

Running head: PROMOTING FIREFIGHTER SURVIVAL BY INSTILLING THE

Promoting Firefighter Survival by Instilling the Warrior Mindset

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CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others are set forth, quotation marks so indicate, and that the appropriate credit is given where I have used the language, ideas, and expression or writing of another.

Signed: _____

Abstract

The problem was that the Iowa City Fire Department did not train its members to understand and minimize the physiological and psychological effects of stress on performance. The purpose of the research was to determine how fireground stress impacts performance, and to determine what models or methods exist to train operators to recognize and minimize the effects of stress on performance. The descriptive research method was used to answer four research questions: (a) How does incident stress impact the performance of emergency operators? (b) What methods do other professions use to reduce the physiological and psychological effects of stress on performance? (c) What methods do other fire departments use to reduce the physiological and psychological effects of stress on performance? (d) What models or methods should the Iowa City Fire Department use to train members to understand and minimize the physiological and psychological effects of stress on performance?

A survey instrument was used to examine both experiences of diminished performance due to stress and sufficiency of stress training on the ICFD. A second survey instrument was used to determine how police, military, EMS and other fire service organizations train tactical operators to be effective performers under stress. Significant findings of the research were that stress has a significant negative impact on tactical performance, that awareness of the true nature of the stress environment is fundamental, and that mental control techniques exist to maximize tactical performance under stress. Further, comprehensive and sequenced training models are rarely used in the American fire service and not used at all in the ICFD.

Recommendations produced by the research were to adopt the Warrior Mindset training paradigm developed by Dr. Asken, as well as provide explicit training that details both the complex reality of the fireground and the physiological and psychological effects of stress.

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Introduction

Frequently and without forewarning, members of the American fire service are summoned to the scenes of emergencies and tasked to create order from a context of disorder. The emergencies to which dedicated men and women respond levy catastrophic penalties. The calendar year 2011 witnessed nearly 1.4 million fires which resulted in 3,005 civilian deaths, 17,500 civilian injuries, and more than 11.6 billion dollars in direct property loss (Karter Jr., 2012). More troubling still are the figures that reflect the inherent risk associated with fire service emergency operations: during the reporting years 2007-2011, 184 firefighters lost their lives while engaged in operations on the emergency scene, while 245,215 incurred injuries (National Fire Protection Association, 2012).

Statistics are wholly unable to convey the horrible nature of the environment in which deaths and injuries occur. On a winter's morning in 1999, three firefighters in Keokuk, Iowa were killed by a flashover while they attempted the rescue of three young children, who also tragically perished. The terrifying reality of their final moments is partially defined by State of Iowa Fire Marshal Ray Reynolds, who described how the three young children were discovered beneath the bodies of the rescuers, the firefighter's bunker coats open and wrapped around the lifeless children (R. Reynolds, personal communication, February 25, 2013).

The harsh reality of the fireground environment is further detailed in the testimony of Jeff Cool, a former firefighter with FDNY's Special Operations Command (Cool, 2012). Cool related how he and other firefighters encountered a novel situation at a high-rise tenement fire, when they discovered apartments on the upper floors illegally sub-divided with sheets of plywood to create multiple apartments within each unit. The modifications altered situational awareness, slowed operational tempo and hindered suppression efforts. Caught in rapid-fire growth

conditions, Cool and other firefighters were forced to jump 50 feet from an apartment window to escape the fire. Cool survived with catastrophic and career-ending injuries; three other firefighters perished as a result of the jump (2012).

The stories of firefighters like the ones in Keokuk and New York City cause the introspective reader to carefully reflect on the extreme stress, uncertainty, and fluidity of the fireground. A seasoned and highly-trained firefighter from FDNY's elite rescue companies, Cool (2012) reflected that nothing in his training or experience left him mentally prepared to consider leaping from the top floor of a high-rise apartment building. While no survivors from the Keokuk flashover remain to offer perspective, it may be reasonably assumed that their training had left them both mentally and physically unprepared to function effectively in an impending flashover environment while simultaneously and heroically trying to save the lives of three young children.

The problem was that the Iowa City Fire Department does not train its members to understand and minimize the physiological and psychological effects of stress on performance. The purpose of the research was to determine how fireground stress impacts performance, and to determine what models or methods exist to train operators to recognize and minimize the effects of stress on performance. This descriptive research project seeks to answer four research questions: (a) How does incident stress impact the performance of emergency operators? (b) What models do other professions use to reduce the physiological and psychological effects of stress on performance? (c) What methods do other fire departments use to reduce the physiological and psychological effects of stress on performance? (d) What models or methods should the Iowa City Fire Department use to train members to understand and minimize the physiological and psychological effects of stress on performance?

Background and Significance

The City of Iowa City is located in the southeastern part of Iowa, approximately 115 miles east of Des Moines and 220 miles west of Chicago. A population of 68,000 resides within the city's 30 square miles. Iowa City is comprised of a mix of residential, commercial, and both medium and heavy industrial occupancies. Iowa City is home to a Big Ten University, the University of Iowa, which increases the city's population by about 35,000 during the academic year. Iowa City is also home to the world's largest teaching hospital, the University of Iowa Hospitals and Clinics, as well as Proctor and Gamble, Oral B, and ACT, which develops and administers standardized testing solutions. The City of Iowa City is divided by the Iowa River and bordered by Interstate 80.

The Iowa City Fire Department is the oldest fire department in the state. Its roots go back to 1842, four years before Iowa's statehood, when the Legislative Assembly of the Territory of Iowa issued Council File 109, which authorized the formation of the Iowa City Fire Engine Company, largely for the protection of the new territorial (and later State of Iowa) capitol building (Brown, 1993).

For the next 70 years, Iowa City would see the formation of several autonomous volunteer fire companies, generally funded by and named for a local benefactor. On October 12, 1912, the Iowa City Fire Department was formally established as a paid full-time fire department. The Iowa City Fire Department has maintained that status since and currently serves the city from three fire stations. Emergency and preventive services are provided by 67 uniformed personnel, including 42 Firefighters, twelve Lieutenants, three Captains, and three Battalion Chiefs. Administrative functions are performed by one Training Officer holding the

rank of Lieutenant, one full-time Inspector holding the rank of Captain, one Fire Marshal, one Deputy Chief, and one Chief Officer.

Considerable department resources have been committed to improving the functional responsiveness of the organization. In 1997, the Iowa City Fire Department began a three-phase organizational planning process. Phase One included faculty from the University of Iowa's Tippie School of Business assisting department members in the formulation of a mission statement, a statement of core values, and a statement of organizational vision and values. Phase Two was comprised of department leadership embarking on the Commission for Fire Accreditation International self-assessment, which further led to the ICFD's pursuit of Accredited Department status. Phase Three focused on the design of a comprehensive strategic plan for the ICFD. In 2002, the Iowa City city council formally accepted the *Iowa City Fire Department Strategic Plan*, endorsing the goals and objectives detailed in the ten-year plan. The Iowa City Fire Department fulfilled the chief goal of the vision statement when the Commission on Fire Accreditation International conveyed an *Accredited Agency* designation in August 2008.

In the spring of 2010, the ICFD joined forces with the Center for Public Safety Excellence to form and implement a new five-year strategic plan (Iowa City Fire Department, 2010). As part of the strategic planning process, the ICFD engaged all personnel in developing a new mission statement, which is *the mission of the Iowa City Fire Department is to protect our community by providing progressive, high-quality emergency and preventive services.*

The Iowa City Fire Department provides the citizens of and visitors to the City of Iowa City with progressive emergency services that include fire suppression, emergency medical services, hazardous materials response, and technical rescue services that include the disciplines of high-angle, low-angle, confined space, building collapse, automobile and machinery

extrication, and trench collapse. Similar to many other urban fire departments, members of the ICFD have been subject to numerous high-profile and extremely dangerous incidents. In the past decade, the department has dealt with a single occurrence of multiple tornados that cut wide swaths through heavily populated areas, as well as one of the worst floods in American history that caused monetary damage enumerated in the billions of dollars. Members have experienced close-calls at the hands of flashovers, smoke explosions, and building collapse. The Spence Research Laboratories at the University of Iowa, adjacent to ICFD Headquarters, was the site of an escalating hazardous materials incident following an attack by a domestic terrorist organization (Scharnberg & Jones, 2005).

During novel emergencies such as tornado strikes, 500-year floods, and terrorist attacks, as well as during structure fire and technical rescue operations, Iowa City firefighters are required to skillfully perform duties within an environment that is rife with stressors, and where the risk of injury or death is significant. Decision-makers and operators know that successful mitigation of any emergency scene relies in part on making sense of an uncertain environment where they do not initially possess the initiative. Fire department personnel must interpret environmental patterns and cues to make sense of a chaotic environment, and skillfully execute tasks designed to de-escalate the incident and swing initiative in the responder's favor. This is often no simple task, as the stressors at emergency incidents frequently impede effective and efficient task execution. Firefighters and fire officers must labor to overcome physical, mental, cultural and environmental hurdles that work individually or collectively to diminish the performance (Cannon-Bowers & Salas, 1998).

This research has its genesis in 2010, when a number of personnel read Robert Coram's biography of United States Air Force Colonel John Boyd. Coram (2002) defines Boyd as an

exceptional intellect, tireless researcher, and master strategist who has been recognized as the most influential reformer of military strategy and tactics since Sun-Tzu. Boyd's research and subsequent briefings entitled *Energy-Maneuverability Theory*, *Destruction and Creation*, and *Winning and Losing* fundamentally changed aspects of the military including how fighter pilots are trained to defeat superior aircraft in aerial combat, how aircraft are conceived and designed, and how combat forces achieve victory. Of special note is Coram's (2002) documentation of Boyd's development of maneuver warfare theory that now forms the battle doctrine of the United States Marine Corps, and the synthesis of the Observe-Orient-Decide-Act (OODA) Loop, which has received wide recognition as decision and planning cycle that, when implemented properly, can help the user obtain victory in any form of conflict.

Reading Coram's book led to the study of subsequent related works, and I began to realize that Iowa City Firefighters were not trained to make rapid tactical decisions under stress. This led to an Applied Research Project that endeavored to determine how decision making was diminished in stressful environments, and how the Iowa City Fire Department could and should train firefighters to be resilient decision makers under stress (Nurnberg, 2012).

This research segued into the study of published works that dealt with human behavior in the midst of stressful circumstances. This study revealed that stressful environments cause physiological and psychological responses that can affect not only rapid tactical decision making of fireground commanders, but also the physical performance of operators at all levels (Cannon-Bowers & Salas, 1998).

Warfighting experts such as Marshall (1978), Von Clausewitz (1982), and Heal (2000) as well as psychologists such as Grossman (2008) and Asken (2010), among many others, have established that effective tactical performance – and by association the very notion of survival –

is predicated on a clear understanding of the causes of stress and the associated effects on tactical performance. In my years of experience on the Iowa City Fire Department, rising from the rank of firefighter to Lieutenant and eventually to Captain, the organization has never provided training explicitly designed to explore the pervasively uncertain nature of the fireground and the subsequent barriers to situational awareness (Gassaway, 2009; Warfighting, 1994). Nor has the organization developed, delivered, or provided training designed to establish awareness of the causes of stress on the emergency scene and the associated physiological and psychological effects stress has on tactical performance.

The significance of this research is related to the terminal objective of the National Fire Academy's Executive Leadership curriculum, which states "The goal of EL is to provide a framework of executive-level competencies by focusing on personal effectiveness" (U.S. Fire Administration, p. 16-3). Regardless of position or responsibility in a fire service organization, job competency is directly related to the ability to perform emergency response duties both effectively and efficiently. Personal effectiveness then, in relation to the objective of the Executive Leadership curriculum and subsequently this research project, may be significantly augmented by an understanding of the physiological and psychological effects of stress on tactical performance.

The significance of this research is further related to enhanced firefighter performance, and subsequently firefighter survival and community safety. These desirable end-states are reflected in goals one, two, and three of the United States Fire Administration's (USFA) 2010-2014 Strategic Plan. The first goal defines a need to "reduce risk at the local level through prevention and mitigation (United States Fire Administration, 2009, p. 18). This research will help the Iowa City Fire Department to achieve that goal by reducing risk to both responders and

citizens by creating resilient operators in stressful conditions. The second goal seeks to “improve local planning and preparedness (USFA, p. 19). With an understanding of the physiological and psychological effects of stress on tactical performance, Iowa City firefighters will plan to and become more prepared to operate at incidents where quick and decisive action under stress may mean the difference between life and death. Similarly supported is the third goal, which defines the need to “improve fire and emergency services’ capability for response to and recovery from all hazards” (USFA, p. 20). To the extent that this research deals directly with human performance in a hazardous medium, any enhancement in that performance will directly and positively impact the capability of emergency response in the City of Iowa City.

Literature Review

Lt.Col. Dave Grossman is a United States Army special forces operator and a world-renowned psychologist who is at the forefront of the modern movement to understand the physiological and psychological effects of stress on tactical performance. Grossman contends that in any number of occupations, people have little reservation related to observing and talking openly about the environment in which they operate and the challenges posed by the nature of that environment (Grossman & Christensen, 2008). This truth is generally not replicated in the cultures of tactical emergency response personnel, according to Grossman, because machismo pervades personalities. The problem is further compounded by the proclivity of tactical operators to feel shame in considering potential shortcomings under pressure, or to encounter a sense of failure when their performance under stress is less than ideal (2008). Regardless, Grossman says “A warrior must be a master of the art of combat, and as such, he must understand its reality” (p. 8).

Few have understood that reality better than Von Clausewitz, widely considered to be history's finest military tactician (Coram, 2002), who referred to war as a resistant medium, where effectiveness is significantly diminished when even the simple things become hard (Von Clausewitz, 1982). The reason that great difficulty springs from simplicity is Von Clausewitz' notion of friction, which he classifies as not only the most determinate factor on the battlefield, but also the only conception which "distinguishes real war from war on paper" (p. 164). Because of his contention that no person can understand the diminishing effect of friction who himself has not experienced the battlefield, Von Clausewitz metaphorically defines friction's effect as a man trying to perform his urgent duties while submersed in water. Just as that man will find his task impossible, so too in war "one cannot keep even the line of mediocrity" (p. 165).

Von Clausewitz (1982) cautions battle commanders to consider that friction is entirely the result of misunderstanding the nature of the battlefield. That the true nature of the medium in which warfare occurs had been little considered is attributed by Von Clausewitz as both counterintuitive and counterproductive. He found that warfighters shunned consideration of the true nature of war because "the horror of its elements excites repugnance" (p. 102). Von Clausewitz classifies the nature of the battlefield as being pervasively uncertain and defined by both confusion and infinite incalculables. Further, he states that human factors adversely affected by the resistant medium contribute to poor decisions and the misapplication of strategy and tactics, and are further manifested in fear, excessive zeal, inaction, and bodily exertion (1982). Within the context of friction, Von Clausewitz noted that soldiers "feel that the light of reason does not move here in the same medium" (p. 159) and that it is only the most extraordinary man who "does not lose the power of making any instantaneous decisions" (p. 160).

Von Clausewitz is not the only military authority to find that the nature of combat was prone to incite chaotic and ineffective performance which diminished mission accomplishment. The ancient warrior Sun Tzu (2001) reflected that the nature of the battlefield was in constant flux, having the capacity to confuse commanders and demoralize armies. Sun Tzu's assertion that "as water retains no constant shape, so in war there are no constant conditions" (p. 58) indicates that conditions in war are fluid, unpredictable, and often incomprehensible, and that "in observing and analyzing the essence of war one will discover that there are always two sides to a question, which are closely related and transform themselves into their opposites under certain conditions" (p. 58).

Charles Heal (2000), an experienced Marine Corps warfighter and law enforcement commander, concurred with Von Clausewitz regarding the fundamental importance of understanding the nature of war, but his diverse experience led him to establish that characteristics common to warfare were also common to most any form of conflict. Heal characterized conflict as "any situation where there is an irreconcilable clash between two opposing wills" (p. 28). Heal's contention was that conflict did not require an intelligent enemy per se; rather fires, earthquakes, floods, hazardous materials incidents, and complicated technical rescues were similar in nature to armed stand-offs, ambushes, and combat patrols (2000).

Heal (2000) observed that it is critical for those operating within a conflict to recognize the five major characteristics, which are uncertainty, risk, unique and temporary circumstances, the human dimension, and disorder. The first characteristic – uncertainty – is classified by Heal as the recognition that "the nature of conflict makes certainty impossible" (p. 28). In conflict, according to Heal, there is always a lack of information, and what information is attained in a time-compressed and stressful setting "is usually incomplete, ambiguous, and sometimes even

conflicting” (p. 28). This attribute of conflict causes operators and commanders to function within an environment where decisions are made and actions taken based on incomplete understandings of the environment.

The second characteristic of conflict is the necessity for operators within the conflict to accept some degree of risk (Heal, 2000). Personal risk is categorized as being subject to the danger of physical or emotional harm. Risk to others is considered to be the reality of willfully subjecting team members to the possibility of encountering personal risk, while organizational risk is the ever-present danger which may involve “the loss of equipment, assets, or prestige” (p. 29).

The third conflict characteristic relates to “a unique and temporary set of circumstances” (Heal, 2000, p. 30). Heal found that in conflict, circumstances can be considered to be unique as they are determined solely by the factors present at a specific place and time. Similarly, conflict circumstances are temporary in that any particular outcome realized by a decision or action changes the subsequent set of circumstances. Heal established the importance of operating within a unique and temporary set of circumstances with his contention that the person who, with his decisions and actions, establishes the fastest operational tempo will seize the initiative, and thereby gain victory (2000). Of significant importance is also the notion that “Moreover, a decision and action delayed is often rendered ineffective because the circumstances will have changed. Thus, all tactical operations are time sensitive” (p. 30).

The fourth characteristic of conflict is related to the human dimension (Heal, 2000). Heal contends that it is absolutely critical that tactical operators maintain awareness of the relationship between the conflict environment and the human factors:

Because interventions are always human activities, characteristics such as training, experience, maturity, emotion, prejudice, and discipline deeply affect individual and collective efforts. Because the most fundamental factor in conflicts is the irreconcilable disagreement. . .these situations are especially susceptible, and will be inflamed and shaped by human emotions and personalities. Any doctrine that that attempts to reduce tactics to ratios of forces, weapons, or equipment neglects the impact of the human will on the conduct of the operation and is, therefore, inherently flawed (p. 31).

Finally, Heal (2000) cautioned tactical emergency operators to consider that the fifth characteristic of conflict, inherently possessing uncertainty, risk, ambiguity, and human-related friction, is the reality that tactical situations are always gravitating toward disorder. As incidents expand along a timeline, and encounter fundamental environmental change as a result of decisions and actions, it must be recognized that complexity often increases – subsequently increasing the specters of risk, chaos, and confusion.

While Heal (2000) raises a 21st-century perspective of the impact of conflict's stressors on individual and team performance, an examination of the literature reveals that observers of performance in conflict have recorded similar notions. In his examination of military training paradigms and end-state performance evaluations, Colonel Marshall (1978) found that a misunderstanding and under-appreciation of the realities of the battlefield have long plagued military training and resulted in diminished individual and unit effectiveness. It is of these environmental realities that Marshall found "the mind of the infantry soldier should be conditioned to an understanding of its reality at all stages of training" (p. 36). Marshall argued that it was unquestionable that the primary cause of breakdowns in combat are the result of failure to appreciate and control human nature. In the midst of an uncertain and confusing

environment, Marshall found that the greatest and most consistent contributing factor in tactical effectiveness was “the result of men failing to carry out tasks which are well within their power” (p. 39).

Similarly, Marine Corps Doctrinal Publication number 1 (MCDP1) assigns primary importance for warfighters to understand and appreciate the nature of conflict (Warfighting, 1994). Among the attributes that MCDP1 addresses are the timeless conflict-related attributes of friction, uncertainty, fluidity, disorder, danger, and the human dimension. MCDP1 holds that these attributes all possess the inherent ability to disrupt, diminish, and render ineffective tactical performance, and that all training must be predicated on an acknowledgement of the nature of the environment where tactical operations will be executed.

In concert with MCDP1, the researchers of the US Navy’s Tactical Decision Making Under Stress (TADMUS) project found that the environment where conflict occurs has significant impact on performance and outcomes (Cannon-Bowers & Salas, 1998). Uncertainty, task saturation, informational volume and complexity, and time pressures have a synergistic effect which places enormous stress on personnel and exponentially increases the likelihood of catastrophic errors. Furthermore, the TADMUS project determined that the combat arms and the fire service “share the commonality of a potentially high-stress, high-demand performance environment” (p. 191). TADMUS researchers found that surveys of accidents within such environments inevitably had increased environmental demands as a contributing factor.

Dr. Dietrich Dorner is director of the Cognitive Anthropology Project at the Max Planck Institute in Berlin. Dorner (1996) characterizes conflict environments as complex systems, where complexity is defined as “the existence of many interdependent variables in a system. The more variables and the greater their interdependence, the greater that system’s complexity” (p. 38).

Dorner found that increasing levels of complexity within systems places higher challenges on an operator to function cognitively and physically within that system. A chief factor that complicates operation within a complex system is the notion that complexity demands an operator to attend both mentally and physically to a myriad of factors at once, making it impossible to focus on a single task or action within that system. The reality of human function within increasingly complex systems, therefore, ultimately and necessarily diminishes the mental and physical performance of the operator (Dorner, 1996).

Contributing to the often overwhelmingly demands on operators are the inherent attributes of the complex system. The attributes are the complexity of the system itself, the intransparency of critical information, operator ignorance and subsequent proclivity to form mistaken hypotheses, and the fluidity of the environment (Dorner, 1996).

While contemporary and historical sources alike contend that the conflict environment is pervasively uncertain and possessive of performance-diminishing stressors, there is science that seeks to identify the specific causes of stress and associated performance effect. Fire service psychologists Mitchell and Bray define stress as “a state of psychological and physical arousal which comes about as a result of a threat, challenge, or change in one’s environment” (1990, p. 13). The common element in stress is the responsive change to something in the subject’s environment, and the authors found that fire service professionals subjected to stressors encountered physiological and psychological changes across the cognitive, emotional, and behavioral domains (1990).

Mitchell and Bray (1990) found that certain levels of stress arousal were necessary to achieve peak physical and mental performance. The positive effects of stress on tactical performance is referred to as “eustress” (p. 13) and helps define the natural physiological and

psychological responses that help us adapt to threats, challenges, or changes in the tactical environment. Of great significance, however, is Mitchell and Bray's finding that each person possesses a qualitative line of demarcation where the effects of stress transition rapidly from "eustress" to "distress" (p. 13) and serve to diminish both mental and physical capabilities of the responder.

One of the research questions sought to determine specifically the physiological and psychological effects of stress on performance. Noted psychologist Hans Selye performed significant research on the physical and mental effects of stress on health, longevity, and performance, and has been referred to as "the father of stress research" (Essence of Stress Relief, 2008, p. 1). Selye devoted his life to the study of stress and its effects, and he discovered and named the "fight or flight response" (Mitchell & Bray, 1990, p. 10). While Selye discovered that repeated interaction with acute and/or chronic stressors had cumulative negative effects on the body and mind, he did find that the general process of becoming stressed increased performance and was profitable for survival (2008).

The complex physiological reactions that occurred as the body responded to and recovered from stress were referred to by Selye (1974) as the General Adaptation Syndrome. Selye found that the syndrome of stress response and recovery was general in terms of how a person's psychological and physiological responses did not distinguish between types of stressors, causing the body to undergo similar activations to a wide range of emotions such as rage, fear, and joy. The syndrome is adaptive in that once the stress response is activated, Selye contended that the body and mind worked together to fashion a specific response to a stressor (1974).

The General Adaptation Syndrome has three key stages, defined by Selye (1974) as the Alarm Stage, Resistance Stage, and Exhaustion Stage. The Alarm Stage is activated when a stressor is recognized and mental acuity is heightened, along with a rapid release of stress hormones such as cortisol, adrenaline, and noradrenaline. The alarm stage is designed to promote resilience and survival to the extent that it chemically enhances brain function and prepares the body for rigorous work in its own defense.

The second stage of the General Adaptation Syndrome is the Resistance Stage (Selye, 1974). Any mental or physical effort generated to cope with the stressor, despite relative effectiveness, is defined by Selye as resistive. During this stage the stressor may ultimately be perceived to be resolved and the autonomic response plateaus as the body begins to restore psychological and physiological balance. Regardless, the body will remain in the Resistance Stage until the stressor is either resolved or the subject becomes incapable of further resistance. In the final stage, the adaptive capacity of the subject has been depleted, and response diminishes into a nonemergency state. Because of the heightened and adaptive demands placed on the subject, a period of rest and recovery is normally warranted before a level of pre-stressor homeostasis can be achieved (1974).

The General Adaptation Syndrome is only activated when a stressor is perceived to be novel or of significant risk to be categorized as an emergency. According to Mitchell and Bray (1990) “the event must exert demands that surpass the effectiveness of the more routine coping mechanisms available to the person” (p. 11). It is significant to note that while Selye found that this response enables general resilience in the short term, the cumulative effects of the General Adaptation Syndrome pose a significant health risk. Notably, any energy made available but not expended in resolving the stressor was shown to have negative physiological effects to include

high blood pressure and an increased risk of heart attack and stroke (Selye, 1974). Further, risk of arrhythmias and hyperglycemia were noted, as well as altered mental function that increased the risk of impaired judgment, memory, and the occurrence of anxiety and depression (Essence of Stress Relief, 2008).

Emotions determine how we act when we find ourselves in stressful environments, according to psychologist and author Dan Coleman (1995). It is difficult to delineate between physiological and psychological response. Coleman offers that while emotions are related to the psyche by definition, both their etymology and purpose weave them inextricably with physiological response. The Latin verb which forms the root of emotion – *motere* – means “to move”, and when married with the prefix – *emotere* – means literally “to move away” (p. 6). Therefore, the physiological is predicated on the psychological, as the propensity to action is implicit in every emotion (Coleman, 1995).

To the extent that the physiological and psychological responses can be separately defined, Coleman (1995) found that the instantaneous emotion of anger caused increased blood flow to the hands and arms, in order to more adeptly strike a foe. Heart rate was also found to increase significantly, and a deluge of hormones such as adrenalin readied the body for strong and vigorous action.

