196	236	36.4	.752
College	216	138	78	12	.248
Officer age	—	36.32	34.61	—	—
Prior shooting					
No	575	334	241	37.2	.768
Yes	73	0	73	11.3	.232
Rank					
High	182	114	68	10.5	.217
Low	466	220	246	38	.783
Total sample size	648	334	314		

In a separate study, Aamodt's findings regarding the correlation between education and force were similar. Aamodt said, "Better-educated officers perform better in the academy…are assaulted less often, [and] use force less often . . . than their less educated counterparts."[288] Aamodt found a positive correlation between education, training, and critical incident decision making and the organizational policy, supervision, and philosophy on the use of force issues.[289] According to Aamodt, lax supervision or a philosophy that does not value human life transfers to the front-line officers. Officers reflect the values of their leaders and department, which are engrained in them during academic police training.

Synthesis of these studies, including PERF and DPD's use of force reports, suggest that officers with a higher education translate knowledge of theories and concepts

[287] Source: McElvain and Kposowa, 511.

[288] Michael Aamodt, *Research in Law Enforcement Selection* (Boca Raton, FL: Brown Walker Press, 2004), 51.

[289] Aamodt, 509.

taught in the academy into a higher level of knowledge. Refocusing TCOLE mandated courses to recruit officers with a higher level of education to perfect intuition can lessen the susceptibility of hypervigilance.

2. Training to Perfect Intuition

Businesses are paying attention to stress reduction through training, and law enforcement should too. Large organizations, like Google, Nike, the U.S. military, and Apple, are capitalizing on the benefits of meditation to reduce stress, reduce healthcare needs, and improve decision making and performance.[290] Recognition of the stress state, through meditation, is credited with improving performance and memory and can increase the brain's gray matter.[291] Reflection can regulate mood states and emotions and reduce stress, depression, and anxiety.[292] Meditation, in concert with aerobic exercise, is credited with profoundly improving cognitive performance.[293] Meditation enhances the cognitive capacity critical for decision making that teaches people to filter out unrelated thoughts due to anxiety, and therefore, frees attentional resources to focus on the situation at hand.[294] Recognition provides skills to reduce stress effects for officers to perform before, during, and after critical incidents.

The research literature is not lacking concerning the negative consequences of decision making under stress; however, current law enforcement training lacks preparation for the physiological responses that officers will encounter during stress. Law

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[290] Marissa Levin, "Why Google, Nike, and Apple Love Mindfulness Training, and How You Can Easily Love It Too," Inc.com, June 12, 2017, https://www.inc.com/marissa-levin/why-google-nike-and-apple-love-mindfulness-training-and-how-you-can-easily-love-.html.

[291] Britta K. Hölzel et al., "Mindfulness Practice Leads to Increases in Regional Brain Gray Matter Density," *Psychiatry Research* 191, no. 1 (January 30, 2011): 38–41, https://doi.org/10.1016/j.pscychresns.2010.08.006.

[292] Hölzel et al., 36–38.

[293] Brandon L. Alderman et al., "Map Training: Combining Meditation and Aerobic Exercise Reduces Depression and Rumination While Enhancing Synchronized Brain Activity," *Translational Psychiatry* 6, no. 2 (February 2016): 7–8, https://doi.org/10.1038/tp.2015.225.

[294] Adam Moore et al., "Regular, Brief Mindfulness Meditation Practice Improves Electrophysiological Markers of Attentional Control," *Frontiers in Human Neuroscience* 6 (2012): 12, https://doi.org/10.3389/fnhum.2012.00018.

enforcement training integrates skills needed for physical survival and physical fitness training while lacking the most important training, training for the mind and how to control emotional and stress reactions. Physical training and repeated exposure automate tasks to require less cognitive effort, which reduces the reliance on analytical thinking.[295] This concept heightens mental preparation through meditation and recognition before and after stress-induced training so the mind can anticipate its biophysical responses. Staal found that mental training can build a strong foundation of expertise to minimize the effects of acute stress, fear, and anxiety responses in the same fashion that skills-based training automates physical responses.[296] Maintaining awareness and increasing decision making during heightened stress through cognitive conditioning during exposure training, while reducing the effects of stress, reduces susceptibility to hypervigilance by allowing officers the ability to control attention and focus it where it belongs.[297]