When the emotion of fear was acutely encountered, heart rate also increased, but blood volume was shunted to the large skeletal muscles – particularly in the legs – to prepare a person to flee. Simultaneously, the body freezes in a reaction known as the “fight or flight” (Coleman, 1995, p. 7) response, allowing intuition to better form a recommendation for action. Also, senses and focus are acutely heightened and narrowed to allow for more detailed focus on the environmental risk.

Coleman (1995) and Klein (2003) also found that perhaps the most significant psychological reaction to a stress environment was the way in which the brain began to instantaneously function differently. Both researchers discovered that the right side of the brain – known for being emotional, creative, and intuitive – heightened its operations while at the same time minimizing the responsiveness of the brain’s left side, which is more logical, comparative, and objective. This psychological change allows the brain to work quickly and more effectively in a time compressed and stressful environment by limiting analytical thought and comparison (Coleman, 1995). Further it allows subconscious and rapid decision making based on perceived environmental cues, patterns, and adaptive expertise based partially on experience (Klein, 2003).

Other psychologists have noted the positive relationships that stress arousal has on performance. The Drive Theory (Asken, Grossman, & Christiansen, 2010) suggests that the level of performance will correlate directly to the level of arousal experienced by an individual. In essence, when stress arousal is low, performance will also be low. Likewise, when stress arousal is high, performance will also be high. The interpretation of Drive Theory is that more stress arousal equals a higher level of performance. In context, “This may be akin to football linemen who pound each others’ pads and bang helmets to get fired up” (p. 29).

A more commonly-accepted theory of arousal and response is known as the Yerkes-Dodson Law – and sometimes referred to as the “Upside-Down-U or Inverted-U Theory” (Asken et al., 2010, p. 29). The Yerkes-Dodson Law is named for the early-twentieth century psychologists who first found that for the execution of any task, there exists an optimal level of physiological and psychological arousal where task performance will be optimized (Yerkes & Dodson, 1908). Of significance to the research of Yerkes and Dodson is the relationship between low levels of arousal and poor performance. Further, while physiological and psychological

stress arousal is determined to help achieve optimal performance, too much arousal causes performance to deteriorate, as noted by the front side of the Yerkes-Dodson Curve.

A third model defining the relationship of stress arousal to performance is referred to as the Cusp-Catastrophe Model (Cohen, Pargman, & Tenenbaum, 2003). The Catastrophe Model suggests that performance is empirically related to stress arousal in the same way that is represented by the Yerkes-Dodson Law, with the exception that when stress becomes excessive to the point that it has a diminishing effect on performance, that performance declines abruptly and rapidly, versus the gradual decline of Yerkes-Dodson (2003).

While many expert researchers, psychologists and authors agree that stress can improve tactical performance, many also concur that stress in the individual reaches levels where performance is affected both negatively and dramatically (Asken et al., 2010; Cannon-Bowers & Salas, 1998; Cohen et al., 2003; Grossman & Christensen, 2008). While many physiological and psychological aspects are altered by operation in a stressful environment, Siddle found that the physiological effect of increased heart rate alone was enough to dramatically inhibit tactical operators (2003).

Siddle (1995) concluded that when heart rates reach 115 beats per minute, fine motor skills begin to fail systematically. When beats per minute exceed 145, complex motor skills suffer the same fate, leaving the tactical operator with significantly diminished capability to execute tasks. Finally, when heart rates exceed 175 beats per minute “A warrior can expect to experience auditory exclusion or loss of peripheral vision and depth perception. This initiates a catastrophic failure of cognitive processing capabilities, leading to fatal increases in reaction time or hypervigilance (freezing in place or irrational acts)” (p. 7). Siddle later refined his position when he published that reactions of the sympathetic nervous system, which control

stress hormones and heart rate, enhance the ability to perform gross motor skills (like push, pull, squeeze and lift), but significantly diminish both fine and complex precision motor skills (2008).

Putting Siddle's research into perspective, SWAT and special forces psychologist Mike Asken cautions tactical operators that it is important to differentiate between the causes of the elevated heart rate. Performance-deteriorating effects do not accompany elevated heart rates caused by physical exertion, like running, while they have been proven to be present when stressors are psychological and emotional (2010).

Asken's indication that the effects of physical stress and mental stress should be perceived very differently is supported by the research of Webb, McMinn et al. (2010) and Webb, Weldy, et al. (2008). The research conducted demonstrated how physically fit firefighters performing exercise exhibit a level of physiological and psychological stress that is elevated exponentially when mental stressors are added. In the instance of the 2010 research (Webb, McMinn, Garten, Beckman, & Acevedo) it was demonstrated that stress hormone production was elevated significantly and accompanied by a similar cardiorespiratory response when exercising firefighters were tasked with computerized strategy and tactics drills. As both Asken (2010) and Webb (et al., 2010) conclude, it is important for a line of demarcation to be drawn when considering the differences between the effect of psychological stressors and those that are strictly caused by physical exertion.

In July 1988, the AEGIS guided missile cruiser *USS Vincennes* shot down an Iranian Air commercial flight that crew members had misidentified as a military fighter on an attack vector. The incident took place during a high-stress passage through the Strait of Hormuz, immediately after the ship had been engaged by Iranian gunboats, and beneath the shadow of intelligence reports that warned of an impending attack (Cannon-Bowers & Salas, 1998).

Following the incident, TADMUS researchers sought to identify physiological and psychological effects of stress that negatively impact performance.

TADMUS researchers found that physiological changes in stressful environments resulted in increased heart rate, labored breathing, and trembling. Further, they identified emotional reactions to include fear, anxiety, frustration, and diminished motivation. Cognitive changes that took place under stress were tunnel vision, protracted reaction time to peripheral cues, lack of vigilance, performance rigidity, and decreased problem solving capabilities.

TADMUS also found that social behavior changed under stress, in that team perspectives were often lost, and “prosocial behaviors” such as helping were decreased (1998, p. 194). TADMUS researchers concluded that any one of the identified effects of stress could negatively affect task performance.

Physiological and psychological changes under stress that resulted in cognitive changes were found to be significant inhibitors to orientation, and therefore extremely undesirable (Coram, 2002; Richards, 2004). Those authors referred to the decision making paradigms created by USAF Col. John Boyd, who observed that when in conflict, any disability in orienting oneself with the environment had an exponential negative effect on speeds of decision and action. Boyd’s orientation is referred to as situational awareness (SA) by retired Fire Chief Richard Gasaway (2009). SA is defined as the ability to continuously observe and process cues and patterns from your environment and determine what those cues and patterns mean to the present and to the future. Gasaway discovered that 116 barriers to achieving and maintaining SA exist, and his analysis indicated that barriers to SA were the leading contributing factor in firefighter line of duty fatalities. SA barriers, if not overcome through training and expertise, may serve to further amplify stress effects and diminish performance, leading to undesirable outcomes (2009).

While Siddle (1995) made contention that performance was diminished by various levels of increased heart rate, and the associated stress responses that predicated the increase, Asken et al. argue that modern psychology proves the reality to be much more complex (2010). Asken lists four important factors that define the extent to which stress arousal may augment or diminish performance: The nature of the skill or task, the complexity of the skill or task, experience with the skill or task, and individual characteristics (p. 33).

Asken et al. defines the “nature of the warrior skill” by saying that “different skills or tasks can allow or actually require different levels of arousal to be performed in an optimal manner” (2010, p. 34). By way of illustration, Asken uses sports analogy to demonstrate that wrestling or heavy weight lifting requires more arousal (and better forgives excessive arousal) than does putting a golf ball or shooting a free throw. Similarly in the tactical environment, the task of forcing entry requires a higher level of optimal arousal than does communicating on the radio or processing information. When considering the effects of stress on performance, Asken reinforces the importance of understanding that different tactical skills are performed more effectively at different levels of arousal.

Related to the “complexity of the warrior skill” (2010, p. 37), Asken et al. indicates that the propensity to employ simple skills instead of complex ones increases as arousal levels become higher. This becomes of considerable importance when considering the role practice and expertise plays in successful performance under stress. An important consideration of the relationship between performance and stress is that “Skills that have been well-practiced allow higher levels of arousal without becoming impaired than do newly learned skills” (Asken et al., 2010, p. 38). Put in a simpler context “Proper experience and training engrains a skill so that it’s much harder to disrupt under any condition, including one of stress and arousal” (p. 38).

Finally, Asken et al. recognize “individuality and the warrior skill” as an important consideration for all tactical operators (2010). Because arousal response varies by individual, every operator has a uniquely defined optimal level of arousal related to tactical performance. The authors caution that it is important that leaders and trainers, as well as operators themselves, recognize that not everyone requires the same levels of arousal for optimal performance. Nor is every person’s level of arousal that signals degraded performance precisely the same. The key, says Asken, is for every operator to identify their own optimal level of arousal for maximized performance so that it can be maintained, and caution may be used not to exceed it (2010).

Both Grossman et al. (2008) and Asken et al. (2010) concur that survival in novel and stressful situations may be dependent upon the tactical operator achieving a state of orientation with the environment in which they are tasked to operate. Fundamental to maintaining orientation and performing effectively is understanding the nature and complexity of the work to be performed within that environment, as well as appreciating the ability of the environment’s stressors to compromise the adaptive expertise (or lack of expertise) of the tactical operator. Many researchers who have studied the effects of stress on performance (Asken et al., 2010; Cannon-Bowers & Salas, 1998; Coleman, 1995; Gassaway, 2009; Marshall, 1978) have concluded that recognizing the stressors present in complex environments and understanding the physiological and psychological effects of stress on performance have primary importance in promoting resilient operators and survivors.

The foundation of three research questions associated with this project dealt with identifying training paradigms to reduce the physiological and psychological effects of stress on performance. TADMUS researchers found that it is critical to differentiate between training and stress training (Cannon-Bowers & Salas, 1998). Where the primary goal of training is generally

considered to be the learning and committing to memory of skills, the training classroom reflects an environment that promotes and maximizes learning. Quiet classrooms, lecture formats and task execution under predictable conditions generally promotes the development of initial skill sets. That paradigm, however, is found to be quite unsatisfactory in preparing the student to execute skills that must be performed in high-stress, high-consequence environments. TADMUS researchers concluded that skills learned within traditional training models did not transfer to the stress environment, and therefore left the student unprepared (1998). Gasaway concurs with this assessment and applies it to the fire service, where he contends that we are training firefighters for failure rather than success. One of the primary reasons, according to Gasaway, is that the realities present in our training environments do not replicate the realities experienced in the actual performance of emergency work. Firefighters learn more effectively within an environment that simulates the stressors of the fireground, and where they are allowed to encounter problems, make mistakes, and develop problem-solving skills. Training that is conducted in traditional environments leaves emergency operators ill-equipped to cognitively access and physically execute skill sets in stressful environments (Nurnberg, 2012).

Because of this emerging reality, “the development of effective training interventions to ameliorate the negative effects of stress on performance has taken on increased performance in the training community” (Cannon-Bowers & Salas, 1998, p. 192). While this continues to be of emerging importance, Asken et al. contends that “no one has fully addressed a synthesis of current work in a comprehensive and structured manner; specifically, direction on how to use such techniques. . .to manage the performance-skewing effects of stress” (Asken et al., 2010, p. xiii). Specific to the fire service, Dr. Gasaway laments the fact that the training paradigms described by TADMUS and Asken are not part of our fire service, which is regrettable because

“If you do not understand it, then you are going to be in a vulnerable position at an incident, and something is going to go bad, and you are going to be part of the reason that it went bad, and when it’s all done you are going to wonder what the hell happened” (Nurnberg, 2012, p. 135).

Two prevailing training paradigms emerged from a review of literature. One was detailed in the TADMUS study (Cannon-Bowers & Salas, 1998) and was referred to as Stress Exposure Training. The other was published by psychologist Mike Asken and is referred to as the Warrior Mindset (Asken et al., 2010).

Stress Exposure Training (SET) has as its primary purpose “to prepare the individual to maintain effective performance in a high-stress environment” (Cannon-Bowers & Salas, 1998, p. 193). The definition of SET is “an intervention to enhance familiarity with the criterion environment and teach the skills necessary to maintain effective task performance under stress conditions” (p. 193). TADMUS defined three overriding objectives to be achieved by Stress Exposure Training, which are: “(a) gaining knowledge of and familiarity with the stress environment, (b) training those skills required to maintain effective performance under stress, and (c) building performance confidence” (p. 193).

The first objective - to convey knowledge of the stress environment - seeks to reduce stress by preparing individuals for the realities that they may encounter in the future (Cannon-Bowers & Salas, 1998). Informing a tactical operator about the nature of the stress environment enables the formation of accurate expectations related to the environment and promotes predictability. Further, it decreases the likelihood of distraction in the face of novel or high-stress, high-consequence occurrences, and it enables the operator to predict, train for, identify and potentially avoid diminished performance issues in the stress environment (1998).

The second objective of SET – the emphasis of skill development – seeks to enable the operator to overcome the potentially catastrophic impact of physiological changes, emotional reactions, cognitive effects, and negative social behaviors detailed on pages 24 and 25 of this literature review. An example of enabling objective fulfillment may be “to address the degradation that stems from having to juggle multiple tasks in a high-demand stress environment, stress training may provide practice in time-sharing multiple tasks and in prioritizing critical task demands” (Cannon-Bowers & Salas, 1998, p. 194). In this light, instilling behavioral and cognitive skills in trainees produces the ability to maintain effective performance under the yoke of adverse physiological and psychological reactions to the stress environment (1998).

The third and final training objective of SET – building confidence in the ability to perform – seeks to demote the formation of negative expectations related to capacity to perform in the stress environment, and instead to instill a positive attitude of accomplishment and survival (Cannon-Bowers & Salas, 1998). TADMUS found that SET was ineffective when the trainee did not experience success or a sense of task proficiency. They subsequently found that operators who have confidence to execute skills proficiently in the task environment, and who view the stress environment in positive terms “are likely to suffer fewer negative effects of stress. They will be less aroused psychologically, less distracted by task-irrelevant concerns, and more likely to focus attention on the task” (p. 194).

Grossman et al. (2008) support this contention by pointing to their experience that “killing” a trainee during an exercise, or concluding training based on trainee failure, only prepares operators to die or to fail in the environment where conflict exists. A trainer should never permit this scenario to occur, and a trainee should be programmed to display a survivor

mindset and continue performing during an exercise no matter what failure is experienced. Because stress inducing simulation training “places an obvious fork in a person’s survival psychology pathway” (p. 134), a trainee who stops or is caused to stop after experiencing failure “programs an undesirable and potentially self-destructive action into his mind” (p. 134).

TADMUS allows that there has occurred some effort to implement different sorts of stress training, with SCBA confidence courses being a prime example (Cannon-Bowers & Salas, 1998). While some stand-alone stress training initiatives may be successful in allowing a cumulation of knowledge related to stress training techniques, very seldom are they effective in preparing trainees for the real-world stress environment. TADMUS contends that SET offers the first integrated approach to stress training that allows careful sequencing of information and skills, as well as an adaptable model for approximating the stress environment (1998).

The implementation of Stress Exposure Training consists of a three-stage training intervention: (a) the initial stage where trainees are taught about stress and stress effects, (b) a stress training phase, in which special cognitive and behavioral skills are developed, and (c) the final stage of application and practice in conditions that increasingly approximate the criterion environment (Cannon-Bowers & Salas, 1998, p. 195).

During the first phase of SET implementation, the trainee should be provided with preparatory information regarding the environment, as well as information about stress responses to the environment. This phase should provide the motivation necessary to understand the value of SET training, as well as “emphasizes the rewards and costs of effective and ineffective performance in the stress environment in order to understand the value of training” (Cannon-Bowers & Salas, 1998, p. 197-8). A comprehensive SET strategy will address: (a) sensory information, which explains how the trainee is likely to feel under stress, (b) procedural

information, which describes the events that will be encountered under stress, to include setting description, types of stressors, and stressor effects, and (c) instrumental information, which will describe adaptive control techniques that may be employed to minimize and overcome the specific effects of stress (1998, p. 200).

The second implementation phase of SET is related to the acquisition and rehearsal of cognitive and behavioral skills that will allow effective performance when physiological and psychological effects of stress are encountered (Cannon-Bowers & Salas, 1998). This phase consists of four important initiatives. The first - cognitive control strategies – emphasizes interventions to “replace negative or distracting cognitions with task-focused cognitions” (p. 201). The second – physiological control strategies – enables a trainee to assess and control negative physiological reactions to stress. Using relaxation and tactical breathing techniques, this training “attempts to train people in the responses characteristic of effective performers under stress conditions: calmness, relaxation, and control (p. 202).

Subsequently, the third initiative of SET’s second phase promotes overlearning, a technique designed to instill “habitual responses that are less vulnerable to stress decrement” (p. 202). Because an effect of the stress environment is to diminish attentional capacity, overlearning instills as “automatic adaptive response” (p. 203) that creates a more resilient and survival-prone tactical operator. TADMUS researchers held that the technique of overlearning was “a particularly potent training procedure for the stress environment” (p. 203).

A fourth initiative related to the SET’s second phase was teaching mental practice. TADMUS researchers found that mentally visualizing specific skills absent of a stress environment was particularly effective in promoting resilient skill development in trainees. While somewhat less effective than the physical execution of skills, mental practice was found to

strengthen neural pathways and make execution of skill sets easier to recall when under stress. Further, it provided an effective method to practice skills that might be dangerous to replicate during training, or skills for which training evolutions occur infrequently (Cannon-Bowers & Salas, 1998).

The third and final implementation phase of SET is related to the application and practice of operations in the stressful environment. While it is stressed by TADMUS researchers that for occupations like firefighting, law enforcement and the military “absolute fidelity in training is not possible nor necessarily desirable” (p. 213), application of skills in an approximated stress environment was found to be invaluable to creating resilient tactical performers. Stress training in the approximated environment should be done “in a graduated manner across increasing levels of stress (from moderate stress exercises to high stress exercises)” (p. 212) and is found to increase both confidence and control in the tactical setting.

The second training paradigm for promoting resilient performance under stress was created by psychologist Mike Asken et al. (2010) and is referred to as the “Warrior Mindset” (p. xiii). Asken is considered to be a seminal source because of his extensive research, and the analysis and synthesis of existing research. Further, he is a psychologist for the Pennsylvania State Police, and has provided training not only for the PSP, but also for the highest levels of municipal, state and federal law enforcement, as well as special forces groups within the United States armed forces (2010, p. 251).

A primary goal of the Warrior Mindset is to promote and instill mental toughness in tactical operators that work in stressful and dangerous environments. According to the authors:

Mental toughness is possessing, understanding, and being able to utilize a set of psychological skills that allow the effective, and even maximal execution or adaptation,

and persistence of decision-making and physical and tactical skills learned in training and by experience. Mental toughness expresses itself everyday, as well as in high stress, critical situations (Asken et al., 2010, p. x).

In accordance with that goal, the purpose of Warrior Mindset training is to provide “a foundation in the psychological skills of mental toughness that promotes optimal response, and especially in high stress missions and operations” (Asken et al., 2010, p. xiii). Foundational to the idea of instilling psychological skills is the notion that an ideal training paradigm would integrate psychological performance skills with other specific mission-oriented skills. Asken contends that “Just as the mind and body are not separate and distinct, neither should be so-called mental and physical skills training” (p. xiv).

Warrior Mindset (WM) training consists of ten integrated and sequenced phases of instruction. They are: (a) Screening procedures, (b) Physical conditioning and mental toughness, (c) Arousal and mental toughness, (d) Stress, fear and mental toughness, (e) Tactical arousal control and mental toughness, (f) Concentration skills and mental toughness, (g) Tactical performance imagery and mental toughness, (h) Tactical self-talk and mental toughness, (i) Negative thought stopping and mental toughness, and (j) Attitude, affirmations and mental toughness (Asken et al., 2010).

The first sequence in WM training deals with screening procedures (Asken et al., 2010). Information gathering allows individuals to qualitatively measure their psychological skills that allow maximum performance of physical ones. This initial phase has great value because “Knowing ‘what you got’ in terms of mental toughness and psychological abilities allows you to efficiently use your time and energy” to enhance your skills (p. 1). This is accomplished by using a Mental Toughness Psychological Skills Profile (MTPSP) which helps individuals to better

understand the psychological skills they already use, and to appreciate how those skills might be further enhanced.

The second sequence is designed to help trainees understand the relationship between physical conditioning and mental toughness. Asken believes that being fit-for-duty is a combination of excellence in both the physical and mental domains (Asken et al., 2010). The relationship between the two is critical to understand “Because the brain (and the mind) exists in the environment of the body, the quality of that environment is an essential factor in the quality of psychological function” (p. 17). In this segment Asken advocates instruction on the benefits of exercise for both the mind and body, as well as for increased mission function. Also included in this segment are data that define the performance deteriorating effects of recreational drugs, performance enhancing drugs, alcohol, as well as the positive effects of caffeine use and the detrimental effects of caffeine abuse (2010).

The third sequence is related to arousal and mental toughness. In a similar way to TADMUS researchers, Asken et al. relate that “A fundamental requirement for a successful mission is to understand and control arousal, that end state that allows you to fight or flee at maximum capacity” (2010, p. 27). Central to this training sequence is an analysis of existing research previously examined on pages 22-23 of the literature review, to include Drive Theory, the Yerkes-Dodson Law, Catastrophe Theory, and Siddle’s (1995, 2008) examination of stress, heart rate, and performance. Another fundamental goal of this sequence is to enable each trainee to define for themselves their own optimal level of arousal for maximum performance under stress (Asken et al., 2010).

The fourth training sequence deals directly with the impact of stress and fear on mental toughness. The first important concept addressed is the Yerkes-Dodson notion of under-arousal

and associated performance detriment. Asken relates that it is not uncommon for operators to experience an inability to achieve an optimal state of arousal for task performance (2010). Notable scenarios where this occurs are insufficient sleep or being awoken to respond to a crisis, protracted operations, having an “off day” where you “just aren’t into it” (p. 44) and being unable to anticipate the nature of the mission. This training section relates proven psychological methods to increase arousal when needed, such as physical warm-ups, utilizing motivating cue words or images, self-efficacy statements, and anger transformation (2010).

Where the dangers of over-arousal are concerned, Asken finds significant benefit in instilling an awareness of the components, characteristics, and consequences of high-stress situations. Components deal with situation appraisals and emotional responses, while characteristics of high-stress situations entail required multi-tasking under duress, complex and unpredictable task environments, and unexpected demands that disrupt normal operations (2010). The consequences of high-stress situations are those physiological and psychological effects of over-arousal that serve to impede performance. These include but are not limited to increased heart rate, blood pressure and respiration, fatigue, trembling, visual changes and decreased emotional control. Further performance effects of stress such as decreased situational awareness, decreased ability to deal with errors and decreased efficiency in mental processing are addressed, as are perceptual effects such as auditory exclusion, tunnel vision, temporary paralysis and intrusive / distracting thoughts about loved ones (2010).

Of primary importance in this sequence is Asken’s contention that trainees must be taught that their perceptions are often what control their reactions. “Faced with an objective situation or challenge, you then make an appraisal of the situation and evaluate your ability to deal with it” (2010, p. 53). Asken further finds that where appraisals indicate a confidence in

preparation to act, stress will be minimal and optimal arousal may be more easily achieved. In instances where the appraisal indicates poor preparation for action, stress will increase along with potentially catastrophic performance effects. Preparing trainees to appreciate that performance, and indeed survivability, can be largely determined by their own perception increases motivation to better understand the concepts of mental toughness (2010).

The fifth sequence in Warrior Mindset training seeks to instill what Asken et al. refer to as “Tactical Arousal Control Techniques” (2010, p. 95). The authors found that relaxation methods were successful in helping tactical-operators in high-stress environments exercise control when adverse physiological and psychological effects of stress were realized. One method taught in this sequence is “Tactical Muscle Relaxation” (p. 101). Tactical Muscle Relaxation (TMR) is an easily-learned meditative technique that involves associating a command word, or cue, that is used in practice while quietly focusing on meditative muscle relaxation (2010). With some practice, association with the cue word creates a Pavlovian physiological response which allows the body to achieve a conditioned state of relaxation when the command word is employed. The benefits of TMR include physiological and psychological control of stress, reduced anxiety, reduced likelihood of injury, and enhanced skill performance (2010).

Another stress control technique found to be effective in the stressful environment was Tactical Breathing, or 4-count breathing (Asken et al., 2010). This method involves inhaling deeply to a slow count of four, holding the breath for the same count, exhaling slowly for four counts, and then holding for four additional counts before inhaling again. This method was found to be useful for special forces tacticians and snipers, who used a few cycles of Tactical breathing to calm themselves and prevent over-arousal (2010).

The sixth training sequence deals with concentration skills and mental toughness. Asken et al. contend that the brain has superlative abilities to observe and process cues and patterns in a way that augments intuitive decision making. They warn, however, that “Excessive negative emotional arousal can paralyze cognition, which the warrior often experiences as lost situational awareness or having an incorrect mental model of what is occurring (fog of war)” (2010, p. 130). While the authors admit that the science surrounding concentration and cognition is fledgling but rapidly evolving, they offer a method of training for adaptive and disciplined attention skills through a model called “Attention Fixation Training” (p. 146), or AFT.

AFT involves progressive training in focusing solely on an object, such as a fire helmet. Asken (2010) recommends a person take their fire helmet into a quiet room and focus on the object and nothing else, carefully noting all of the details of the helmet and thinking about nothing else. The trainee should maintain diligent focus for 15-30 seconds, gradually increasing the duration of careful attention to two minutes. Asken cautions that this exercise is related to disciplined focus, and that distracting thoughts will pervade the trainee’s awareness. They should be discarded as quickly as possible with focus returned to the fire helmet (2010).

Once practice in AFT allows for uninterrupted focus for a period of two minutes, a distraction such as quiet music should be introduced to the environment; the trainee then concentrates intently on ignoring the music and maintaining disciplined focus on the object for two minutes (Asken et al., 2010). Gradually, the volume of the distraction should be increased until the trainee can maintain sharp focus on the object without being distracted by the loud music. Once that has been achieved, sounds from the real world should be integrated in the same way the music was. According to Asken et al., “By training with sounds that mimic the type of settings in which you actually function, you more quickly transfer your skills to real-life

situations” (p. 147). Ultimately, this training should be transferred to an environment that closely approximates the tactical environment. To implement flexibility and resilience, it is further recommended to ultimately transfer disciplined focus from the object to the distraction, and then back to the object. Attentional focus skills develop rapidly, and AFT exercises “strengthens your ability to focus your attention, which is often the hardest thing to do in highly charged distracting situations” (p. 147).

The seventh sequence in Warrior Mindset training promotes the development and use of Tactical Performance Imagery (TPI). Mental imagery, also called mental practice, is a process that Asken et al. hail as one of the most powerful psychological skills for increasing mental toughness. This is due in part to its effectiveness in instilling flexibility and adaptability, but also because it is a practice that most people use to some extent on a regular basis (2010, p.150).

TPI is the recruitment of imagination to enhance the execution of specific skills, and should be considered to be mental rehearsal of skills or missions (Asken et al., 2010). TPI is used to augment physical skills, such as tying knots, forcing doors, or performing EMS skills. It is also a useful tool in improving interactional skills. According to Asken et al.:

It can be particularly useful in skills that are sequenced. . .by imaging the details of the mission, you not only ‘practice’ . . .but you can also check for any points of uncertainty or confusion about what should be done. If you cannot complete the mission smoothly in your imagery, you probably cannot execute it effectively in reality (p. 152).

TPI is useful for skill improvement, but it also has significant application for analysis and correction of performance errors. By working to imagine a tactical scenario, correct action sequences are enhanced and identification of uncertainty, confusion, and mistakes occurs, allowing for consideration of more effective responses. In this way “imaging helps to ‘erase the

old tape' of sub-optimal response and errors to 'reprogram' a more successful response to be stored in your brain" (Asken et al., 2010, p. 153).

The authors found that TPI also is an effective method to maintain skill sets in between physical training evolutions, and to build confidence in abilities. The latter is extremely important because confidence helps to displace negative imaging, which was shown to be far more effective in promoting undesirable performance than TPI is in eliciting effective performance (Asken et al., 2010). Further, "Tactical Performance Imagery integrated with training and practice can provide exposure for developing depth and breadth of knowledge and experience within a context of structured training, variable situations, repetition and feedback to practice accessing and applying skills in multiple challenges" (p. 155).

In order to make Tactical Performance Imagery maximally effective, Asken et al. found that the following rules should be followed: imagine using all senses, use the best perspective, imagine correct responses, imagine in real time, image problems and success, move and use kinesthetic imagery, and make the images as vivid as possible (2010, p. 157). These techniques, described in specific detail in the book *Warrior Mindset* (Asken et al., 2010), can be very effective for two primary reasons: first, because the brain is essentially unable to distinguish between fact and fiction; therefore scenarios that are rehearsed using mental imagery are mentally catalogued as real experiences. Also, biofeedback is at work during TPI, causing detectable electrical signals in the muscle groups that are being "worked" in the imagery scenario. "This suggested that performance imagery strengthens the connections between the brain and the body parts involved in actually doing the skill" (p. 173). It is significant to note that the use of mental imagery was found to be effective by other researchers (Cannon-Bowers & Salas, 1998; Coleman, 1995; Gassaway, 2009; Grossman & Christensen, 2008).

The eighth sequence in Warrior Mindset training teaches the value of Tactical Self-Talk. Asken et al. explain that cognition is essentially defined as “how we think” (2010, p. 184). Considerable cognitive research, as well as the application of cognitive-control techniques have demonstrated that thoughts “have a strong effect on our emotions, behavior, and therefore, the quality of our performance” (p. 184).

This concept is important to reinforce because most people very frequently experience thinking as having a conversation with themselves. “This is called self-talk and it’s a powerful process that affects your behavior and a powerful tool to maximize your performance” (Asken et al., 2010, p. 185). Asken advocates a self-talk training initiative called “STEP-UP” which refers to “Self-Talk for Enhanced Performance – Under Pressure” (p. 189). Being able to STEP-UP as a result of Warrior Mindset training “is like having your instructor, coach, or your DI ‘whispering’ what you need to do at each given point in the mission” (p. 189). Using the STEP-UP method has also proven to be very effective in enhancing performance because it can effectively stop negative self-talk, which is prone to occur when physiological and psychological stress causes confidence to be low (2010). Using the STEP-UP method involves achieving optimal zone of performance, encouraging both yourself and others, monitoring / counteracting distorted thinking, focusing on action, and phrasing self-talk instructions positively (2010).

The ninth initiative in Warrior Mindset training defines the relationship between negative thought-stopping and mental toughness. It has been established in this literature review that negative thoughts serve to diminish performance. According to Asken et al., negative self-talk interferes with tactical by creating stress and anxiety, degrading self-confidence, impeding concentration, programming self-doubt and failure, and infecting other personnel (2010, p. 202). It is also noted that the toxic effect of negative thoughts is much more powerful than positive

thoughts. Asken relates the results of research focused on professional arm wrestlers where the competitors were paired disparately according to strength. Prior to every competition, the objectively stronger competitor was told that he was weaker than his opponent, while the weaker opponent was told that he was stronger. In a majority of the arm wrestling matches, the objectively weaker competitor was victorious (2010).

There are two methods for effectively stopping negative thoughts, and they may be sequenced with each other (Asken et al., 2010). The first involves use of an imperative or emphatic key word that a trainee can be taught to say (or even yell) to himself when he senses negative thoughts, such as “No!” or “Stop it!” After stopping the negative thought, the trainee should immediately transition into positive self-talk, or positive mental imagery as described previously (2010).

The final sequence of the Warrior Mindset stresses the importance of attitudes and affirmations in mental toughness. Essentially an augment to the positive effects of Tactical Self-Talk and negative thought stopping. According to Asken (2010), they form the two primary ingredients in creating and maintaining a positive attitude. Because attitude represents “the essence of the survival mindset, the winning mindset” (p. 209) it is important to exhaust every approach to maximizing positive attitude. While the authors contend that “the best source of effective attitude is your confidence in your ability to perform physically and psychologically, both of which come from the mental toughness techniques described earlier” (p. 209) it is also incumbent on the trainee seeking mental toughness to appreciate the performance value of affirmations (2010).

Described simply by Asken et al. (2010), an affirmation is a creed, invocation, or inspirational phrase designed to motivate an operator in one of three categories: performance,

personal or professional. Examples of performance affirmations identify foundational aspects of skill sets or effort, such as “I will never quit,” or “I will look out for my team mates at all times” (p. 210-211). Personal affirmations recognize unique and definitive qualities, such as “I trust myself,” or “I am committed to excellence” (p. 210), while professional affirmations refer to unique qualities of yourself as a warrior, survivor, or servant, such as “I am mentally tough” (p. 2010).

The results of this literature review revealed that effective tactical performance in stressful environments was first predicated on understanding the nature of the environment where tactical action occurs. It was demonstrated in the literature that the conflict environment possesses attributes that confuse, disorient, and render ineffective even dedicated practitioners. It was also discovered that an appreciation for the attributes of the conflict environment, and training in environments that progressively and accurately replicate the stress environment are required for effective performance under stress. It was also determined that the nature of conflict – be it on the battlefield or the fireground – is universal, and that the lessons of the combat arms and other professions are applicable to the fire service.

It literature review also determined that physiological and psychological effects of stress serve to augment effective tactical performance, and that performance may also be significantly diminished – possibly with fatal consequences – when physiological and psychological arousal becomes too high. It was a significant contention among the sources reviewed that tactical performance in the stress environment is less likely to be augmented and more likely to be negatively impacted.

The literature review also revealed that science related to training tactical operators to perform well under stress is fledgling but emerging, and that few training models exist or are

presently employed. Science has indicated that thorough training on the physiological and psychological effects of stress is imperative for creating resilient performers, and that sequenced training initiatives are considered to be the most profitable in creating successful performers within the conflict medium.

Procedures

The research problem and purpose was identified by my experience as a fourth-year candidate in the National Fire Academy's Executive Fire Officer Program, where research efforts have focused on the effects of stress on rapid tactical decision making and tactical performance. Experience as a United States Marine, a member of the Iowa City Fire Department Command Staff, and as a company officer who has both witnessed and experienced diminished tactical performance in the stressful operational environment also contributed to the identification of the research problem and purpose.

The descriptive method of research was used to answer the following questions related to the physiological and psychological effects of stress on performance: (a) How does stress impact the performance of emergency operators? (b) What methods do other professions use to reduce the physiological and psychological effects of stress on performance? (c) What methods do other fire departments use to reduce the physiological and psychological effects of stress on performance? (d) What models or methods should the Iowa City Fire Department use to train members to understand and minimize the physiological and psychological effects of stress on performance?

While not a research procedure per se, a literature review was initially used to gather information on the subject of stress and its effect on operators who function in dangerous and stressful environments. Literature from military commanders representing diverse countries and

historical periods was studied, as well as numerous researchers and experts in the fields of psychology, neuroscience, and human behavior. The literature review provided insight related to which groups to survey, and informed the writing of the survey questions.

Components of original research associated with this project took the form of two surveys. The first electronic survey instrument was developed to help further define the research problem and purpose as it was related to the Iowa City Fire Department. In order to provide insight into answers for the first and fourth research questions, the survey instrument also sought to determine the following: (a) the attitudes of firefighters related to the importance of the mental aspect of emergency operations, (b) the experience of firefighters with either experiencing or witnessing the negative effects of stressors on performance, (c) the degree to which firefighters have received explicit training on the physiological and psychological effects of stress, (d) the degree to which the ICFD training program has prepared firefighters to function effectively under stress, and (e) the attitudes of firefighters related to the ability of explicit psychological training to increase their performance in austere environments.

The first electronic survey instrument (hereafter referred to as the internal survey) was posted on www.surveymoneky.com on February 1st, 2013. An e-mail was sent to all members of the Iowa City Fire Department on the same day explaining the research project and associated survey, and asking all members to complete the internal survey. A total of 67 surveys were distributed. 32 respondents completed the survey for an overall response rate of 48 percent. The internal survey instrument is included with this project as Appendix A.

The second electronic survey instrument was developed to help further define the research problem and purpose as it was related to both other fire departments and other professions. In order to provide insight into answers for all four research questions, the second

survey instrument also sought to determine: (a) the degree to which other fire departments and other professions have received explicit training on the physiological and psychological effects of stress, (b) the experience of others related to experiencing or witnessing diminished tactical performance in stress environments, (c) the degree to which those organizations provide sequenced stress training, (d) the experience of other organizations in preparing operators to understand the nature of the stress environment, (e) the experiences of other organizations in providing real-time, scenario-based training, (f) the experience of other organizations in providing training scenarios that approximate the conflict environment, and (g) if any stress training initiatives were used by other organizations that were not specifically referenced in the survey.

The second electronic survey instrument (hereafter referred to as the external survey) was posted to www.surveymonkey.com on February 2nd, 2013. An e-mail was sent on the same day to approximately professional contacts in the fire service, law enforcement, EMS, and the United States armed forces. The e-mail explained the research project and associated survey, and asked all recipients to complete the internal survey. A total of 126 surveys were distributed. 90 respondents completed the survey for an overall response rate of 71.4 percent. The external survey instrument is included with this project as Appendix B.

The final results of this survey were impacted by significant limitations. The first limitation was that the literature review caused me to recognize that the project scope was both exceedingly broad and relatively complex. The literature revealed that the physiological and psychological processes that occur in a stressful environment have a myriad of both causes and effects that are incredibly complex, making them difficult to summarize. A significant omission of this research project dealt with the regions of the brain and their relative function both

normally and under stress which predicate many of the effects described in this research. Those functions and processes were increasingly difficult for the layman to understand and summarize in a meaningful way, and were therefore omitted.

It was also determined during the literature review that a line of demarcation existed related to the proliferation of resources – namely that significant research exists related to occupations outside the fire service, while a relative dearth of resources exists related to the fire service. The former is defined by the more than 4,000 pages of literature reviewed, while the latter is defined by the existence of only two published fire service-related books in publication. Of those two books, one deals primarily with situational awareness and decision making (Gassaway, 2009), while the other deals specifically with the subject matter but is more than two decades old (Mitchell & Bray, 1990). Of the more than 15,000 EFO ARPs catalogued as of this date, none were found to deal specifically with the physiological and psychological effects of stress on performance.

Time was also considered to be a limiting factor where literature review was concerned, as scientific publications referenced a myriad of related studies that might have been of significant value, but could not be reviewed in the time available. Further, complexity of information was a significant impeding factor. A majority of pertinent resources detailed the results of research in psychology and neuroscience, and some was found to entail academia that exceeded my understanding, or contained novel and complex findings that were difficult to review succinctly, as in the case of Asken (2010).

A second limitation was related to the second and third research questions. The questions sought to determine what training methods or models other organizations used to minimize the physiological and psychological effects of stress on performance. The literature revealed that

subject matter experts in the military, law enforcement, and the fire service have concluded that existing training paradigms are ineffective in preparing resilient operators, but it is considered a possibility that this would not be assumed to be true among training professionals who have not reviewed the literature. It is also a possibility that very few people, if any, have reviewed the literature when it is considered that fire service resources are exceedingly scarce. Therefore, many survey respondents may believe that their training paradigms are sufficient, when in fact that may not be true.

A third limitation was related to the external survey instrument, and is impacted by two considerations. Primarily, my relative inexperience with designing surveys may have served to diminish the level of detail that was gleaned by the instrument, particularly as it is related to modern stress training techniques in the military and law enforcement, areas in which I have little familiarity. As this limitation was anticipated from the outset, I did enlist the assistance of three trusted mentors in reviewing and providing feedback on the voracity of the external survey. The mentors were Baltimore County Battalion Chief (retired) and current TriData Project Manager Stephen Brezler, United States Marine Corps Major and FDNY Firefighter Jason Brezler, and United States Marine Corps CWO5 (retired) and Chicago Police Department Precinct Commander Dr. James Roussell. Secondarily, my professional contacts list for military and law enforcement personnel is not robust, and may not be considered to represent a sufficient sample group to derive an accurate representation of “best practices” used in those fields.

Finally, a fourth limitation was realized when considering the relationship of the internal survey instrument to the first research question, which was: (a) How does stress impact the performance of emergency operators? Questions 2-5 of the internal survey instrument listed some examples of physiological and psychological effects of stress on performance and asked

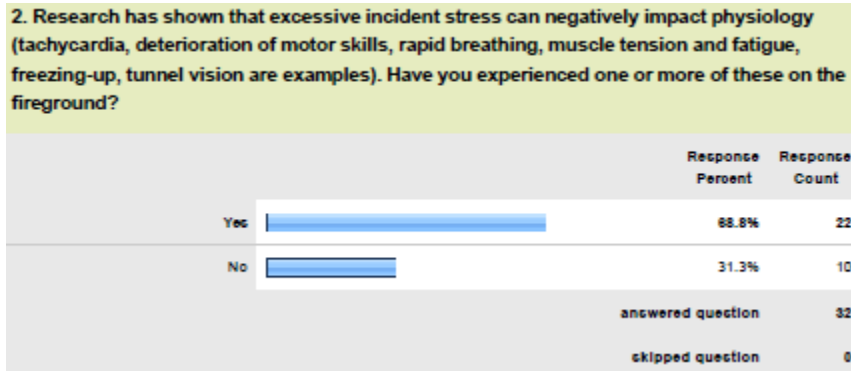
only if ICFD firefighters had experienced one or more negative effects of stress. It would have proven far more effective if the survey had included a more comprehensive list and asked respondents to identify specifically each one that they had experienced. It is reasonable to assume that such data should be further expanded by identifying the frequency with which each effect is experienced, and the degree to which individuals believe those effects impact their performance. This data would have provided deeper insight into the answer for the first research question.

A question raised by the internal survey results and related to this limitation deals with possible the possible infidelity of the respondent's introspection. Specifically, nearly 100 percent of respondents believed that co-workers had experienced one or more performance-diminishing effects of stress, while far fewer believed that they had experienced those effects themselves. Further research is required to determine if and to what degree people believe themselves to be more resilient under stress than their peers.

Results

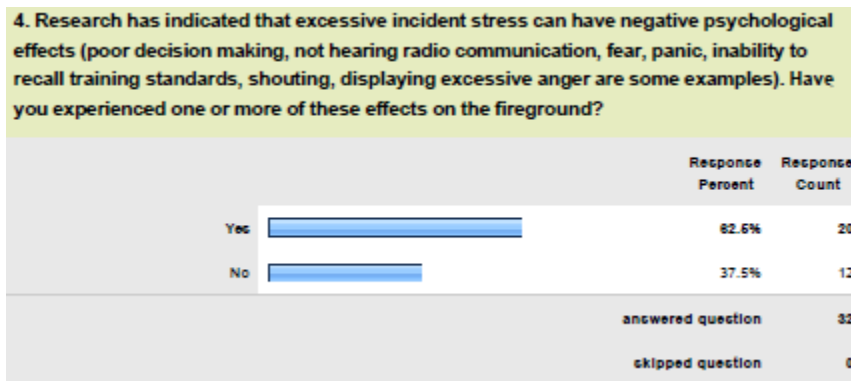
The first research question was: (a) How does stress impact the performance of emergency operators? The literature review revealed a myriad of ways that the physiology and psychology of tactical operators are influenced both positively but mostly negatively when subjected to stress. The internal survey document of members of the Iowa City Fire Department listed examples of some detrimental physiological and psychological effects of stress and asked the respondents if they had personally experienced one or more of those effects (Figure 1 and Figure 2). 32 of 32 respondents answered both questions, for a response rate of 100 percent.

Figure 1. Physiological effects of stress experienced



22 respondents representing 68.8 percent admitted that they had experienced one or more of the negative physiological effects of stress on the fireground. 10 respondents representing 31.2 percent admitted that they had not experienced any of the physiological effects under stress.

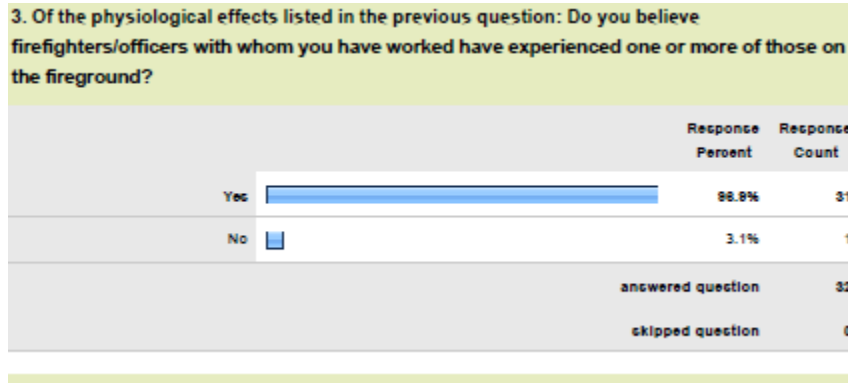
Figure 2. Psychological effects of stress experienced



20 respondents representing 62.5 percent admitted that they had experienced one or more of the negative psychological effects of stress on the fireground. 12 respondents representing 37.5 percent admitted that they had not experienced any of the psychological effects under stress.

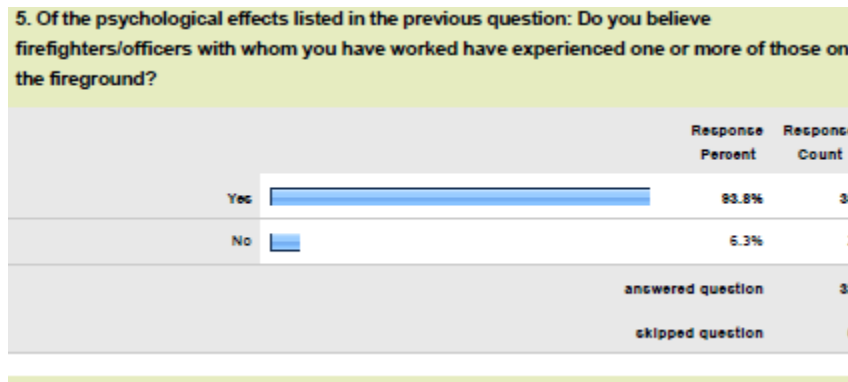
Subsequent questions asked the respondents to identify if they believed firefighters and officers with whom they have worked on the fireground had experienced one or more of those negative physiological and psychological effects of stress (Figures 3 and 4). 32 of 32 firefighters surveyed answered the questions for a response rate of 100 percent.

Figure 3. Physiological effects of stress observed in co-workers.



31 of 32 firefighters surveyed, representing 97 percent, believed that their fireground co-workers had experienced one or more negative physiological effects of stress. 1 respondent representing 3 percent did not believe that other co-workers had ever experienced any such effects.

Figure 4. Psychological effects of stress observed in co-workers.

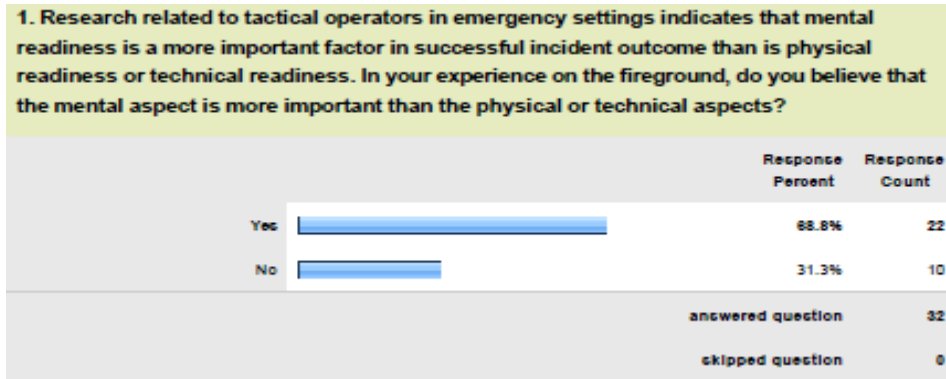


30 of 32 firefighters surveyed, representing 94 percent, believed that their fireground co-workers had experienced one or more negative psychological effects of stress. 2 respondents representing 6 percent did not believe that other co-workers had ever experienced any such effects.

Another survey question informed respondents that the literature review indicated that mental readiness was a more important factor in determining successful incident outcome than

was physical or technical readiness. The question sought to determine the degree to which firefighters believed this statement to be true (Figure 5).

Figure 5. The importance of mental readiness vs. physical/technical readiness.



32 of 32 people surveyed answered the question, for a response rate of 100 percent. 22 firefighters representing 70 percent allowed that mental readiness was the most important factor, while 10 firefighters did not believe that to be true.

The research survey concluded that the majority of firefighters believe positive incident outcome to be predicated primarily on psychological resilience. Further, a majority of respondents concluded that they had experienced one or more physiological and psychological effects of stress that diminished their performance, and nearly all respondents believed that co-workers had experienced those effects while on the fireground. The research did not provide an empirical answer to the research question, but it did conclude that examples of physiological effects of stress (tachycardia, deterioration of motor skills, rapid breathing, muscle tension and fatigue, freezing-up, and tunnel vision) were considered to diminish performance, and were experienced by most firefighters, although the degree and frequency of experience was not determined. The research also concluded that examples of psychological effects of stress (poor decision making, not hearing radio communication, fear, panic, inability to recall training standards, shouting, and displaying excessive anger) were considered to diminish performance

and were experienced by most firefighters, although the degree and frequency of experience was not determined.

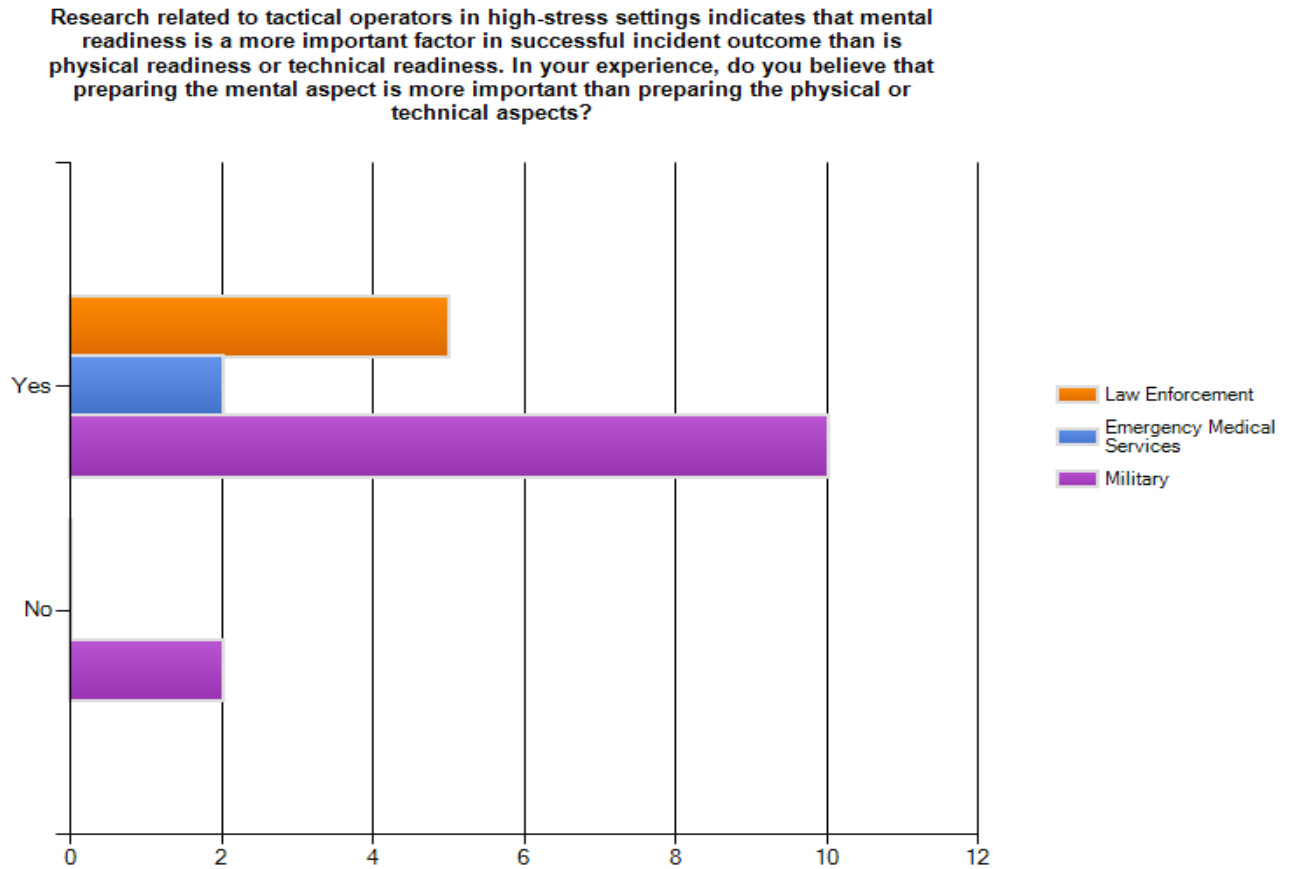
While further research is required to identify an empirical answer to the first research question, it may be deduced from the internal survey instrument that physiological effects of stress are tachycardia, deterioration of motor skills, rapid breathing, muscle tension and fatigue, freezing-up, and tunnel vision. Similarly, the psychological effects of stress are poor decision making, not hearing radio communication, fear, panic, inability to recall training standards, shouting, and displaying excessive anger.