3. Intuition and Exposure Training

Acquiring a well-engrained skill takes more than just training; it takes consistency, intense focus, and pushing people to the edge of their abilities.[298] Quality and effective training are more important than the act of training alone. In fact, training that reinforces an incorrect skill or task is worse than not training at all, since training and habits go hand-in-hand.[299] Training should start slowly to build coordination and a solid foundation for a particular skill. As the skill develops, the speed of repeated exposure should gradually increase. Once a skill is fully grasped, training can be reinforced by

[295] Kahneman, *Thinking, Fast and Slow*, 35.

[296] Staal, *Stress, Cognition, and Human Performance*, 68.

[297] Kahneman, *Thinking, Fast and Slow*, 36.

[298] Richard Schmidt and Robert Bjork, "New Conceptualizations of Practice: Common Principles in Three Paradigms Suggest New Concepts for Training," *Psychological Science* 3, no. 4 (July 1992): 208–9.

[299] Kahneman and Klein, "Conditions for Intuitive Expertise," 519.

imagining and rehearsing it vividly in the brain.[300] Integrating stress and emotional exposure training into training iterations should follow the same concept.

Traditional law enforcement training reflects the status quo of the military, but without the aim of optimal intuitive training through continuous stress recognition and exposure. Lieutenant General Robert B. Brown has recognized that, "Legacy training methodologies and capabilities do not replicate the complexities or challenges they [who?] encountered during a decade of conflict." [301] Brown continues, "Our Soldiers and leaders realize the environment they will encounter in future combat is growing in complexity and unknowns, and they are demanding realism in training."[302] Blascovich defines an immersive virtual environment (IVE) as a simulator that "create[s] a psychological state in which the individual perceives himself or herself as existing within the cockpit of an aircraft."[303] The Army defines realistic training as, "the deliberate practice of individual and collective tasks to enable tactical and technical proficiency that support mission accomplishment in a training environment that approximates the operational environment in both sufficient complexity and substance."[304] Law enforcement is adopting worst-case scenario training to enable trainees to experience a mental rehearsal and experience a psychological state while in a controlled environment.[305] These concepts must be reinforced in a controlled exposure-based training environment.

[300] James E. Driskell, Carolyn Copper, and Aidan Moran, "Does Mental Practice Enhance Performance?," *Journal of Applied Psychology* 79, no. 4 (1994): 490, https://doi.org/10.1037//0021-9010.79.4.481.

[301] Mike Casey, *White Paper Says Army Seeds Tough, Realistic Training* (Washington, DC: U.S. Army, 2016), ii, http://www.army.mil/article/163751.

[302] Casey, ii.

[303] Jim Blascovich, "Challenge and Threat," in *Handbook of Approach and Avoidance Motivation*, ed. Andrew J. Elliott (New York: Psychology Press, 2013): 431.

[304] Casey, *White Paper Says Army Seeds Tough, Realistic Training*, 3.

[305] Christopher K. McClernon, "Stress Effects on Transfer from Virtual Environment Flight Training to Stressful Flight Environments" (PhD diss., Naval Postgraduate School, 2009).

4. Recognition and Mindfulness Training

Optimal curricula for recruits should include cognitive conditioning in the form of meditation and stress recognition at the beginning of their academic program, which then transforms their learned theory into higher knowledge throughout practical worst-case scenarios. The course should include simple techniques, like controlled breathing with cognitive control, relaxation, and non-responsive attitudes have been shown to improve selective attention, improve performance, and decision making.[306] Continuous reinforcement and cognitive conditioning through exposure training throughout the recruits' learning can easily be incorporated in the recruits' worst-case scenario training.