The second research question asked (b) What models do other professions use to reduce the physiological and psychological effects of stress on performance? An electronic survey instrument surveyed leaders in other professions who conduct tactical operations under stress: Law enforcement, emergency medical services, and the American military. The survey was submitted to 20 municipal, state and federal law enforcement officers who serve as patrol officers, members of special tactical teams, and in undercover investigative capacities. The survey was also submitted to 10 leaders in EMS operations that provide ALS transport services, as well as 26 military officers and operators in the United States military.

Eight of 20 law enforcement officers responded to the survey, for a response rate of 40 percent. Two of 10 EMS professionals responded, for a response rate of 20 percent. 13 of 26 military officers responded to the survey, for a response rate of 50 percent. In total, 23 of 56 respondents in those professions responded, for an overall response rate of 41 percent.

A survey question sought to determine the degree to which members of other professions concur with a common research contention that mental readiness is more important than physical or technical readiness (Figure 6).

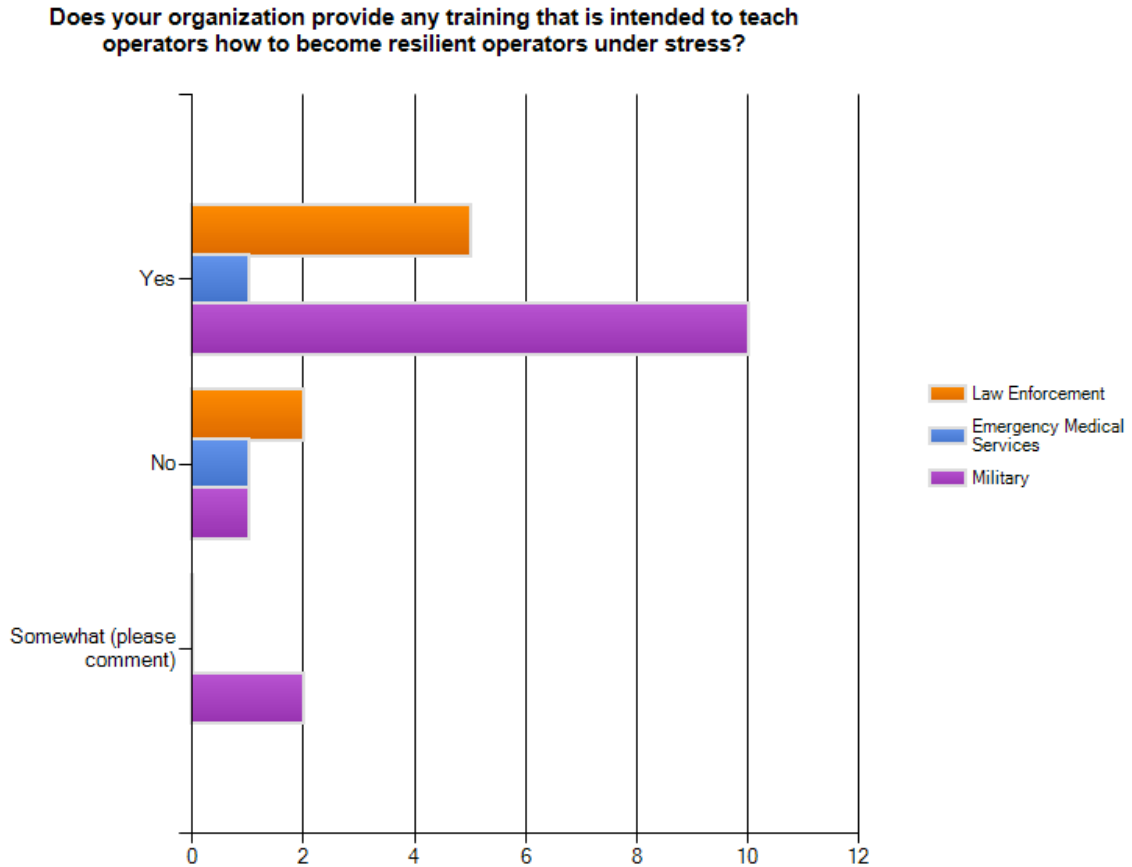
Figure 6. The importance of the mental factor.



The results showed that members of other professions overwhelmingly agreed that mental readiness was paramount. 19 of 23 survey participants completed the question, for a response rate of 82.6 percent. Five law enforcement officers, comprising 100 percent of the sample answering the question, believed that mental readiness was most important. Two EMS professionals, comprising 100 percent of the EMS sample answering the question, concurred. Ten military leaders agreed, representing 83.3 percent of the military respondents answering the question. Combined results showed that 17 respondents (89.5 percent) agreed that mental readiness was most important, while two (10.5 percent) did not.

A subsequent question asked if member organizations provided training that was intended to create resilient operators under stress. 22 of 23 respondents answered the question, for a response rate of 95.6 percent (Figure 7).

Figure 7. Organizations that train for resilience under stress.

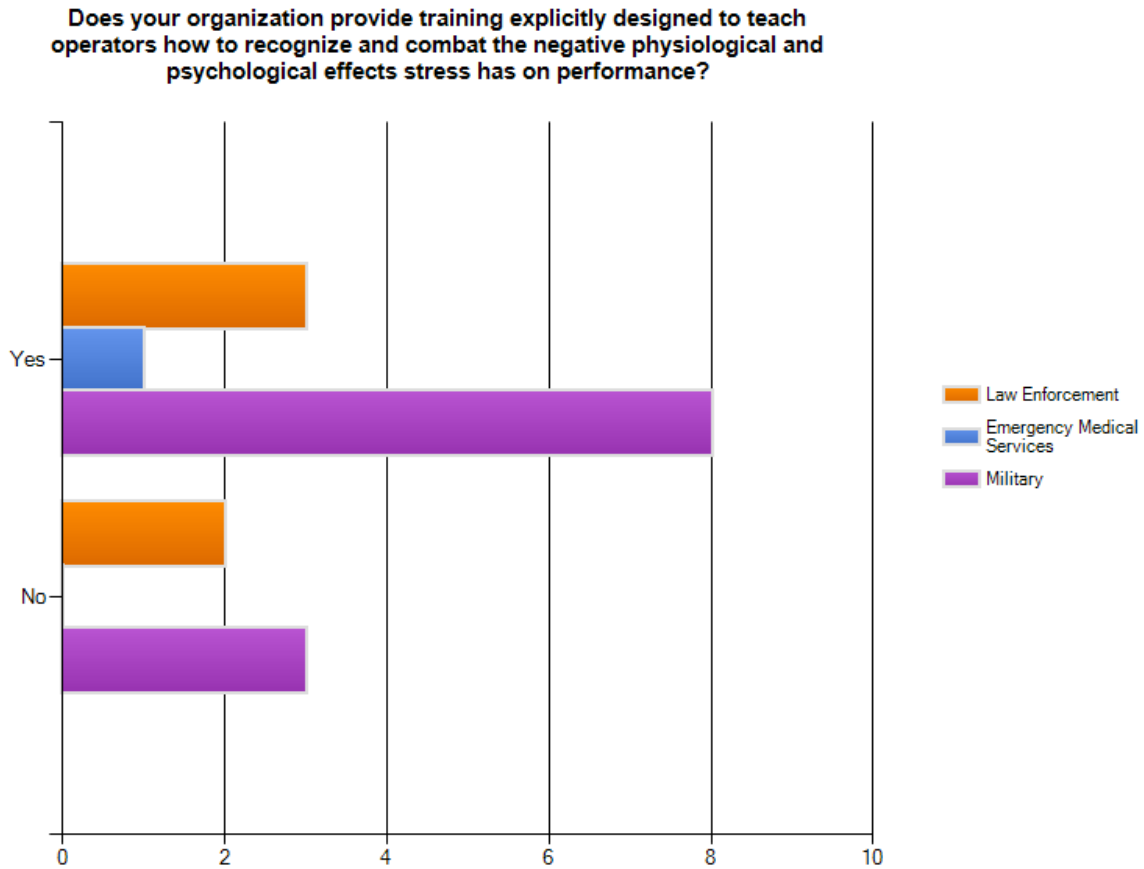


The survey question found that a majority of members surveyed worked in organizations that trained operators to be resilient under stress. Five law enforcement officers, representing 71.4 percent, indicated that their organizations did provide this type of training, while two or 28.6 percent did not. One EMS professional answered affirmatively while one answered no, with each answer representing 50 percent of the EMS sample. In the military community, ten people representing 72.7 percent answered yes, while four or 18.2 percent answered no. Among military

respondents, two members representing 9.1 percent answered “somewhat.” Comments left by those two individuals indicated that their organizations endeavored to provide this sort of training, but in the respondents’ experience were not successful. Overall, 16 respondents (72.7 percent) answered yes, four (18.2 percent) answered no, and two (9.1 percent) answered “somewhat.” Respondents who indicated that their organizations did not provide training to create resilient operators under stress were precluded from completing the remainder of the survey, as subsequent questions were related to specific stress training methods and paradigms.

The literature review revealed that an often-observed shortcoming in training for high-performance under stress is the lack of training classes that explicitly address the physiological and psychological effects of stress. A subsequent research question was asked to determine if other organizations provided explicit training to address these areas, and to teach operators to overcome negative effects of stress (Figure 8).

Figure 8. Recognizing and combating effects of stress.



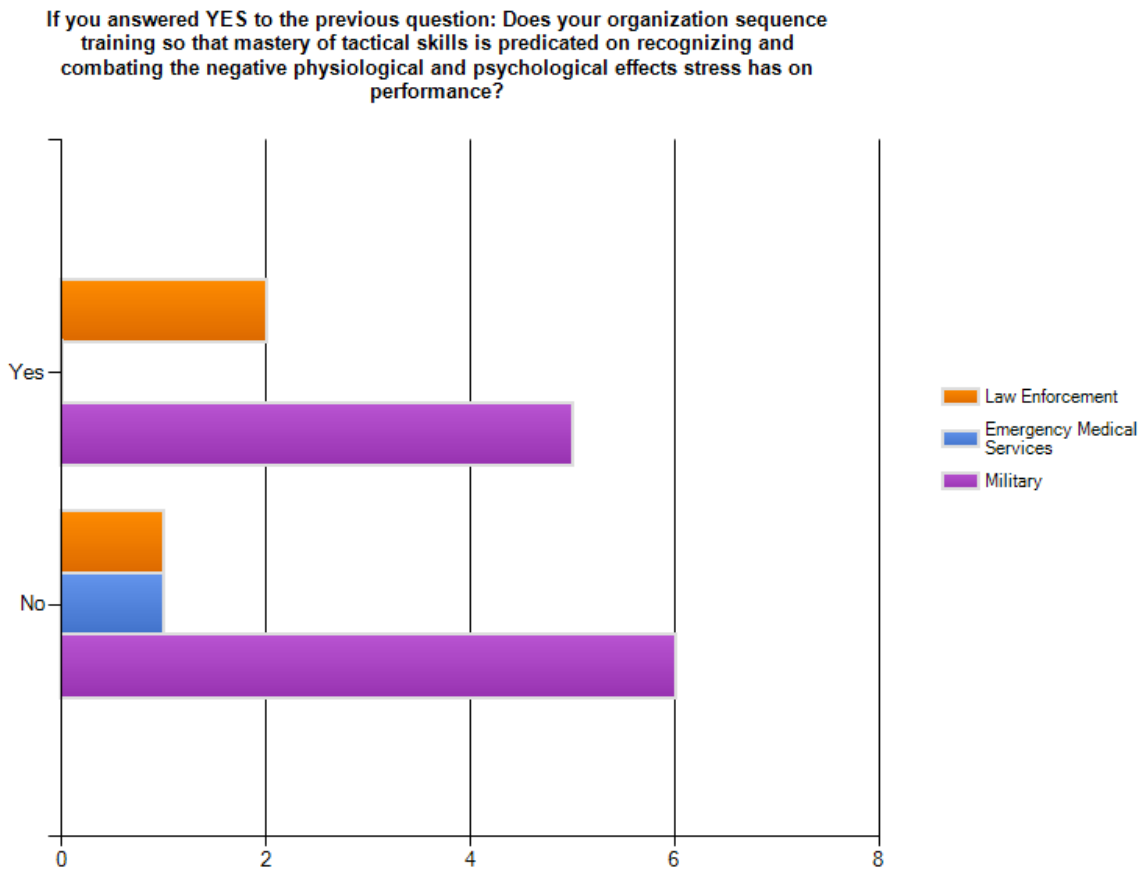
The sample size was effectively reduced by five respondents for this and subsequent questions, as those who indicated that their organization provides no training to create resilient performers under stress (Figure 7), were excluded for further questions. Also, the lone individual who skipped the question in Figure 7 was excluded from further participation.

Explicit training related to the physiological and psychological effects of stress was found to be utilized by a majority of survey respondents. 17 of the 18 remaining eligible respondents answered the question, representing 94 percent. 60 percent of law enforcement officers, 100 percent of EMS professionals, and 73 percent of military officers worked in organizations that taught operators to recognize and combat the physiological and psychological effects of stress.

Two military combat leaders and one municipal SWAT officer indicated in comments that this phase of training was foundational for creating positive outcomes in real-life tactical operations.

To build upon the previous question (Figure 8), respondents were asked if their organizations sequenced training in such a way that physical mastery of skills was predicated on mental readiness training (Figure 9).

Figure 9. Sequenced stress training for resilience under stress.

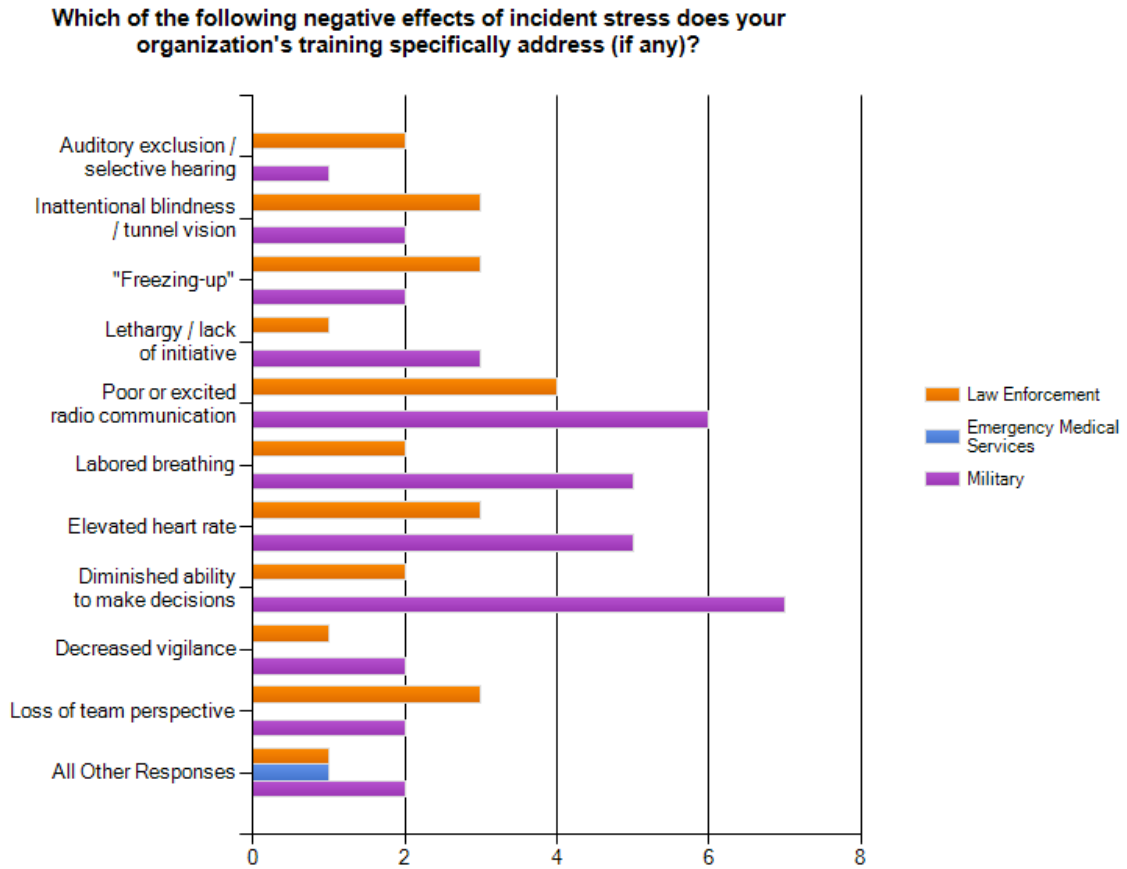


15 of 18 answered the question for a response rate of 83.3 percent. Sequencing structured training initiatives was not used by a majority of other tactical professions; a total of 53.3 percent of organizations reflected in the survey did not sequence their training, while 46.7 percent did. The highest rate of utilization was reflected in the law enforcement community, where 66.7

percent used structured training designed to progressively increase effective performance under stress. 100 percent of EMS respondents did not, while slightly more than half (53.3 percent) of military units did not sequence training. Further, 100 percent of the three comments associated with this question indicated that respondent organizations recognized the value of sequenced training, but were unable to implement because of lack of expertise and competing demands for time.

The literature review indicated that learning to recognize and overcome specific performance-diminishing effects of stress was of high importance; a subsequent survey question listed 11 common physiological and psychological reactions, and are found in the chart in Figure 10. The respondents were asked to mark the ones that were addressed by their organization's training programs (Figure 10).

Figure 10. Negative effects of stress addressed in training.



17 of 18 respondents answered the question, representing 94.4 percent of the sample group. Response totals of all three professions showed that the most common factor addressed in stress training was poor or excited radio communication (58.8 percent). Diminished ability to make decisions was the second most-popular training initiative (52.9 percent), while combating the performance effects of elevated heart rate and labored breathing also received high marks, with 47.1 percent and 41.2 percent respectively.

The law enforcement community and the military community valued training on specific stress effects differently. Among law enforcement, poor radio communication received the most training attention (80 percent), while freezing-up, inattentional blindness/tunnel vision, and loss

of team perspective each were marked by 60 percent of the law enforcement group. Military leaders indicated radio communication most frequently (58.8 percent), and also trained for decision making (52.9 percent), elevated heart rate (47.1 percent), and labored breathing (41.2 percent). The EMS sample indicated that their organization did not offer training relative to any of the listed stress effects.

The survey instrument gave a very brief synopsis of literature review findings that showed that most training initiatives have little or no value in enhancing task performance in the stress environment. Stress Training was a concept revealed to be an effective tool in preparing operators to be effective in the stress environment. A survey question asked respondents if their organizations provided stress training which approximated the conditions found in the target environment (Figure 11).

Figure 11. Stress training that approximates the high-stress environment.

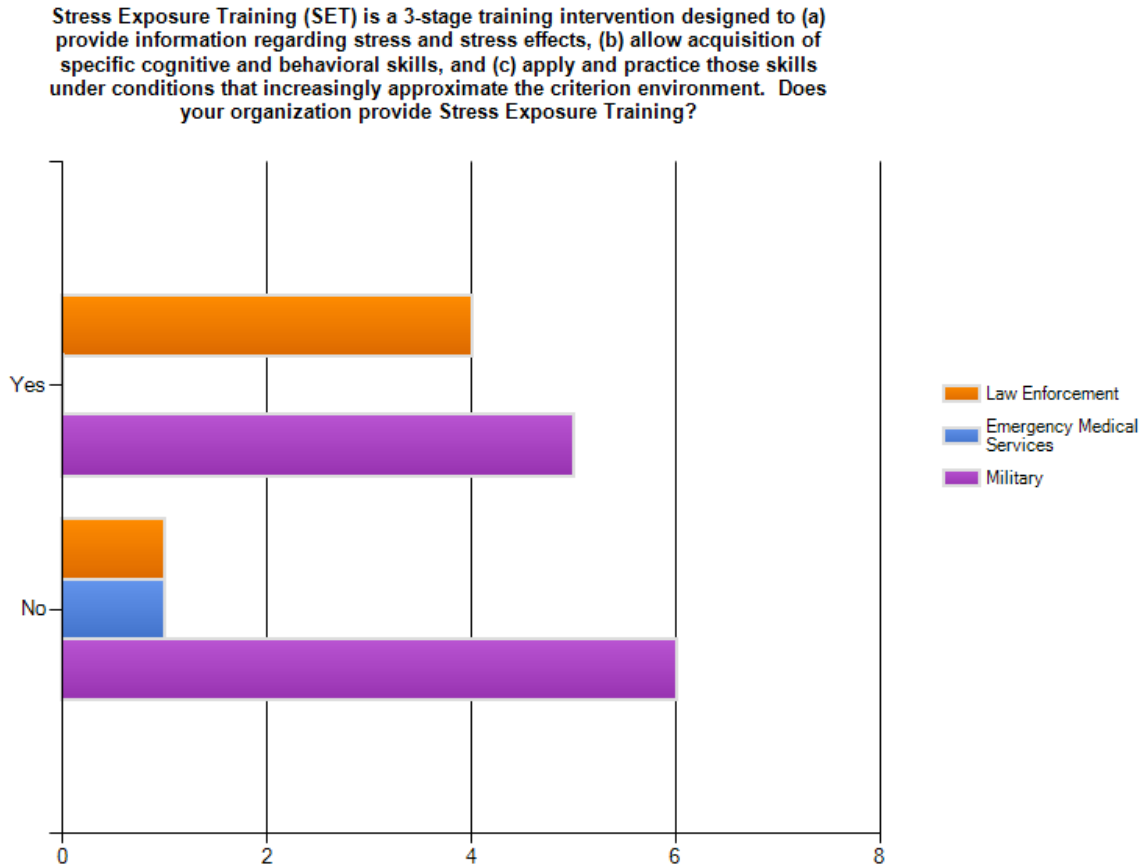


The value of training which approximates stressful environments and reflects the realities of the operational spectrum were found to be embraced in the law enforcement and military communities. 16 of 18 respondents answered the question, for a response rate of 89 percent. Survey response totals indicated that 13 of the 16 organizations represented (81.3 percent) did train to approximate the stress environment. 100 percent of law enforcement officers, 80 percent of military officers, and zero percent of EMS professionals indicated that their respective organizations perform Stress Training.

The survey instrument explored the proliferation of stress training interventions that were identified in the literature review, namely Stress Exposure Training, or SET (Figure 12) and

Stress Inoculation Training, or SIT (Figure 13). The sequenced, three-stage SET model was found to be utilized by both the law enforcement and military communities (Figure 12).

Figure 12. Stress Exposure Training (SET).

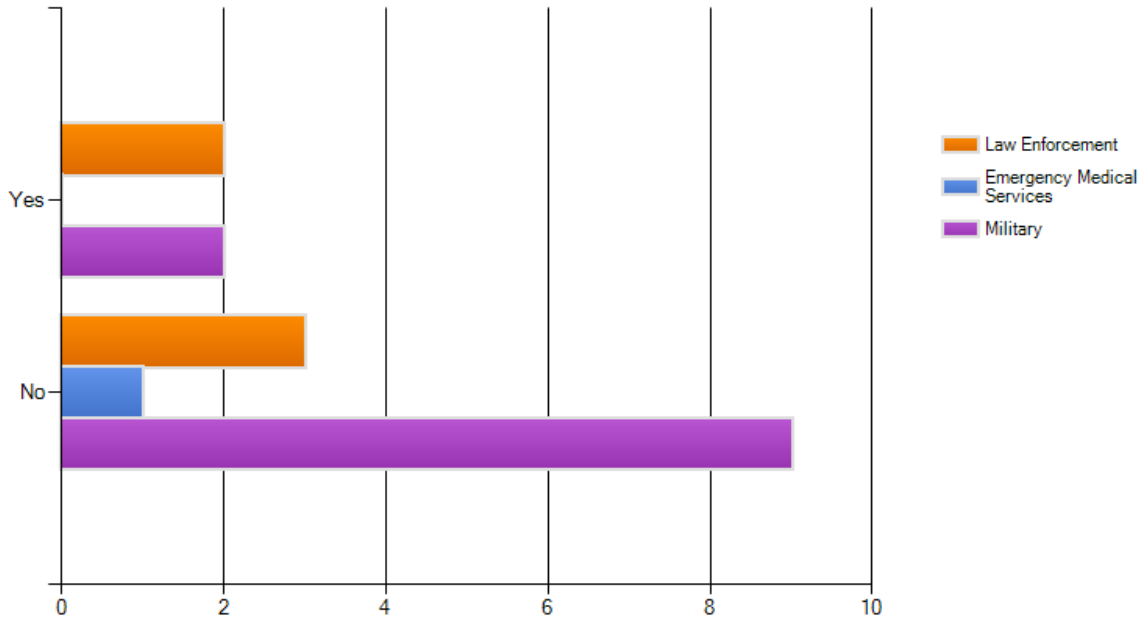


17 of 18 (94.4 percent) of respondents answered the question. Overall, SET was found to be utilized by 52.9 percent of the respondents. 80 percent of law enforcement respondents and 45.5 percent of military respondents used SET, while the EMS respondent did not.

While SET was used by more than half of the respondents surveyed, Stress Inoculation Training did not have the same prevalence among other organizations represented in the survey (Figure 13).

Figure 13. Stress Inoculation Training (SIT).

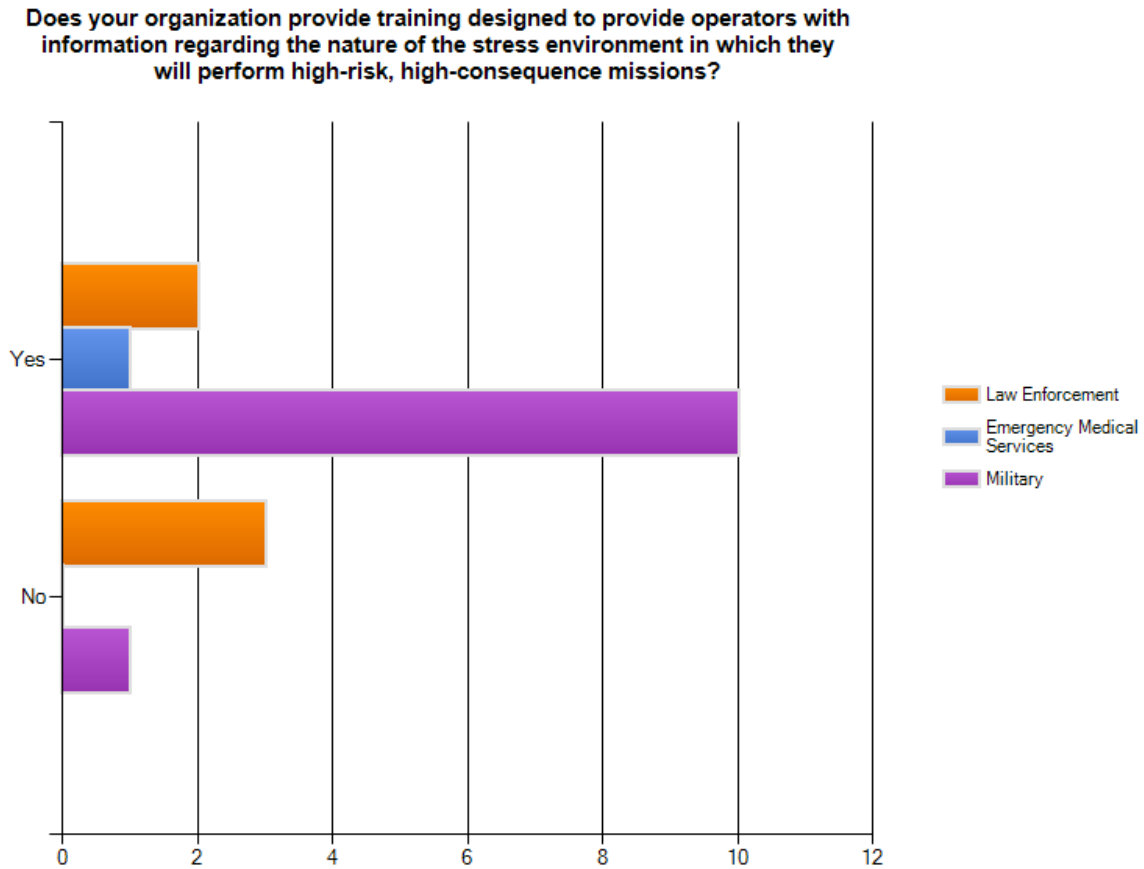
Stress Inoculation Training (SIT) builds resistance to specific stressful situations. The four steps include (a) Preparation for Provocation - mentally preparing for an event; reviewing the philosophy and strategy for meeting it, (b) Impact and Confrontation - prepping for the way the event will likely affect you; summoning practiced skills, (c) Coping and Arousel - the application of learned tactical arousal control skills to the challenge when it occurs, and (d) Review and Adjustment - reviewing behavioral and emotional management of the event to determine what worked and what did not. Does your organization provide Stress Inoculation Training?



17 of 18 respondents (94.4 percent) answered the question; 76.5 percent did not use SIT as part of their training program. Of the 17 respondents, 2 law enforcement officers and 2 military officers indicated that their organizations engaged in Stress Inoculation Training.

A subsequent question asked if respondents' organizations provided training with the objective of informing operators about the nature of the high stress/conflict environment. (Figure 14).

Figure 14. Preparing for the nature of the stress environment.

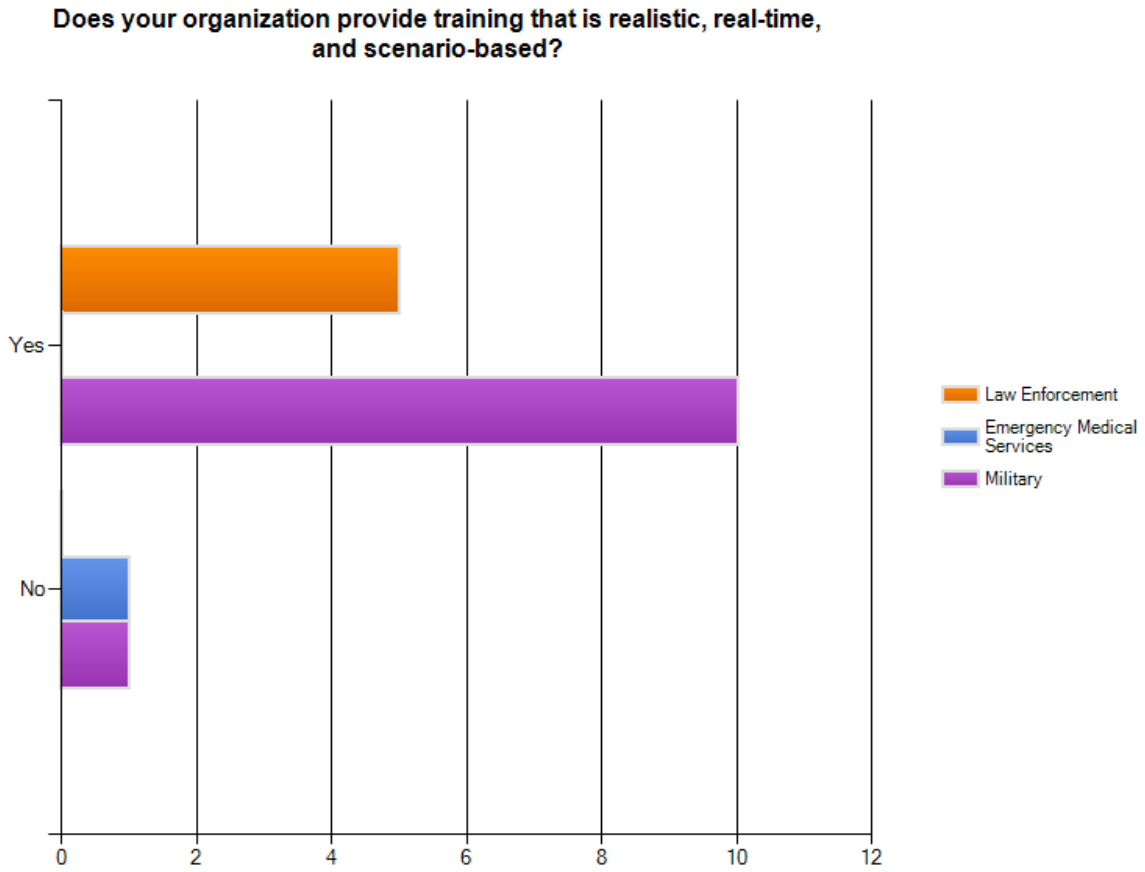


17 of 18 respondents answered the survey question for a response rate of 94.4 percent.

Training on the nature of the tactical environment was not prevalent in the law enforcement community, but was a focus of training in the EMS and military groups. 40 percent of law enforcement respondents had received training on the nature of the tactical environment, while 100 percent of EMS and 90.9 percent of military officers focused on the nature of the environment as a training initiative.

The provision of realistic, real-time, scenario-based training was found to be widely used in law enforcement and military communities. (Figure 15).

Figure 15. Scenario-based training.

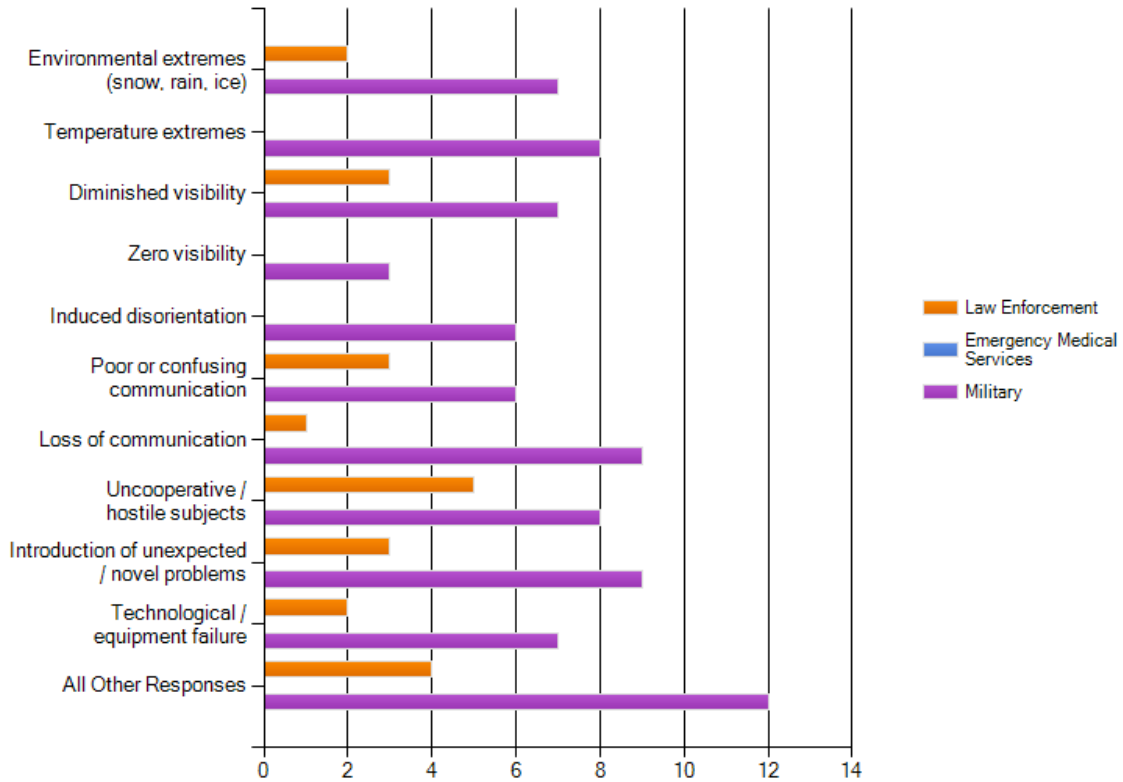


17 of 18 respondents (94.4 percent) answered the question. 100 percent of law enforcement respondents conducted training in a real-time, scenario-based model, while 90.9 percent of military officers had the same experience. Zero percent of the EMS sample utilized this form of training.

Two subsequent survey questions sought to determine particulars about training for resilient performance in the stress setting. The first asked what recognized stressors (if any) were utilized when performing realistic, scenario-based training (Figure 16), while the second asked what specific control methods were taught to overcome the negative effects of stress (Figure 17).

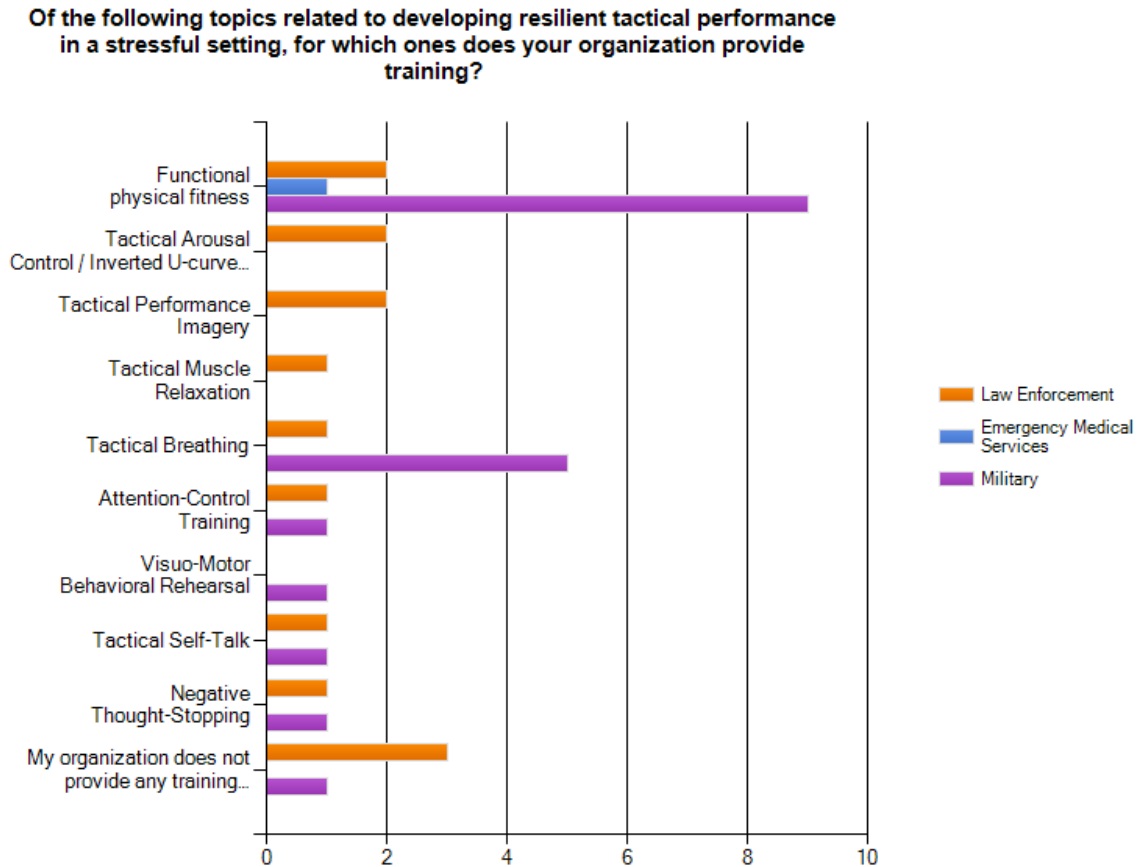
Figure 16. Stressors used in training.

During realistic, scenario-based training, which of the following stressors does your organization seek to utilize? More than one answer is allowed.



16 of 18 respondents answered the question in Figure 16, for a response rate of 88.8 percent. Overall results showed that the most popular stressors were uncooperative/hostile subjects (81.3 percent), unexpected/novel problems (75 percent), and disabled/injured/fatally wounded team member (75 percent). Both the law enforcement group and the military group identified these three stressors as those most often used in training, and in the same order as reflected in the overall results. Both groups also identified diminished visibility as a fourth-ranked stressor used in realistic training scenarios.

Figure 17. Training topics related to resilience.



The survey question was designed to determine which, if any, of the arousal control techniques specified in the literature review were in use by other organizations. 17 of 18 respondents answered the question, for a rate of 94.4 percent. A majority of law enforcement officers (60 percent) indicated that their organizations did not provide training on any of the control techniques; forty percent used functional physical fitness, Tactical Arousal Control, and Tactical Performance Imagery. In the military sample, 81.8 percent indicated that functional fitness was taught as a way to ensure resilience under stress, as was Tactical Breathing (45.5 percent). In the military sample, no other arousal control technique was taught by the

organization of more than one respondent. Functional physical fitness was the only training initiative indicated in the EMS group.

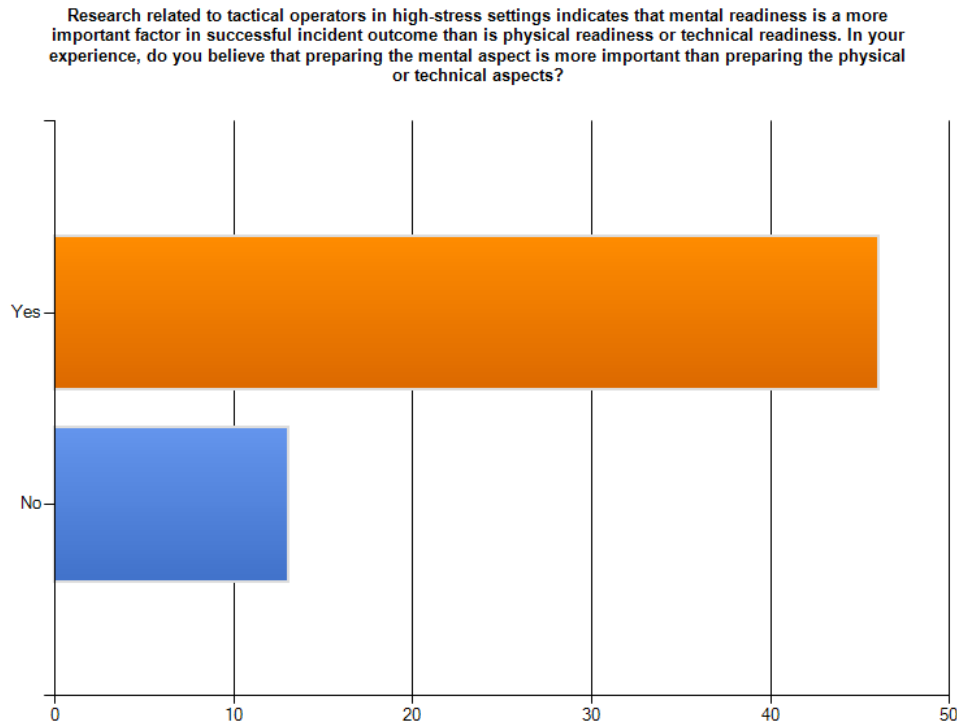
The results of the instrument used to survey law enforcement, EMS and military professionals satisfied the second research question. Analysis of the survey instrument concluded that leaders in these professions realize that tactical performance is predicated on mental development. Foundational aspects of mental development were revealed to be understanding of the target environment's nature, recognition of stressors inherent to that environment, and a detailed understanding of the physiological and psychological reactions that occur when subjected to stressors.

The survey also revealed that tactically-oriented professions use training explicitly designed to create operators who can both recognize and combat the negative physiological and psychological effects of stress on performance. In order to do this, professions outside the fire service employ both stress training that approximates the stress environment, as well as Stress Exposure Training, which is a sequenced training initiative which seeks to teach tactical operators to perform with resilience under stress. Further, outside organizations utilize realistic, real-time, scenario-based training where students are purposefully exposed to stressors. They also provide instruction designed to specifically address performance-diminishing effects of stress, such as poor radio communication, diminished ability to make decisions, labored breathing and elevated heart rate, inattentive blindness, and loss of team perspective.

A third research question endeavored to determine what methods other fire departments used to reduce the physiological and psychological effects of stress on performance. The external survey instrument that was used to answer the second research question also was distributed to 70 chief officers in the American fire service. 63 fire department representatives participated in

the survey, for a response rate of 90 percent. The first question explored attitudes related to the importance of mental preparedness (Figure 18).

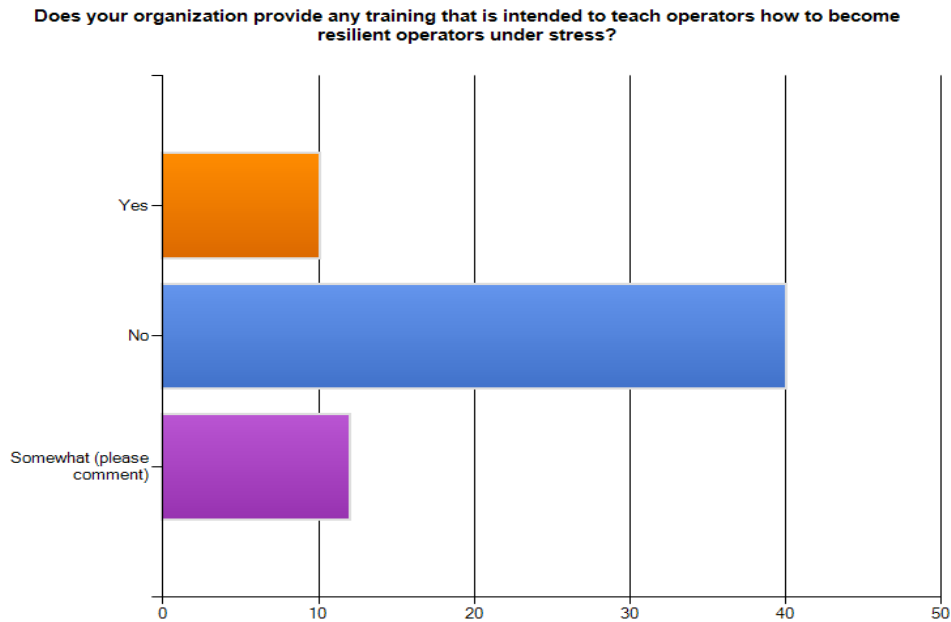
Figure 18. The importance of the mental factor.



The survey found that a majority of chief officers surveyed agreed with the contention that the importance of developing the mental factor outweighs the importance of physical and technical development. 59 of 63 respondents answered the question, with 46 of those (78 percent) representing that they believed mental development to be most important.

A subsequent question asked chief officers if their fire departments provided training that taught operators to be resilient operators under stress (Figure 19).

Figure 19. Organizations that train for resilience under stress.

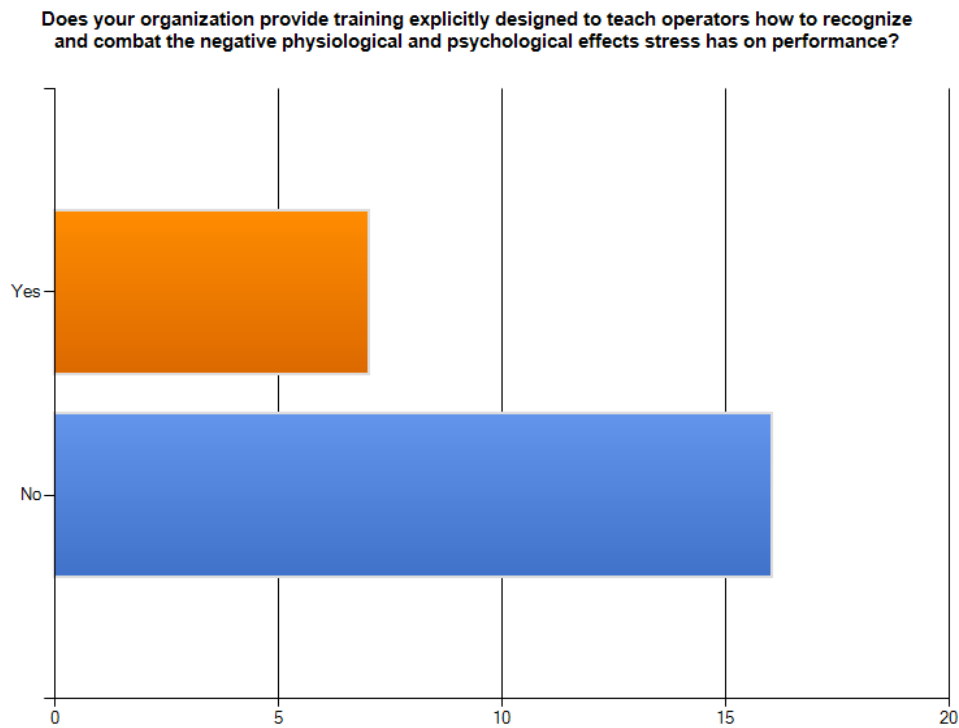


62 of 63 respondents representing 98.4 percent answered the question. Training designed to create resilience in the stressful environment was not found to be a common practice among the departments surveyed, with 64.5 percent of the sample answering that their department did not offer the sort of training described in Figure 19. 16.1 percent did, and 19.4 percent answered that their departments provided training that somewhat aligned with the objective of creating resilience under stress. It is significant to note that 18 respondents left comments associated with their answers. Three common themes existed among comments: (a) that they did not provide this sort of training due to competition for limited time or because of challenging curriculum design, (b) that they only endeavored to enhance decision making skills with computer simulations, and (c) that they recognized the importance of the training, but had simply not implemented it.

It is pertinent to note that all respondents to the question in Figure 19 who answered no were directed to the end of the survey, as the remaining questions dealt specifically with stress training initiatives and paradigms.

The 23 survey respondents who continued on with the instrument were asked if their fire departments provided training that had the explicit objective of teaching students to recognize and combat the physiological and psychological effects of stress (Figure 20).

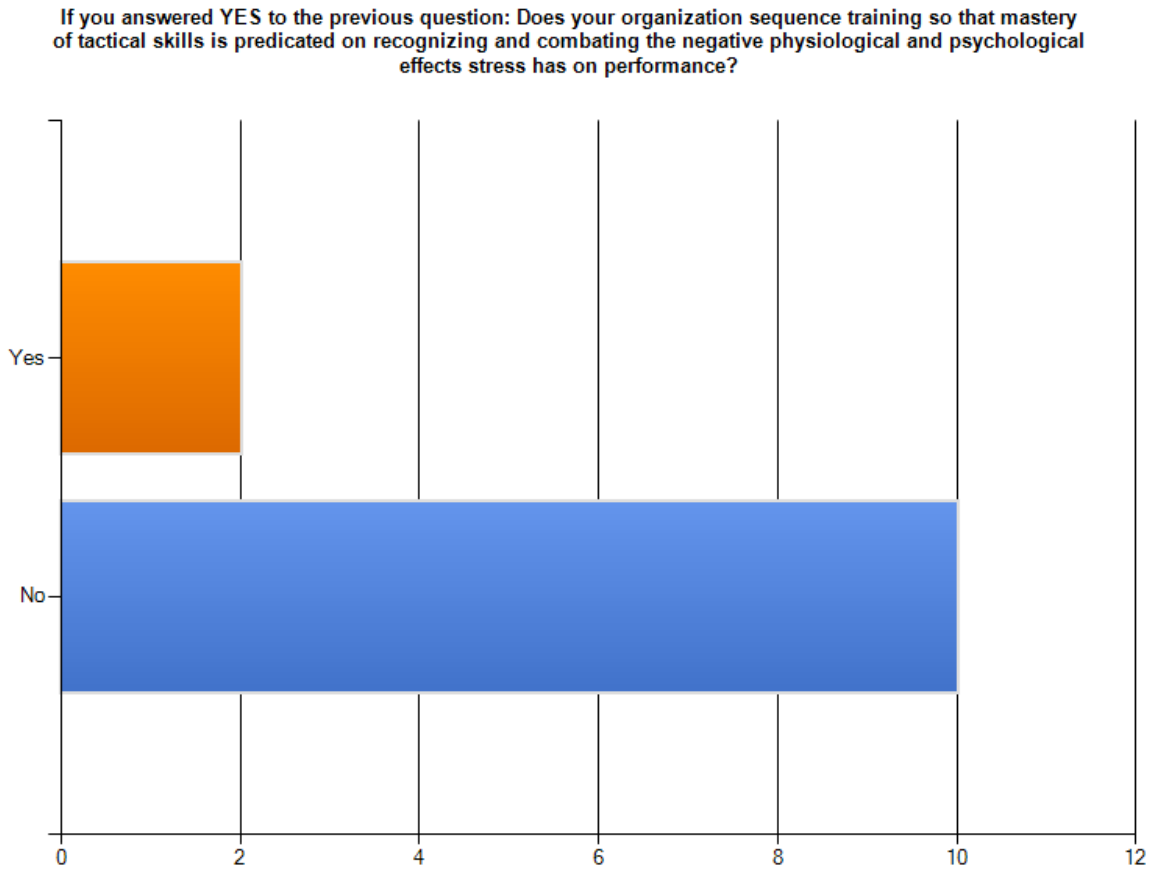
Figure 20. Recognizing and combating effects of stress.