As previously stated, meditation is credited with stress reduction and improving performance, memory, and increasing the brain's gray matter.[307] Mindfulness can regulate mood states and emotions, and reduce stress, depression, and anxiety.[308] Recognition, in concert with aerobic exercise, has been credited with profoundly improving cognitive performance.[309] After all, meditation is free, can be done anywhere, and requires little effort once it becomes a habit.

The first step in reducing the effects of a physiological response during stress-induced training is to recognize its effects. Officers experience stress in different manners. One officer may experience tunnel vision and the perception of slow motion while another officer's perception is just the opposite. Being able to pinpoint the effects of stress and recognize what stimuli trigger it starts with recognition during reflection in meditation. Training that allows officers to practice breathing techniques during the onset of a stress reaction in worst-case training scenarios can slow a situation down in real-life. Slowing a situation down allows for additional time to contemplate more choices to make better decisions.

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[306] Moore et al., "Regular, Brief Mindfulness Meditation Practice Improves Electrophysiological Markers of Attentional Control," 12.

[307] Hölzel et al., "Mindfulness Practice Leads to Increases in Regional Brain Gray Matter Density," 38–41.

[308] Hölzel et al., 36–38.

[309] Alderman et al., "MAP Training," 7–8.

After recognizing the individual effects of stress, tailoring mental preparation and reflection before and after officers' worst-case training scenarios recognizes their stress responses while critiquing their decision making. Sensors on officers can capture physiological reactions during stress-induced training to aid in recognition. Sensors are increasing in popularity; the Apple iWatch, for example, collects some of this information already. Data collected from sensors measuring blood pressure, pulse, heart rate, and breathing can further aid in future partnerships between psychologists and law enforcement trainers to reduce hypervigilance.

Finally, after recognizing how stress affects officers, they can integrate lessons learned to harness the positive effects of stress and improve intuitive decision making. Increased strength, additional energy, and motivation are some examples of the positive effects of stress.[310] Meditation prior to and immediately after worst-case training can expose the effects of stress experienced during the scenario and allow the officers to reflect on specific stimuli that trigger their biophysical responses. The scenario can be reenacted, while the officers focus on recognizing and correcting adverse responses of stress specific to themselves. Breathing techniques employed by the officers during a scenario, for example, can slow heart rate, lower blood pressure, and slow respiration. Breathing and scanning a situation by physically moving the eyes back and forth can reduce the effects of tunnel vision. Repeated exposure of the scenario, in combination with meditation and stress recognition between intervals, can work in concert to reduce cognitive resources needed for decision making. Replicating the current training process continuously can fill the gap between recruits' lack of experience and expertise while reducing hypervigilance. Replacing pure repetition with cognitive conditioning through exposure training transforms a higher level of learning by not just understanding stress, but effectively applying and evaluating it. This thesis suggests that stress awareness and cognitive conditioning through exposure training can reduce bias, reduce hasty decisions, and improve scanning of available choices during critical incidents. Adequately

[310] McCorry, "Physiology of the Autonomic Nervous System," 7–8.

understanding and responding during a stress response is necessary to reduce hypervigilance.

D. IDEAL DECISION MAKING

So what does ideal decision making look like during a critical incident? Optimally trained recruits recognize that judgments and decisions that are intuitively based on expertise are quite helpful; however, in critical incidents that present surprising or unfamiliar stimuli, recruits need to refrain from automated responses that lack an understanding of the situation. Optimally trained recruits recognize that an expert may apply a response influenced by the closest experience they have encountered, but it is inappropriate in their current situation because of a slight nuance in the situation. Practicing meditation and mindfulness training to reduce the negative effects of stress can help mitigate these errors.