100 percent of the remaining 23 respondents answered the question. Fire departments which taught students to recognize and overcome physiological and psychological effects of stress on performance were found to be less than half as prevalent as those which did not. 69.6 percent of respondents indicated that their fire departments offered no such training.

Similarly, fire departments did not sequence their training in a way that predicated mastery of tactical skills on recognizing and combating the negative effects of stress on performance (Figure 21).

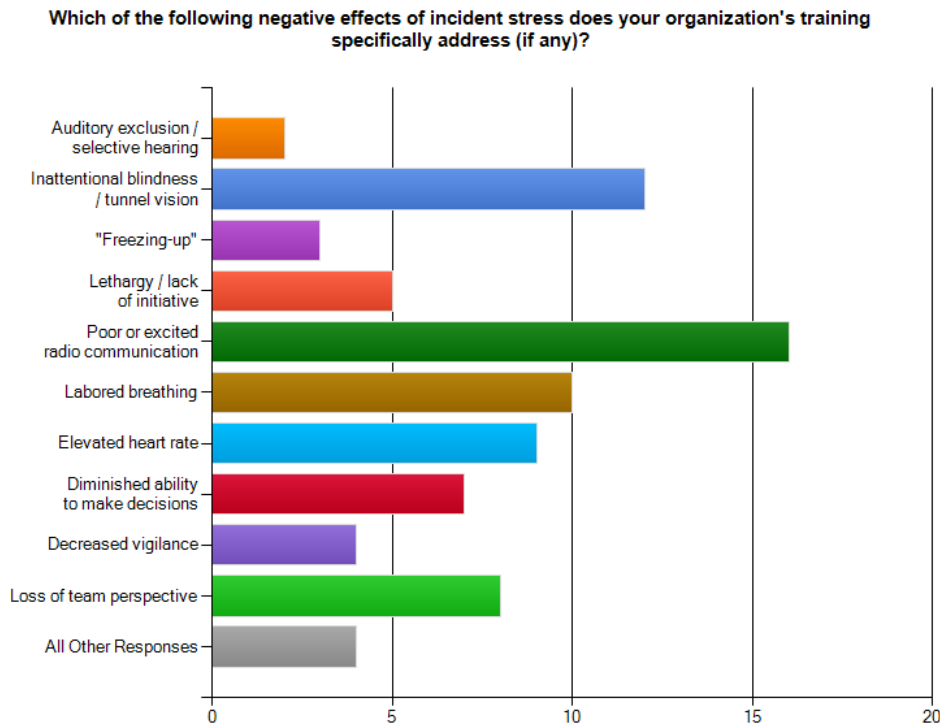
Figure 21. Sequenced stress training for resilience under stress.



Of the survey respondents, 83.3 percent answered that their organizations did not sequence training efforts to promote effective tactical performance.

The survey instrument asked the respondents on which performance-diminishing effects of stress, if any, their fire departments provided training (Figure 22).

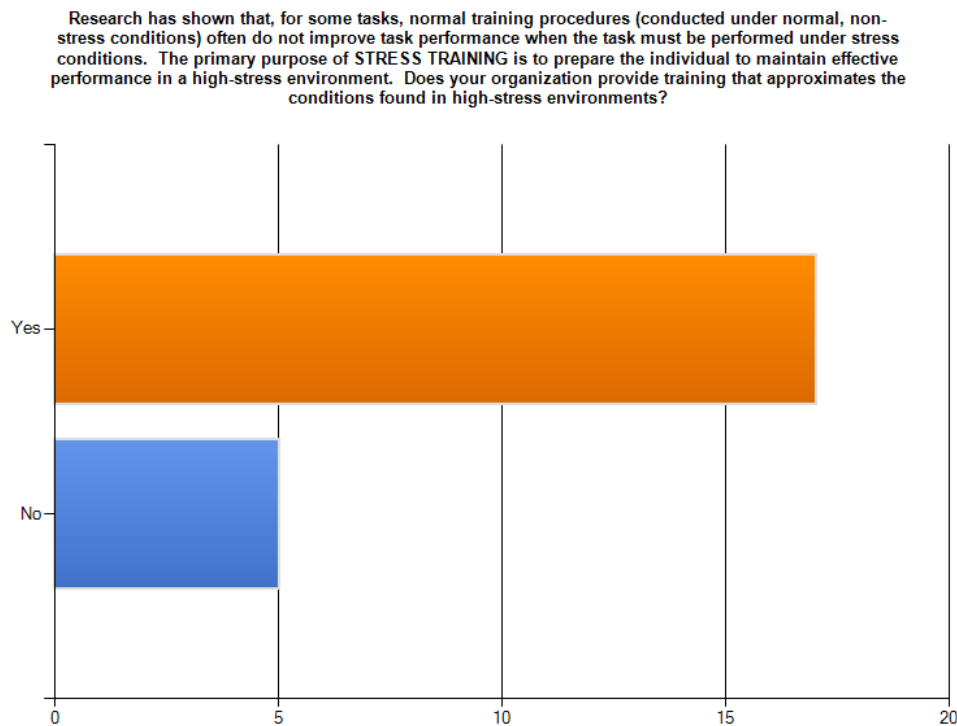
Figure 22. Negative effects of stress addressed in training.



22 of 23 respondents answered the question. Of the ten stress effects listed, five were addressed in the training programs of 30 percent or more of fire departments: (a) Poor or excited radio communication was addressed by 72.7 percent, (b) Inattentional blindness was addressed by 54.4 percent, (c) Labored breathing was addressed by 45.5 percent, (d) elevated heart rate was addressed by 40.9 percent, and (e) Loss of team perspective was addressed by 36.4 percent of fire departments.

The next survey question (Figure 23) endeavored to determine to what extent fire departments provide Stress Training, which promotes effective performance under stress by training in an environment that approximates the high-stress emergency scene.

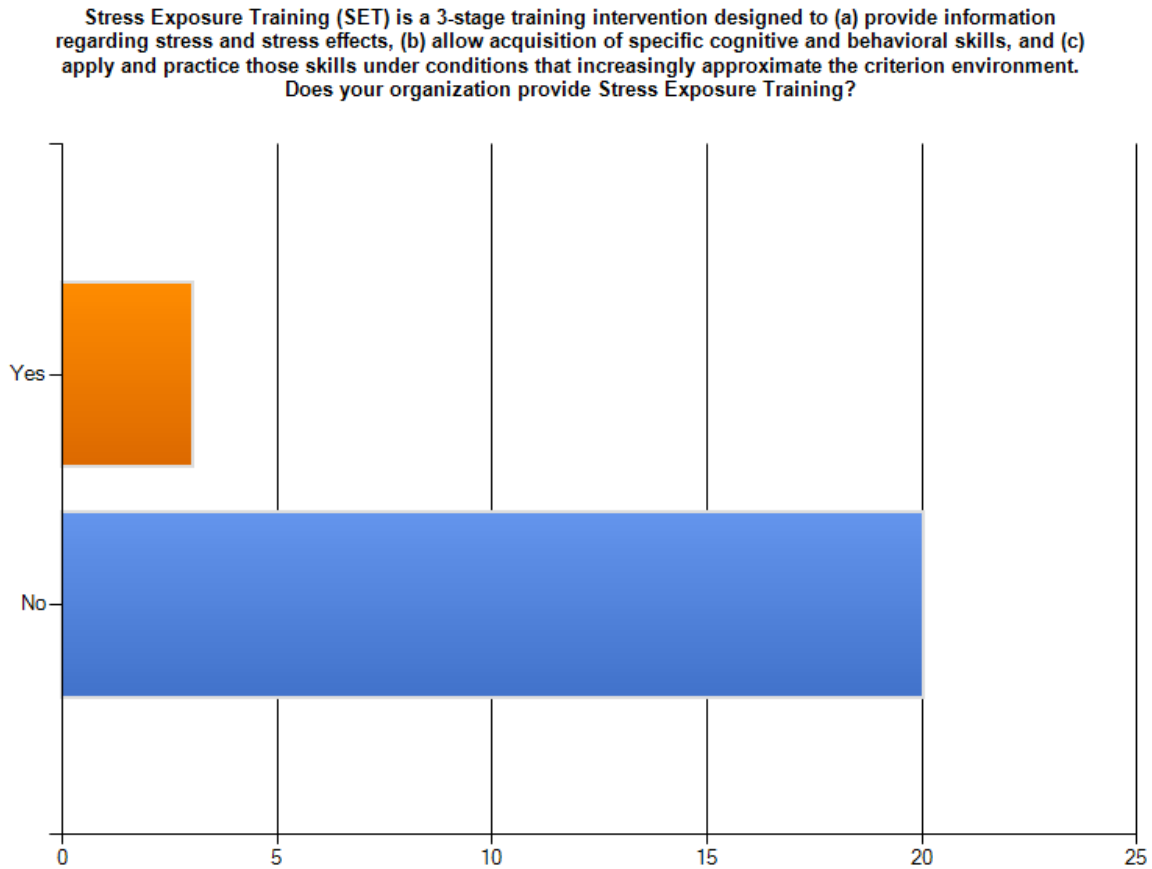
Figure 23. Stress training that approximates the high-stress environment.



Training in an environment where stress is replicated was found to be utilized by a majority of fire departments. 22 of 23 respondents answered the question, with 77.3 percent indicating that their fire department uses training that realistically approximates the operational environment.

As with the other tactical agencies surveyed, the survey instrument explored the proliferation of stress training interventions that were identified in the literature review, namely Stress Exposure Training, or SET (Figure 24) and Stress Inoculation Training, or SIT (Figure 25).

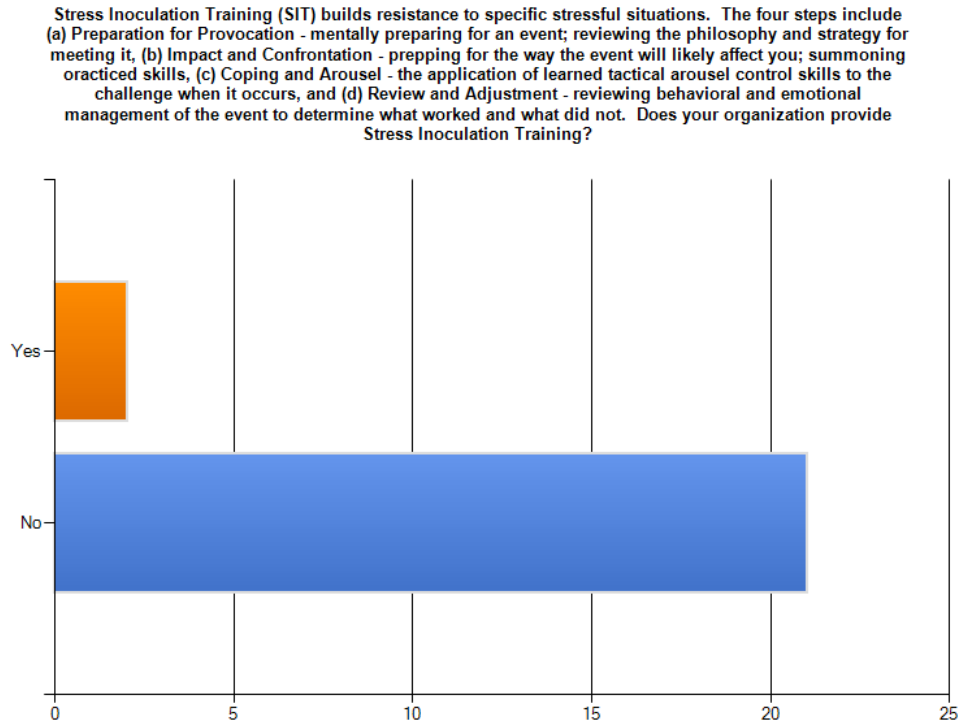
Figure 24. Stress Exposure Training.



22 of 23 participants answered the survey question. The instrument found that a significant minority of fire departments prepared individuals to maintain effective performance in the high stress environment by using the sequenced, three-phase Stress Exposure Training. Three chief officers answered that their fire departments used SET, representing 13 percent. The remaining 87 percent of respondents did not use SET as part of their training curriculum.

The question represented in Figure 25 asked if fire departments used the Stress Inoculation Training model that uses four sequenced phases of training to build resistance to stressful situations and environments.

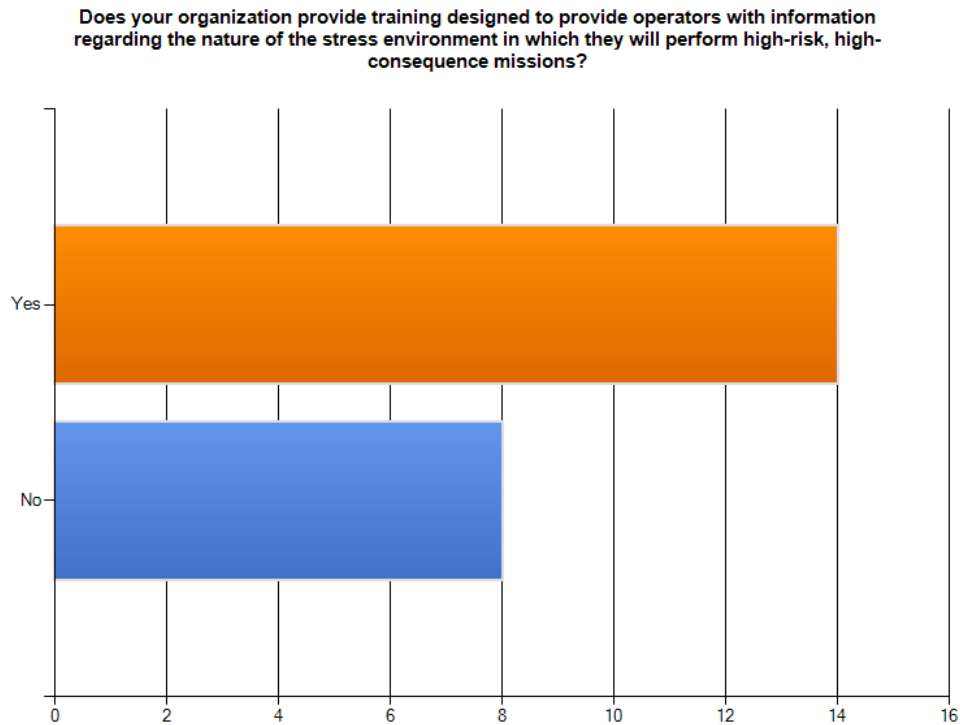
Figure 25. Stress Inoculation Training.



23 of 23 participants answered the question. The survey instrument revealed that Stress Inoculation Training is not prevalent in the fire service, with 91.3 percent of chief officers belonging to fire departments that did not utilize SIT as a component of the training program.

Fire department participants were also asked if their organization provided training to inform their firefighters about the nature of the stress environment where high-consequence missions would be conducted (Figure 26).

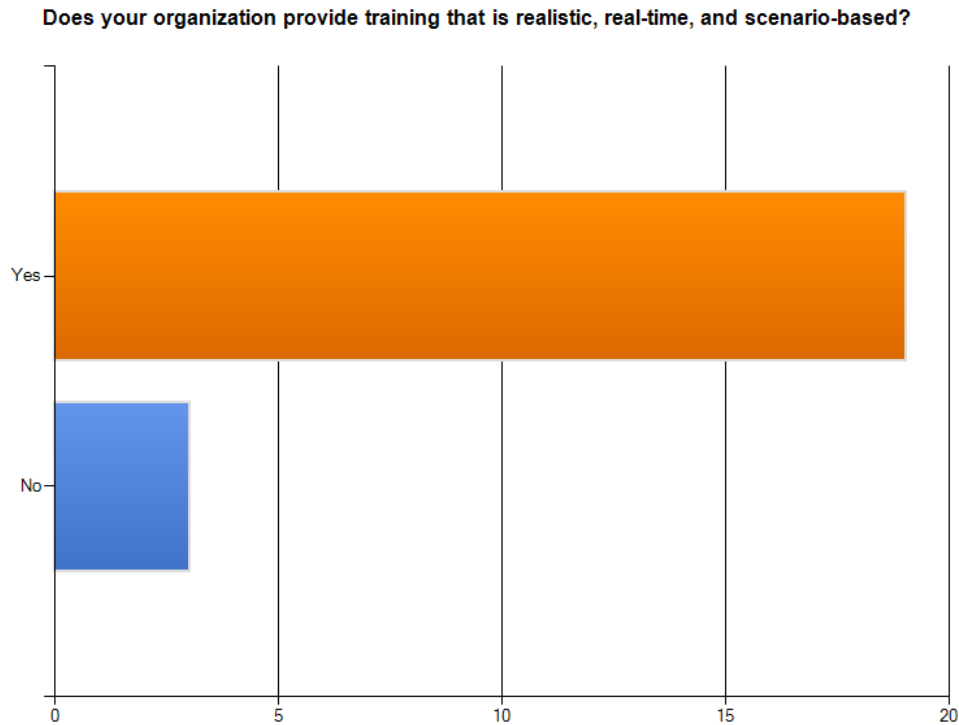
Figure 26. Preparing for the nature of the stress environment.



22 of 23 participants answered the question. Answers revealed that 63.6 percent of fire departments included in the survey do educate their firefighters about the nature of the stress environment, while 36.4 percent do not.

A subsequent question sought to define the extent to which fire departments use realistic and scenario-based training evolutions with real-time execution (Figure 27).

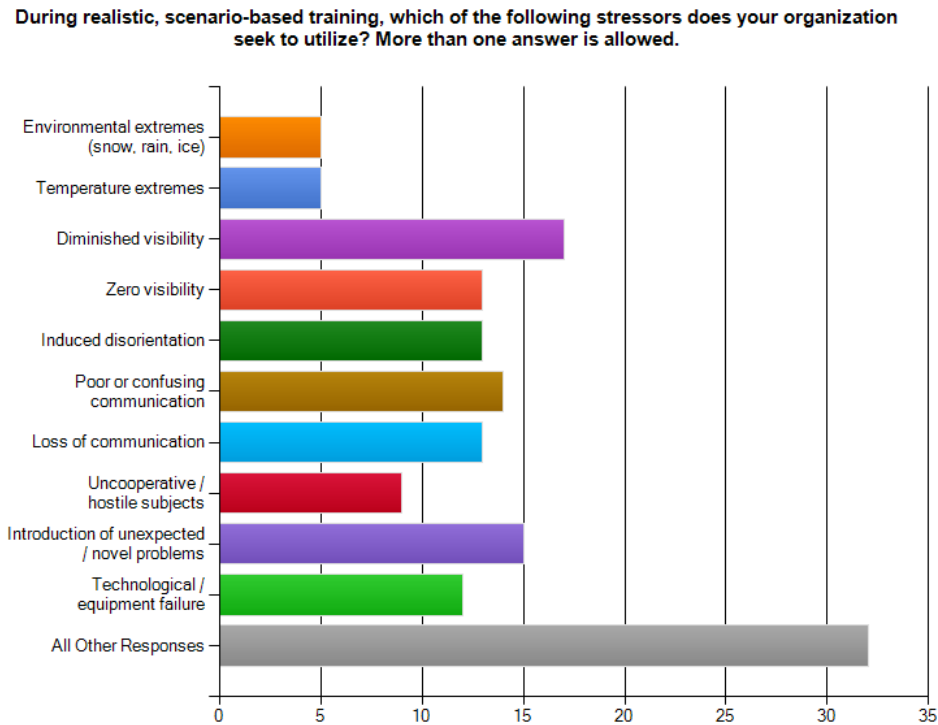
Figure 27. Realistic, real-time, scenario-based training.



22 of 23 participants answered this research question, which showed that most fire departments do execute realistic, scenario-based and real-time training evolutions. 19 of the 22 respondents indicated that their fire department does provide realistic training evolutions that are scenario-based and use a real-time operational tempo. Three of the chief officers surveyed acknowledged that their fire departments did not provide realistic scenario-based training.

An additional question asked survey participants which stressors, if any, they used to augment realistic scenario-based training (Figure 28). 21 of 23 chief officers answered the question, reflecting a response rate of 91.3 percent.

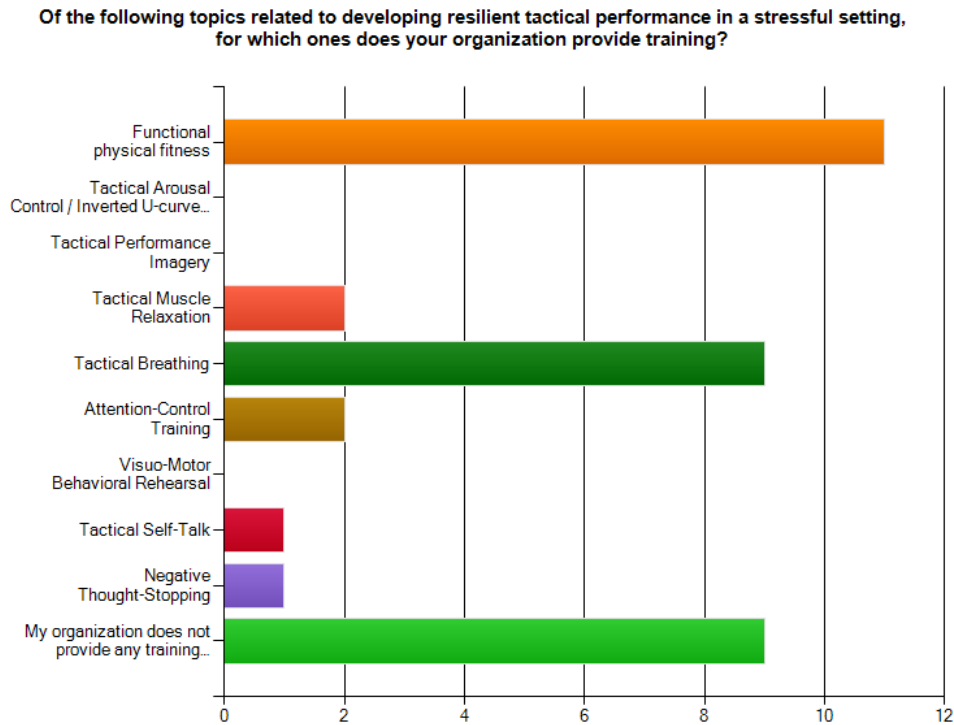
Figure 28. Stressors used in training.



Several of the stressors which serve to diminish tactical performance under stress were indicated to be used in the training programs of a majority of fire departments. Eight of the stressors were used by more than 60 percent of fire departments: (a) 81 percent used diminished visibility, (b) 76.2 percent used disabled / injured / fatally wounded team members, (c) 71.4 percent used the introduction of novel or unexpected problems, (d) 66.7 percent used poor or confusing communication, (e) 61.9 percent used zero visibility, induced disorientation, loss of communication, and PPE failure.

A subsequent survey question explored the extent to which the sequenced initiatives of Warrior Mindset training were utilized in the American fire service (Figure 29). 22 of 23 participants answered the question.

Figure 29. Training topics to promote resilience.



With the exception of functional physical fitness, which was promoted by 50 percent of the respondent fire departments, and tactical breathing techniques, which was taught by 40.9 percent of fire departments, it was found that Warrior Mindset principles were used very little or not at all by the departments surveyed. Tactical Muscle Relaxation and Attention Control Techniques were taught by two of the 22 organizations represented in the sample, while the remaining initiatives were taught by only one department or none at all.

The electronic survey instrument which examined training paradigms of 63 fire departments answered the third research question, which sought to identify the methods used by other fire departments to counter the physiological and psychological effects of stress on performance. The survey instrument revealed that nearly 80 percent of chief officers surveyed believed that effective tactical performance was predicated on mental readiness training. In a

dichotomy however, the survey showed that nearly two-thirds of fire departments provide no training whatsoever to create operators whom are better equipped to function in the stress environment.