A real-life example of an optimal critical decision happened when a fire commander ordered his firefighters out of a burning building within seconds of the floor collapsing.[311] As the fire commander was battling the blaze, he felt an uneasy feeling; his intuition told him something was wrong. He ordered his men outside within seconds of the floor giving way. Unknown to the fire commander, the fire started in the basement, and not in front of him where he could see the fire. When asked why the fire commander made his decision, he replied that he had "a sixth sense."[312] When the researcher (Klein) pushed the fire commanders for deeper reasoning, a discussion between the researcher and the fire commanders ensued:

> The commanders said [fire fighting] is just a matter of following routine procedures," Klein continues. "So I asked to see the book in which all of those procedures were codified. And they looked at me as if I was nuts. They said, 'Nothing's written down. You just learn through experience.[313]

[311] Breen, "What's Your Intuition?"

[312] Breen.

[313] Breen.

Recruits endure the same phenomenon of experience as intuition. Trusting your "gut instincts" starts with awareness and the ability to understand, not just see, what is going on around you. As in the example with the fire commander, police officers perceive incoming stimuli in situations that are interpreted through their previous experiences and expectations, which then leads to an intuitive judgment about the situation.[314] In high-risk situations, these decisions are increasingly likely to be hasty decisions that are made without considering every available alternative. The aforementioned example illustrates the intent of integrating stress and emotional recognition into training to create intuition and good decision making during critical incidents.

E. SUMMARY

Researchers suggest that an automatic response, immediate reflex, or a hasty decision that occurs during or immediately after a life-threatening situation can be mitigated by prior experiences or expertise.[315] Researchers who have studied pilots during acute stress credit successful responses with prior experiences in simulation training.[316] Training diminishes the effects of stress during critical incidents by creating habits that lead to better decision making using simulated situations.[317] Officers are no different from pilots; they tend to make decisions that resort to their training and are based on experience, intuition, and repetitive training that forms expertise. Officer should learn stress resistant skills in training. These skills allow access to long-term memory recall with fewer mental resources during a critical incident that can serve as the foundation for an assessment of the current situation.[318]

Police officers work in a complex world and respond to complex situations. Since no one-size-fits-all answer exists to anything police officers do, they must function in the abstract. That foundation for their abstract thinking must begin during their police

[314] Kahneman, *Thinking, Fast and Slow*, 11.

[315] Thackray, *Performance Recovery Following Startle*, 2.

[316] Green, "Stress and Accidents," 639.

[317] Green, 640.

[318] Staal, *Stress, Cognition, and Human Performance*, 61.

training with exposure to as many possible experiences as they may encounter. Those exposures must test their decision making under stressful conditions, so they can experience the physiological and psychological effects of stress and overwhelming emotions in a controlled environment. Continuous training transforms their learning from performance susceptible to hypervigilance and poor decision making to an intuitive execution of sound decision making under stress through repeated exposure.

V. CONCLUSION

> The preservation of life has always been at the heart of American policing. Refocusing on that core ideal has never been more important than it is right now.[319]
>
> ~ Chuck Wexler

The tragic shooting in the Bay Area Rapid Transit system where Officer Mehserle responded to a fight in the subway that ended with the death of Oscar Grant reflects the need to improve law enforcement training.[320] Grant, while lying on the ground, was shot in the back when Mehserle mistakenly shot Grant with his firearm, believing it was his Taser. During Mehserle's trial, an expert witness testified Mehserle's confusion was evidence of a phenomenon known as hypervigilance.[321] Ron Martinelli testified Mehserle never intended to use lethal force against Grant and implied Mehserle overreacted out of fear of being killed by Grant.[322] Martinelli testified Mehserle's actions resulted from "a lack of appropriate force training and situational awareness" resulting in Mehserle's confusion and panic.[323]

This example highlights how hypervigilance can affect decision making in critical situations. The disconnect between academic conceptualization and applied use results in a lack of understanding in police contexts, a deficit of what accounts for the phenomenon, and what deficiencies in mitigation and training techniques may help to prevent adverse reactions under conditions that may give rise to hypervigilance.