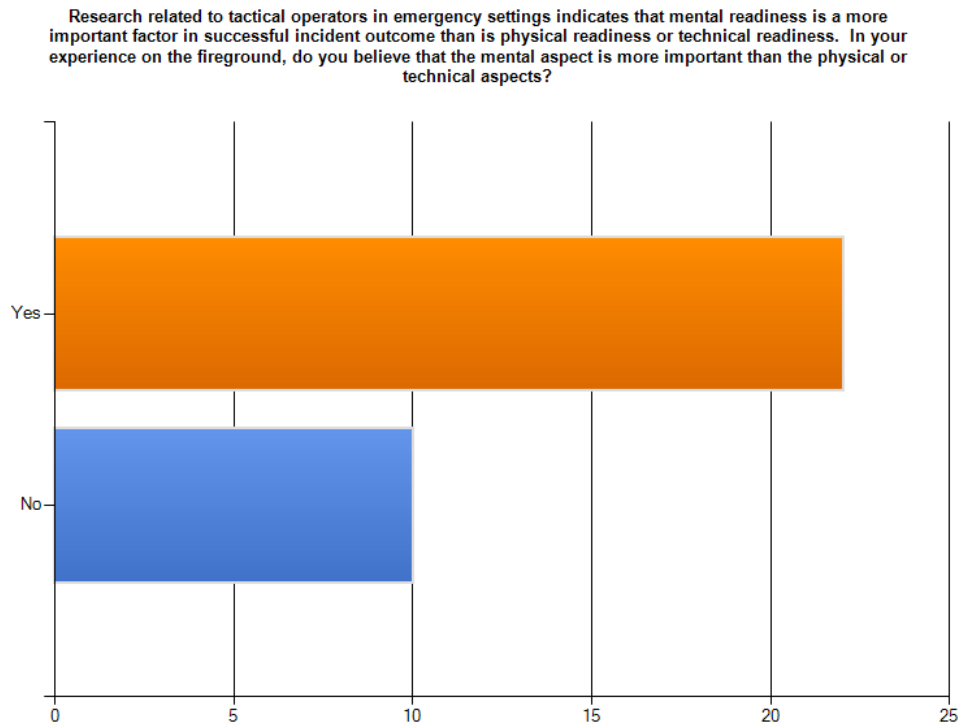
While not prevalent, the survey found that some fire departments are employing methods to train firefighters to succeed and survive in an environment that diminishes the possibility of both. Fire departments were found to teach skills that enabled operators to recognize the physiological effects of stress and combat those effects. Also, realistic, scenario-based training, and Stress Training that seeks to approximate the conditions of the hazard environment were found to be used by a majority of fire departments. These efforts included the approximation of stressors commonly found on the fireground, such as diminished visibility and poor radio communication, and also included efforts that made operators more resistant to stressors, like functional fitness and tactical breathing.

Sequenced training initiatives like Stress Exposure Training, Stress Inoculation Training and Warrior Mindset Training were also utilized, but were not common.

A fourth research question endeavored to determine what training initiatives the Iowa City Fire Department should use to teach the Iowa City Fire Department to recognize and minimize the physiological and psychological effects of stress on performance. Analysis and synthesis of the internal and external survey instruments were used to answer the final research question.

The internal survey instrument asked ICFD members if they concurred with a common contention in reviewed literature that development of the mental aspect was primary in creating operators who are physically and technically effective under stress (Figure 30).

Figure 30. Prominence of mental development.



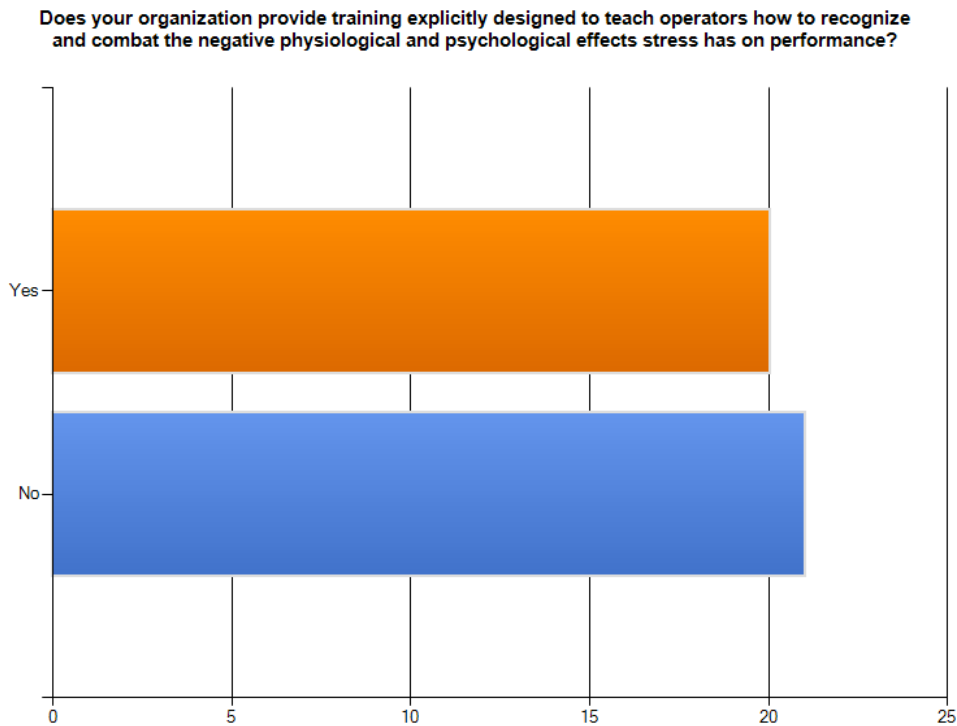
32 of 32 ICFD participants answered this question. The importance of mental aspect development was defined by 68.7 percent who felt that mental readiness was more important than physical or technical factors in achieving success in the stress environment. Similarly, a significant majority of members in other tactical professions agreed (Figure 6), as well as members of other fire departments (Figure 18).

The internal survey instrument also identified that various physiological and psychological effects of stress impact tactical performance in a negative way. Further, 68.6 percent of respondents acknowledged experiencing negative physiological effects on performance in the stress environment, while 62.5 percent admitted that they had suffered from one or more psychological effects (Figures 1 and 2). Also, 96.9 percent of respondents believed that performance diminishing physiological effects of stress impacted their co-workers (Figure

3), while 93.8 percent believed that the performance of their co-workers suffered from psychological effects (Figure 4).

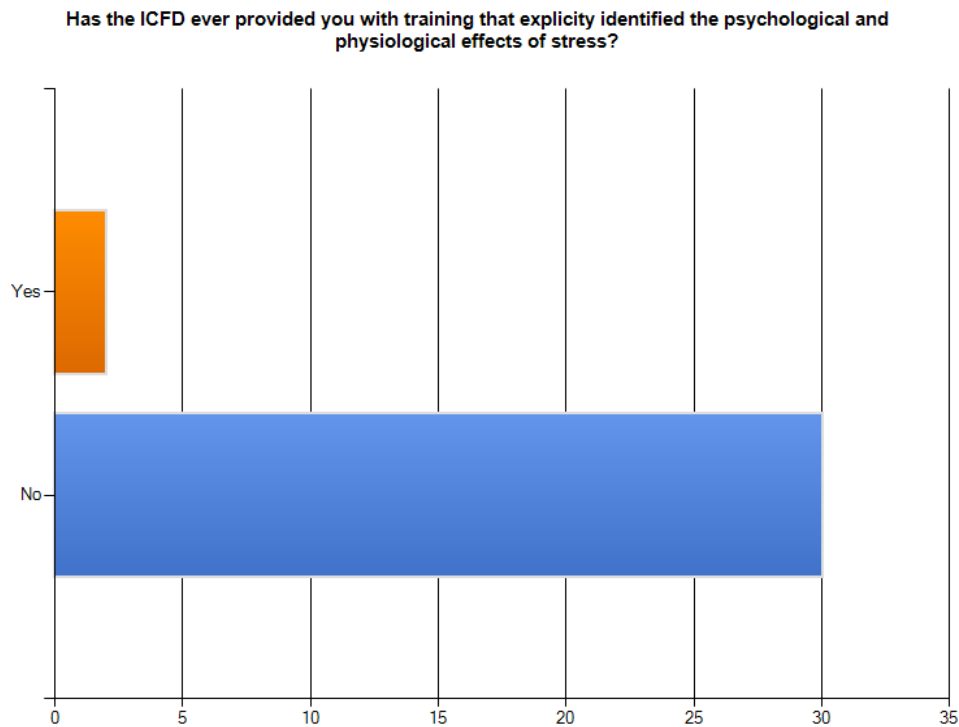
Representatives of law enforcement agencies, EMS providers, the United States military, and other fire departments established the importance of recognizing and combating the negative effects of stress on performance by providing explicit training on the topic (Figure 31).

Figure 31. Training to recognize and combat effects of stress provided.



Of the 44 respondents whose organizations taught operators to be more resilient under stress, 20 provided training explicitly designed to teach techniques that would enable students to recognize those effects and overcome them. In the internal ICFD survey, a great majority of department members responded that the ICFD provided no such training to them (Figure 32).

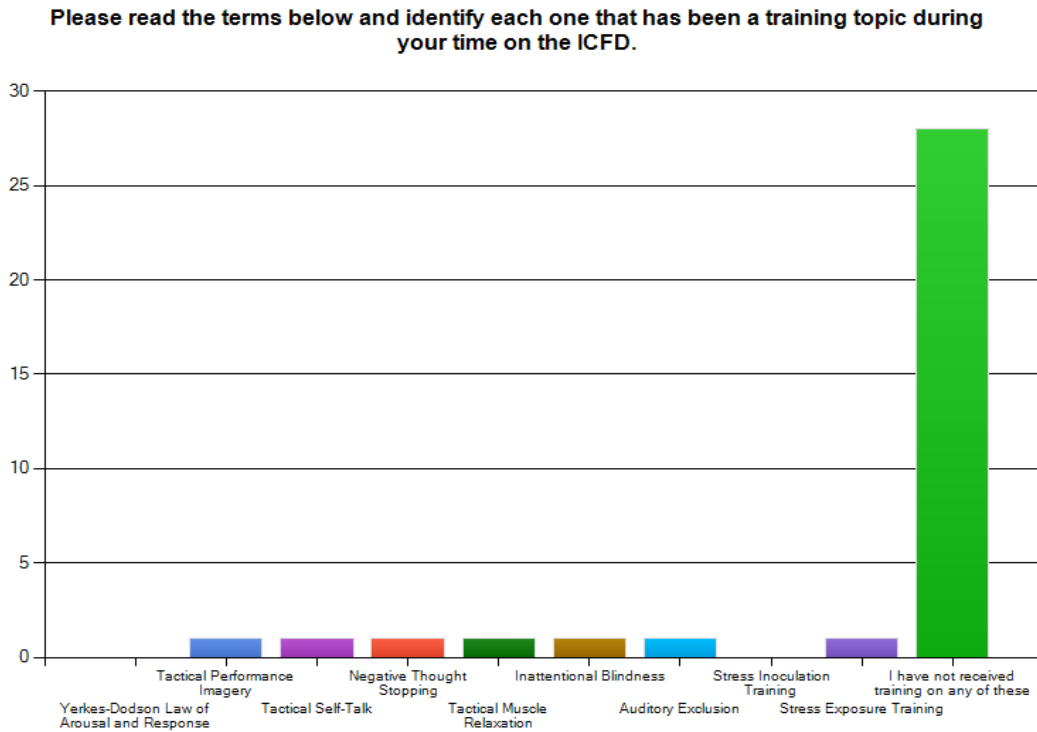
Figure 32. Physiological and psychological stress effects taught within the ICFD.



Of the 32 ICFD participants who answered the question, 30 firefighters and officers representing 93.8 percent admitted that they had never received training related to the physiological and psychological effects of stress on performance.

A question included in the internal survey instrument was informed to a significant degree by the literature review, and was related to significant physiological and psychological effects of stress on performance, as well as important skills to control those effects (Figure 33).

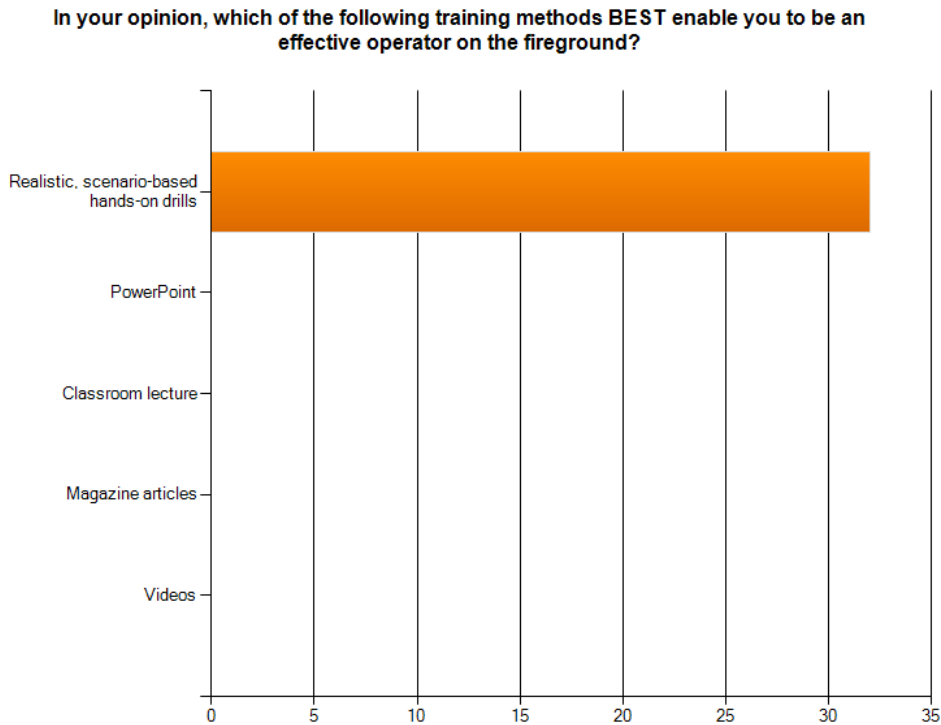
Figure 33. Stress effects and control techniques in the ICFD training program.



The question reflected in Figure 33 identifies two key negative effects of stress referred to as inattentional blindness and auditory exclusion. It also identifies the SET and SIT training paradigms, as well as important initiatives to control and recognize the negative effects of stress on performance. 32 ICFD members were asked to identify which of the terms they had received training on. 32 participants answered the question; the results showed that 87.5 percent of participants had not received any training. In no category did more than one respondent indicate that the ICFD training program had addressed any of the terms listed in the question.

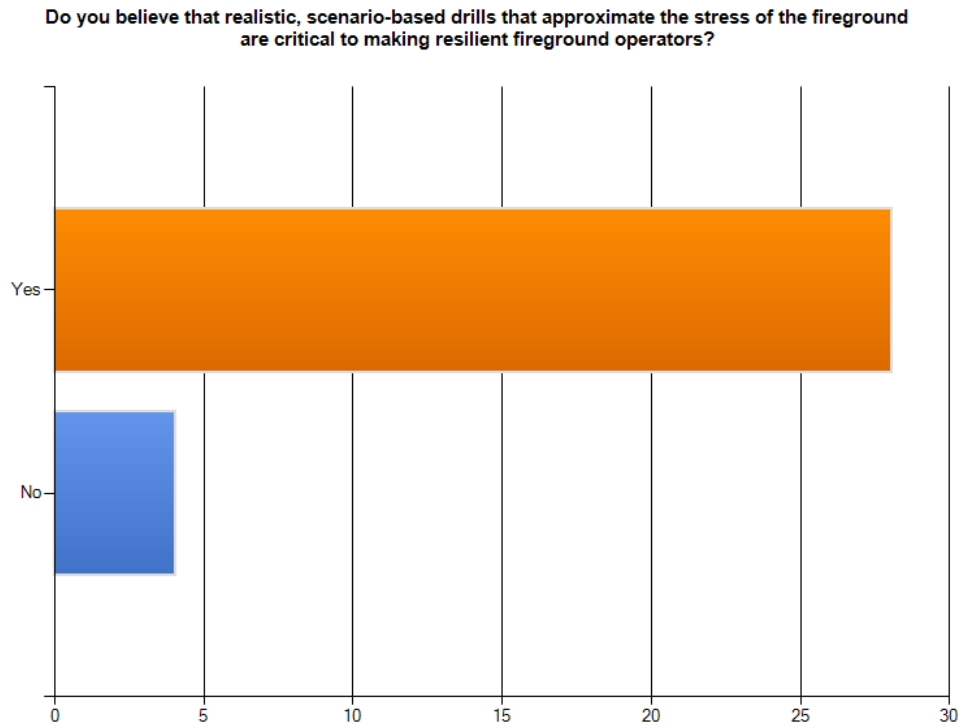
The internal survey instrument identified four popular methods of training used by the ICFD, and asked respondents to identify which method, in their experience, was most effective in creating effective firefighters in the stress environment (Figure 34).

Figure 34. Most effective method of training for operational effectiveness.



32 of 32 participants answered the question. 100 percent of respondents identified realistic, real-time, scenario-based drills as the most effective training model. A follow-up question was asked that sought to determine whether ICFD members believed that realistic, scenario-based drills were fundamental in creating resilient fireground operators (Figure 35).

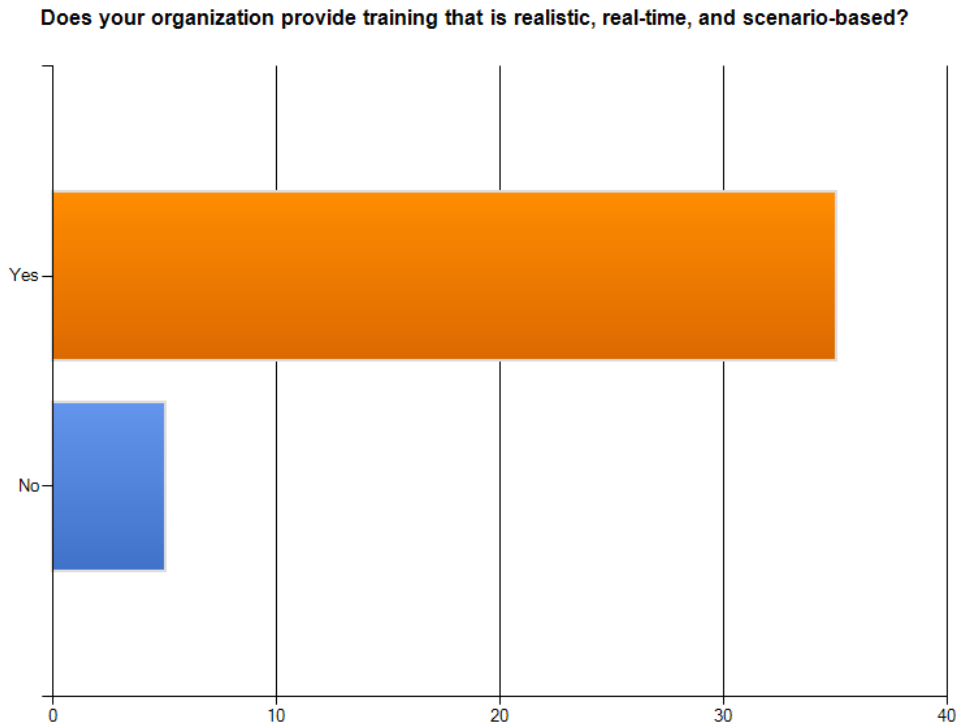
Figure 35. Importance of realistic training in creating resilience under stress.



100 percent of the participating sample group answered the question. The survey indicated that realistic, scenario-based drills were critical for preparing firefighters to operate effectively under stress, with 87.5 percent of respondents signaling that they believed this to be true.

While the internal survey instrument established the effectiveness of the scenario-based model and the importance of the method to create resilient operators under stress, the external survey also reflected that realistic, scenario-based, real-time scenarios were practiced in other organizations (Figure 36).

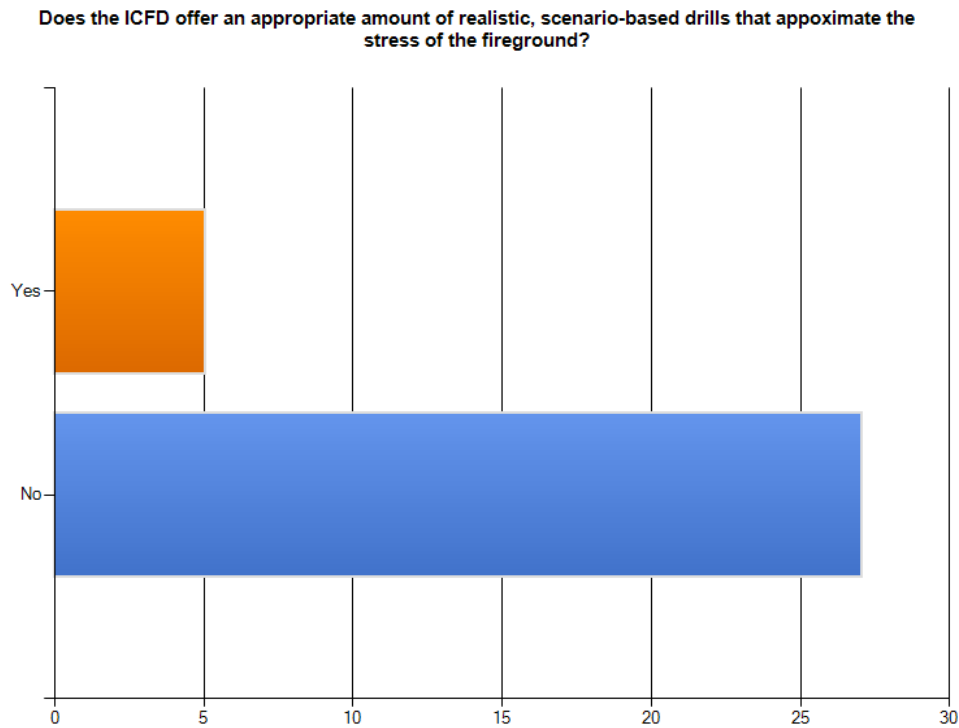
Figure 36. Realistic training scenarios in other organizations.



40 of 41 total participants answered the survey question, with 87.5 percent indicating that their organizations relied on the realistic and real-time scenario model.

With the relative importance of realistic training established, the survey instrument asked ICFD members whether they believed their fire department training program offered enough realistic training that approximated the actual fireground (Figure 37).

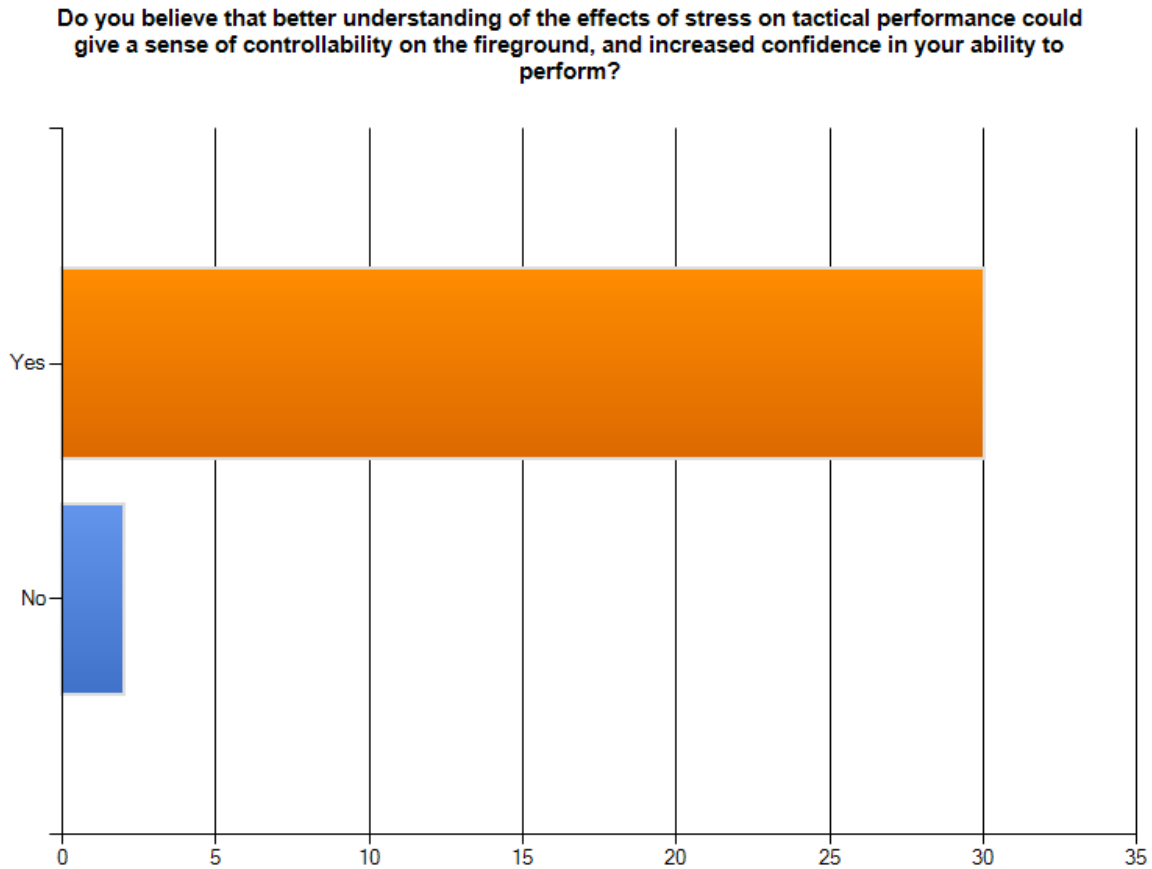
Figure 37. Appropriate levels of realistic training within the ICFD.



A lack of realistic training which approximated the stress environment was identified by the internal survey instrument. 32 of 32 participants answered the question, with 27, representing 87.5 percent, indicating that the ICFD does not provide an appropriate amount of training that was deemed to be both the most effective method of training and the foundational model for creating operators who can function effectively in the high-stress environment.

A final survey question posed to ICFD firefighters and officers dealt with attitudes related to a focus on mental development related to the effects of stress on performance. Specifically, the participants were asked if they believed that an increased understanding of the effects of stress on tactical performance would instill a sense of control on the fireground, and augment confidence in their performance ability (Figure 38).

Figure 38. Importance of ICFD training related to effects of stress on performance.



The survey instrument clearly established that the members of the ICFD believed that explicit training related to the physiological and psychological effects of stress on performance would make them more effective operators on the fireground by instilling a confidence a sense of control. 32 of 32 participants answered the question, with 93.8 percent answering that they believed in the ability of a mental-centric training program to enhance their performance.

The results of both the internal and external surveys provided an answer to the fourth research question. Those survey instruments identified the importance of a training program that first recognizes the primary importance of mental development and readiness on tactical performance. The training program should identify (a) what stressors are present on the

fireground, (b) how those stressors impact physiological and psychological function in firefighters, and (c) how those physiological and psychological changes may serve to diminish performance. Training related to negative effects of stress should include poor radio communication, inattentive blindness, labored breathing, elevated heart rate, diminished ability to make decisions, and loss of team perspective.