This thesis expands on the concept of hypervigilance by understanding how its underlying concepts of stress, fear, and anxiety impacts crisis decision making. Current

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[319] Police Executive Research Forum, *Guiding Principles on Use of Force*, 10.

[320] Martinelli, "Murder-or-Stress-Induced-Hypervigilance," 36.

[321] Martinelli, 36.

[322] Martinelli, 36.

[323] Martinelli, 36.

literature on hypervigilance fails to consider how expertise and overconfidence, created during training, affects decision making. Rote training, without repeated stress awareness and cognitive conditioning through exposure training, contributes to inappropriate force training. This thesis:

1. Enhances law enforcement's understanding of the cognitive response known as hypervigilance during critical incident decision making by understanding its separate constructs: anxiety, fear, and acute stress on decision making during a crisis.
2. Recommends transforming law enforcement's worst-case training, to include cognitive conditioning through exposure training to build expertise and experience, with the purpose of subsequently reducing hypervigilance and overconfidence.
3. Recommends testing the effectiveness of cognitive conditioning through exposure training. A successful measure for implementation of cognitive conditioning though exposure training can be shown by a reduction of improper decisions during critical incidents.
4. Recommends future research to determine if the content of a 911 call serves to prime officers' reactions by influencing their perception of the situation before they arrive on-scene.

Expertise and experience go hand-in-hand. Training is the closest replication to experience by which new officers start to build their foundational expertise. Current training, through repetition, builds false expertise and builds the likelihood of susceptibility from hypervigilance through automating responses without applying rational thought. Changing the training curricula to those built on cognitive conditioning through exposure training by injecting mindfulness and meditation into it may enable better, more efficient intuitive decisions grounded in relevant experience and expertise. The objective is to enable officers to make optimal intuitive decisions, while being familiar with high-stress reactions, thereby making them less susceptible to hypervigilance. With regards to the Mehserle shooting, such training might have afforded

Mehserle the opportunity to realize he inadvertently grabbed his gun while intending to grab his Taser. Mehserle's actions, while not intentional, resulted from rote training without rational thought. Mehserle's fear from Grant's perceived threats resulted in a hurried decision.

Exploring real-world experiences and theoretical applications of how hypervigilance—segregated by stress, fear, and anxiety—diminish improper critical decision making and reactions to erratic responses during a critical incident may lead to less susceptibility to hypervigilance. Ideally trained recruits who recognize intuitive decisions based on expertise are optimal. Crises that are unfamiliar or surprise recruits, however, require an analytical thinking approach. Cognitive conditioning through exposure can slow the perception of a situation down to distinguish when it is inappropriate to apply a response influenced by the closest training experience they have encountered based on the current situation is critical.

Future research may be needed to shed light on *why* officers respond the way they do, and if receiving a 911 call primes officers' responses before getting to the situation. Training serves as the foundation for officers' intuition, expertise, and experience to fall back on during critical incidents. The comments of a call can serve as an anchoring effect that starts a cognitive bias based on the comments to a call and resorts to officers' overreliance on their bias during their decision-making processes.[324] If officers receive a call that primes their expectations of a situation (e.g., a call about a man with a gun), the officers are going to see cues in the environment that confirm these preexisting beliefs, even if they may not be accurate (e.g., the man had a pipe in his hand and not a gun). Anchoring and priming can be deferential to critical incident decision making since working memory rarely resorts back to analytical thinking in a stressful situation.[325] The inability to think analytically during a critical incident makes it difficult to recall optimal references when a situation is different than expected when arriving at a call location.

[324] Kahneman, *Thinking, Fast and Slow*, 119.

[325] Epstein, "Integration of the Cognitive and the Psychodynamic Unconscious," 710–11.

As in the Mehserle example, law enforcement can use cognitive conditioning through exposure training to implement steps to ensure officers remain vigilant and in control by overcoming the factors that contribute to erratic responses during a critical incident. This mitigation starts during exposure training.

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