The ICFD training program should further seek to teach students to recognize when stressors are causing physiological and psychological changes that may diminish performance, and instill techniques within firefighters and officers to combat and overcome those effects. The survey instrumentation revealed that topics for inclusion should be the Yerkes-Dodson Law, Stress Exposure and Stress Inoculation Training paradigms, Tactical Breathing, Tactical Performance Imagery, Tactical Self-Talk, Negative Thought-Stopping, and Tactical Muscle Relaxation.

The training program should include significant levels of realistic, scenario-based, real-time drills that approximate the stress environment. Stressors should be included in scenario-based training, and should include diminished and zero-visibility, novel or unexpected problems, poor or confusing radio communication, disorientation, PPE failure, and disabled / injured / fatally wounded team members.

Discussion

The effects of stress in diminishing tactical performance have been well-documented by military warfighters, psychologists, and human behaviors specialists. Most prominent among these may be the ancient warrior-leader Sun Tzu, and the Prussian general Von Clausewitz, both widely considered to be the finest strategists and tacticians in the history of conflict (Coram, 2002). Sun Tzu counseled that the wise commander could effectively prepare the mind of his

enemy and thereby swing initiative in his own favor without engaging him (Tzu, 2001). Maneuver, unpredictability, controlling of the environment, and understanding the reality of warfare give more advantage to a commander than most any other factor, including force size. The implication inherent throughout the writings of Sun Tzu was that the mental aspect of war carries an exponential importance over the physical aspect (2001).

Von Clausewitz (1982) wrote extensively about the nature of the battlefield, and particularly about how stress caused by uncertainty and complexity significantly reduced the effectiveness of warfighters. Those factors, he said, created infinite incalculables, making it impossible for trained professionals to hold “even the line of mediocrity” (p. 165). Von Clausewitz concluded that these factors combined to form a resistant medium, within which the simplest tasks became increasingly difficult or impossible. Von Clausewitz classified this notion as friction, a context which soldiers will find to be devoid of reason, where only the most exceptional minds do not “lose the power of making any instantaneous decisions” (p. 160).

The United States Marine Corps Warfighting Doctrine (1994) warned Marines that to achieve any level of success in war, one must be familiar with its attributes. Finding concurrence with Sun Tzu and Von Clausewitz, the modern doctrine warned that the timeless attributes of war are friction, uncertainty, fluidity, disorder, complexity, and dimensions of human behavior. Those attributes were found to create a malevolent synergy that had a significant negative impact on human endeavor.

While the nature of conflict was found to be both eternal and essentially unchanging, Von Clausewitz deduced that the greatest contributing factor to reduced performance in conflict was warfighters’ relative unawareness about the conditions in and nature of conflict. The effect was

diminished tactical effectiveness, loss of unit cohesion, and ultimately destruction for those who were unable to adapt to the realities of the conflict environment (1982).

Given the perspectives of two military leaders who are regaled by history, both Boyd (Coram, 2002) and Richards (2004) concluded that it was pertinent for anyone operating in a competitive environment – especially one where life and death hang in the balance – to consider first the true nature of the medium. Both Boyd and Richards, known for being leading strategic and tactical reformers in the 20th century military, found that the nature of combat was overwhelmingly similar to other competitive environments that involved conflict of any sort. Major Jason Brezler, a highly-decorated leader of combat Marines in both Iraq and Afghanistan, and also a firefighter in New York City, also agreed that both his study and his experience led him to believe that the nature of the battlefield and the nature of the fireground are overwhelmingly similar (Nurnberg, 2012).

While this seems perfectly reasonable to openly consider how the nature of conflict influences action, Von Clausewitz argued that men who operated in the conflict medium commonly refused to consider its reality, because “the horror of its elements excites repugnance” (1982, p. 102). Leading authorities in the 21st century agree: Noted psychologist and Army Green Beret Lt. Col. Dave Grossman said that people in most occupations have little reservation related to considering how their performance is shaped and affected by the realities of their environment, but that machismo and ego in tactical response personnel preclude most from every talking openly about the effect of the environment on performance. This was due in part to the proclivity of response personnel to feel shame in admitting that their performance may be negatively impacted under pressure (2008). Nevertheless, Grossman held that openly considering

the topic was fundamental, because “a warrior must be a master of the art of combat, and as such he must understand its reality” (p. 8).

Academia supported the notions found in the writings of experienced battle commanders. Researchers Klein (2003) and Gasaway (2009) both found that the fireground was pervasively uncertain, consisting of critical pieces of information that were essentially unknowable in time-sensitive and high-stress environments. Failure to understand the nature of the environment significantly reduced the likelihood that firefighters could orient themselves to their environment. Richards subsequently found that disorientation in the conflict environment rapidly caused panic, chaos, reduced morale, and the loss of team cohesion (2004).

Gasaway (2009) and Richards (2004) both found that a fractured understanding of the environment’s realities could lead readily to defeat. Orientation was impossible if operators did not understand their reality; because decision and action were both predicated on orientation, decisions and actions would be flawed and not have the desired effect for the disoriented individual or team. Richards concluded that “you won’t understand why this is happening to you, despite your best efforts, and breakdowns in groups or individuals can be expected. You will have lost the initiative, and the conflict” (p. 66).

As in the preceding paragraph, this research project refers frequently to concepts such as diminished performance, undesirable outcomes, and lack of success in the stress environment. Because a relative dearth exists in topical literature related to the fire service, it is of overwhelming significance to define what these terms mean within the scope of this fire service research project. Whereas Major Brezler concluded that the fireground, like the battlefield, was an environment of significant danger where no measure of relative safety could be guaranteed (Nurnberg, 2012), it should be noted that diminished performance may be a

precursor to firefighter injury, or worse. Lack of success in the stress environment may well refer to the deaths of firefighters or civilians whom they serve, or both. Noted fire service researcher Dr. Gasaway found that fractured understanding of the environment's realities – what he refers to as Situational Awareness – were the leading contributing factor in fire service line-of-duty-deaths. Both Grossman (2008) and Asken (2010) concurred that survival in dangerous, novel, and stressful situations is dependent on this sort of environmental orientation. This research project then is directly related to promoting survival within a medium where survival is not guaranteed.

The research questions sought to determine how incident stress impacted performance, how other organizations trained for tactical resilience under stress, and how the ICFD would be best suited to offer similar training. It is relevant to note that the literature review clearly supported the notion that understanding the nature of conflict was foundational in understanding the impact of stress on performance, and predicated any training efforts to overcome the effects of stress on performance.

The first research question was: How does incident stress impact the performance of emergency operators? The literature review provided significant insight, showing that the human mind and body, when subjected to stressors, initiate physiological and psychological responses that serve to both improve and significantly diminish tactical performance.

Conflict “is a business in which every man's horizon is greatly shortened” according to SLA Marshall (1978, p. 113). As an authority on the nature of conflict, Marshall held that pervasive uncertainty, friction, and disorder serve to render the unprepared mind – and by extension the body – useless. Marshall found that while in the midst of a conflict where injury or

death is possible, the stress of the situation may disable the soldier because “its most unnerving characteristic is that it invites him to a death which he does not seek” (p. 44).

The experiences of Von Clausewitz led him to reflect that the complexity of the conflict environment, coupled with disorder and the often complicating factors of the human dimension, made action in battle seemingly impossible (1982). He likened action within the stressful context of war to trying to execute tasks while submersed in water: “Just as a man immersed in water is unable to perform with ease and regularity the most natural and simplest movement, that of walking, so in war, with ordinary powers one cannot keep even the line of mediocrity” (p. 166).

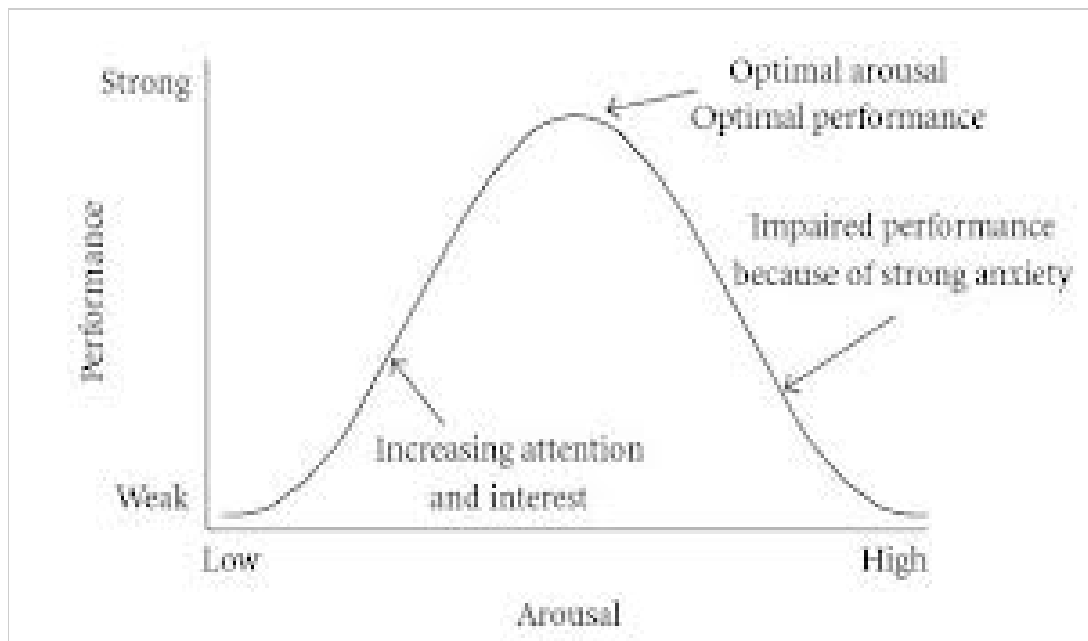
Modern psychologists and human performance experts have significantly advanced the mental machinations that cause what Von Clausewitz and Marshall observed. Grossman has dedicated much of his life to understanding the psychology and physiology of those who function in the high-risk tactical environment. He found that when the mind perceives danger, responses from the sympathetic and parasympathetic nervous systems spring into action and institute “a total mobilization of all assets toward one thing and one thing only – survival” (Grossman & Christensen, 2008, p. 15).

Grossman (2008) noted that instantaneous reactions to stressors can include physiological responses such as massive dump of performance-enhancing hormones, increased heart rate, increased respiration, blood shunting to major muscular-skeletal groups, and the heightening of senses. Similarly, psychological responses abound, the most notable of which include the diminished function of the logical and rational left hemisphere of the brain, and the significant enhancement in function of the emotional, creative, and intuitive right hemisphere. Other notable researchers concur that the homeostatic mind and body, while in a non-stress environment,

resembles very little the organism that is the grips of the fight-or-flight reflex (Coleman, 1995; Gassaway, 2009; & Klein, 2003).

Foundational research that has significantly augmented modern understanding was performed by the human behavior researchers Yerkes and Dodson (1908). The significance of the “Yerkes-Dodson Law,” as it is called, is defined by the fact that it is prominently referenced in seminal research related to the effects of stress on performance (Asken et al., 2010; (Grossman & Christensen, 2008; Mitchell & Bray, 1990). Yerkes and Dodson effectively determined that effective performance under stress may be defined by the level of stress – or arousal, as it is referred to in academia – which a subject experiences. The Yerkes-Dodson Law states that performance will be poor when not enough arousal exists, and poor when too much arousal is experienced. Further, performance will be optimal when an optimum measure of arousal is experienced (Figure 39).

Figure 39. Yerkes-Dodson Law



Selye (1974) found that stress played an important role in human's adaptive effort to survive in novel or stressful situations, to the extent that moderate amounts of "good stress" – also known as "eustress," serve to heighten mental acuity and physical performance. Similarly, Coleman (1995) found that moderate arousal was useful in the way that it altered mental function. Whereas the relatively slow and detail-oriented logic and reasoning centers of the brain are generally in control of mental function, Coleman deduces that the brain reacts to stressors by relieving those centers of control. To better facilitate survival, the brain conveys control of mental and physical functions to the much faster and intuitively-oriented centers of the brain. Coleman's research promoted the notion that this change in neurologic function allowed the individual to react quickly to novel and dangerous circumstances, rather than determining courses of action in a more linear and subsequently slower fashion (1995).

In concurrence with Yerkes and Dodson, however, Coleman found that the physiological and psychological benefits of stress only existed to a defined point of demarcation, where they began to diminish performance. Asken agreed (2010), and forwarded findings based in research that showed that physiological and psychological reactions to arousal are generally much more likely to diminish performance than to enhance it.

Grossman (2008) and Asken (2010) determined that physiological and psychological effects of stress served to diminish tactical performance in a number of ways. Physical disruptions included choking, freezing-up, death grip, muscle tension and fatigue, disrupted coordination, and blurred vision (Asken et al., 2010, p. 65). Stress effects on performance included decreased awareness of environmental cues, decreased ability to manage anxiety, decreased ability to deal with errors, and increased mistakes and injury (p. 68). Perceptual

distortion included auditory exclusion, intensified sounds, inattentive blindness / tunnel vision, intrusive distracting thoughts, and slow or fast motion time.

While never before contemplated openly or in training classes among members of the Iowa City Fire Department, this research was found to be relevant to the experiences of department members. A majority of members participating in the internal survey instrument admitted that they had experienced one or more physiological or psychological effects of stress which disrupted performance. Further, more than 90 percent of those surveyed admitted that they believed they had observed similar performance reducing signs in co-workers at emergency scenes.

Survey participants allowed that the ICFD has never provided any relevant training on the effects of stress on performance. Further, a significant majority allowed that instruction on the performance degrading effects of physiological and psychological responses would enhance their performance and confidence on the fireground. These results, considered within the research context of both the nature of the fireground and the performance diminishing characteristics of stress, identify that an unresolved problem exists on the Iowa City Fire Department. The results of this research and literature review concluded that physiological and psychological responses to stress can diminish performance in a myriad of ways, and that those diminishing effects are experienced by tactical operators on the ICFD.

The three remaining research questions were directly related to training models and methods. The second question and third research questions asked what methods other organizations and other fire departments used, respectively, to reduce the physiological and psychological effects of stress on performance. The final research question asked what methods

the Iowa City Fire Department should use to teach firefighters to understand and minimize the physiological and psychological effects of stress on performance.

Historical and modern literature alike were exceedingly critical of existing training paradigms, claiming that they were ineffective at preparing students for operation in the stress environment, and encouraging new and progressive training models to satisfy the defined need. Von Clausewitz (1982) railed against the military training paradigms that sent soldiers to war without an approximate understanding of the environment he would experience there, not the ways in which that environment would affect him. The Prussian general was certain that soldiers must be informed about the realities of war and how humans react to it from the very beginning of their training. He suggested that soldiers would only be effective in war if they were trained in an environment that replicated war, stating that the correct training theorist “is like a swimming master, who teaches on dry land movements that must be required in the water, which must appear ludicrous to those who forget about the water” (p. 166).

Clausewitz is of course not referring to the value of repetition outside the resistant medium in preparation for it, but rather alludes that training must continually seek to exist within the broader context of the target environment, reminding the swimmer that the strokes he has rehearsed on dry land will not so easily be executed in the water. SLA Marshall cautioned training authorities that in training for performance in battle “the mind of the infantry soldier should be conditioned to an understanding of its reality through all stages of training” (1978, p. 36).

Marshall believed that the facts related to the nature of the conflict and its effect on human performance “should be made his not only for the sake of personal survival but in the interests of unit efficiency” (1978, p. 37). Because of the stressors inherent to the medium of

conflict, Marshall found that failure to prepare the minds of soldiers culminated in men going into battle “haltingly and gropingly” (p. 37) losing lives, team perspective, time and initiative along the way. It is Marshall who first offered the notion of training with the explicit objective of understanding the stressors of conflict, their effect on performance, and techniques to combat and overcome those effects:

It is possible that the infantry soldier can be trained to anticipate fully the true conditions of the battlefield; it is possible that units can be schooled to take full and prompt action against the disunifying effects of these conditions. Fear is ever present, but it is uncontrolled fear that is the enemy of successful operation, and the control of fear depends upon the extent to which all dangers and distractions may be correctly anticipated and therefore understood (1978, p. 37).

It was remarkable that a treatise on training for effective performance in war, penned at the end of World War II, offered insight that modern scientists have only begun to significantly expand in the past two decades. Klein’s groundbreaking work related to intuitive decision making on the fireground (2003) found that the mental models necessary to enable effective decision making required adaptive expertise forged in circumstances similar to the target environment. Gasaway (2009), Richards (2004), and Heal (2000) agreed that lack of specific mental and physical preparation for operational eventualities increased the odds of novel situations diminishing odds of success and survival.

The survey instruments revealed trends in tactical training that proved both interesting and disconcerting. A majority of respondents to both survey instruments, representing ICFD members, officers from other fire departments, law enforcement officers, EMS professionals and military commanders agreed with Marshall et al. that tactical performance was most importantly

predicated on mental development. That finding was not expected, and proved to be both interesting and encouraging. Subsequent survey findings, however, proved to identify an area of concern, particularly in the fire service.

In both the internal and external survey instrument (Appendix A and B), a majority of respondents identified the critical nature of mental development related to effects of stress on performance. In the ICFD survey, for example, most respondents found mental development to be of primary importance, but an even greater majority admitted that the ICFD provided no training in that area. While some did indicate that they had received such training at the ICFD, my familiarity with both the research and the history of training in my department leads me to conclude that those responses are not accurate. Further, the external survey instrument showed that more than three-quarters of chief officers in other departments believed Marshall's training definition to be foundational for effective tactical performance, yet only 16 percent of fire departments offered that training.

It is my belief that this ARP represents a novel research undertaking in the fire service, and it is a certainty that much more research is required to "gap-analyze" the training paradigms of my fire department or any other. The survey results raise the significant question, however, if fire officers with influence understand the link between survival and mental development training for performance under stress. The allowance that 78 percent of chief officers believe the performance of their firefighters is predicated on a specific training initiative that is only provided in 16 percent of departments is troubling.

The literature review revealed volumes of research and abundant theories regarding the physiological and psychological effects of stress on performance. Only two comprehensive training paradigms were revealed to prepare operators for resilient performance under stress.

The seminal research works found in Making Decisions Under Stress (Cannon-Bowers & Salas, 1998) and The Warrior Mindset (Asken et al., 2010) each independently concluded that tactical organizations largely have no training programs to promote resilience under stress. They further found that those that endeavor to provide such training do it in a way that is largely ineffective. Dr. Asken provided insight on why this reality existed:

Even where the importance of psychological skills is recognized, it's often true that training on how to succeed psychologically, as well as physically, is not taught consistently. Unfortunately, this is often to the detriment of the important contribution that psychological skills and training can have in maximizing the execution of physical skills. Consider this a form of "training tunnel vision" that slows the development of physical and psychological readiness (mental toughness) for many (2010, p. vii).

Some reasons offered by Asken as to why such training is underutilized (and improperly utilized) is that (a) a common misperception exists that because a training topic is psychological in nature that simply discussing the topic is adequate, (b) that most training officers are uncertain about how to train for mental toughness skills, and (c) there has existed a lack of a comprehensive and structures training program (2010).

The TADMUS researchers (Cannon-Bowers & Salas, 1998), clearly defined the need for a comprehensive and sequenced training program to prepare individuals to maintain effective performance under stress. TADMUS found that the appropriate integrated model of stress training enabled the training designers to appropriately answer critical questions, such as (a) When would stressors be introduced in training? (b) How should training be sequenced? (c) When should skills training be introduced? (d) What information should be presented regarding stress effects?

TADMUS researchers offered significant insight into the sequenced and integrated training models of Stress Exposure Training and Stress Inoculation Training. They did readily admit though, as did Asken (2010), that those training programs were used very rarely in the professions that would benefit the most from them: the military, law enforcement, firefighting, and aviation.

It was interesting that the survey instruments confirmed this notion. Members of the ICFD, as previously established, represented that the organization provides no explicit stress training. It logically follows then that the organization provided no comprehensive and sequenced training programs. While external organizations had different experiences with training programs, those results also confirmed the common literature review contention that proper training paradigms were underutilized.

In the external survey, only 30 percent of the total sample group provided Stress Training as defined in Marshall (1978) and TADMUS (1997). Of those law enforcement, EMS, military, and fire department samples, only nine of 90 organizations attempted to sequence training. Affirmative results continue to decline in the external survey, with only 12 of 90 total respondents utilizing Stress Exposure Training, and seven of 90 utilizing Stress Inoculation Training. As a result, very few respondents signified that they were satisfied with the extent to which their current training programs prepared operators to function effectively under stress.

While occurrences of the aforementioned training models were indicated to a higher degree in law enforcement and military samples, the survey results for other fire departments reflected an alarming shortcoming in training. Most notable was that 65 percent of those chief officers surveyed work in organizations that make no attempt whatsoever to teach operators to be resilient under stress. Further, only two of 90 departments endeavored to sequence their training,

with only three admitting that they used components of Stress Exposure Training, and two noting that their department employed Stress Inoculation Training. Similarly, very few fire departments used components of Asken's Warrior Mindset Training (2010). It seems reasonable that causes of these results may be (a) that fire departments do not understand the relationship between stress and poor fireground performance, (b) fire departments have little understanding of appropriate methods for stress-related training, (c) that fire departments lack the resources or desire to implement a complicated and long-term training initiative, and (d) that these paradigms, particularly Asken's more refined model, are relatively new and therefore have not achieved a significant level of notoriety.

Other organizations were found to make efforts at training operators to function more effectively under stress. Fire departments and other tactically oriented professions alike did provide, to some degree, what the literature might classify as Stress Training (Asken et al., 2010; Cannon-Bowers & Salas, 1998; Grossman & Christensen, 2008; Marshall, 1978).

Of those organizations that provided training to promote effective performance under stress, nearly 90 percent used realistic, real-time, scenario-based drills. This was identified by ICFD members as the best training model to create effective performers under stress – a contention that the literature overwhelmingly supports (Asken et al., 2010; Cannon-Bowers & Salas, 1998; Grossman & Christensen, 2008; Klein, 2003; Nurnberg, 2012; & Von Clausewitz, 1982).

Some organizations injected stressors into their training drills to approximate the stress environment. External organizations indicated that they utilize diminished visibility, zero visibility, novel or unexpected problems, poor or confusing radio communication, disorientation, PPE failure, and disabled or fatally wounded teammates in training drills to approximate the

target environment. Von Clausewitz (1982) would approve of these endeavors, as he believed that “It is of the first importance that the soldier, high or low, should not have to encounter in war things which, seen for the first time, set him in terror or perplexity” (p. 160). Marshall reinforced the point when he stated that the overriding goal must be to cast such an illuminating light in training scenarios that the darkness encountered during conflict would hold no surprise (1978).

Among those organizations that endeavored to provide training for stress resilience, many were found to specifically address common physical/psychological/cognitive effects that are proven to reduce tactical performance. While exhaustive examples may be found in the literature, common effects addressed in training and reflected in the external survey included poor or excited radio communication, diminished decision making ability, inattentive blindness or tunnel vision, loss of team perspective, labored breathing and elevated heart rate, and lack of initiative. These efforts are in keeping with recommendations found in the literature that “Stress Training should focus on developing the cognitive and behavioral skills required to maintain effective performance under stress” and “the type of skills training implemented varies according to the specific training requirements but may include cognitive control techniques that train the individual to regulate negative emotions and distracting thoughts, as well as training to enhance physiological control (i.e., awareness and control of muscle tension and breathing)” (Cannon-Bowers & Salas, 1998, p. 212).

A synthesis of the survey instruments and the literature review showed that there are efforts in the American fire service to prepare firefighters to understand and overcome the effects of stress that reduce both performance and the likelihood of survival. There were three interesting revelations associated with the second and third research questions. The first finding

of interest is that while efforts to train for the stress environment in targeted ways exist, they were indicated to a higher degree among the law enforcement and military communities, but relatively rare in the fire service (and non-existent in the ICFD). The second significant finding was that there was no significant proliferation found regarding comprehensive and sequenced stress training in the fire service. The third significant finding was considered to be one of the most important discoveries of the research. The two most notable authorities on implementing comprehensive and sequenced training models (and the only two authorities to propose any models at all), found that while building technical skills in training is important, it is not sufficient for instilling the ability to react appropriately in the stress environment (Asken et al., 2010; Cannon-Bowers & Salas, 1998).

It was determined therefore that the scenario-based training, use of stressors, and training related to the negative effects of stress are not wholly unprofitable. It is unlikely, however, that students are allowed to approach their full development potential during those training drills, and even more unlikely that those skills will translate to the stress environment. While more research is required to effectively determine the best-practice training paradigms identified by empirical research, it can be conclusively stated that the second and third research questions did determine how other organizations train for resilient and effective performance under stress. Because those training methods were found by subject matter experts to be insufficient, it was also determined the results of the external survey did not fully illuminate verified best-practices for application within the ICFD.

The final research question dealt with determining the training methods and models that would be most appropriate for teaching operations personnel in the ICFD to recognize and overcome the physiological and psychological effects of stress on performance. Both historical

and modern literature lent a significant understanding to the research endeavor. Literature and research related to the performance-diminishing effects of stress on the battlefield were found to exponentially outnumber those that are expressly related to the fire service. While this could be viewed as a hindrance to the research effort, it was interesting to find that researchers like Asken (2010), Canon-Bowers & Salas (1997), Klein (2003), and Siddle (1995, 2008) all agreed that fireground stressors and their effects upon performance were very similar to those found in combat. Further, they found that effective training paradigms for armed conflict and for success in emergency fire operations are similar.

Heal (2000), Marshall (1978), Von Clausewitz (1982), and Marine Corps battle doctrine (Warfighting, 1994) were among those warrior experts who described the battlefield as an environment of pervasive uncertainty and fraught with friction, disorder, fluidity and complexity. Boyd (Coram, 2002) and Richards (2004) found that the elements that pervade the battlefield exist in most forms of conflict, a contention that Gasaway (2009) and Brezler (Nurnberg, 2012) found to be especially applicable to the fireground. It was of primary significance to the research project that these authorities all found that performance and survival in the stress environment were significantly enhanced by a deep understanding of the realities of the environment. The doctrine of the United States Marine Corps contended emphatically that any training for success during conflict must be predicated on this type of understanding (Warfighting, 1994).

The project concluded that any training paradigm designed to create resilient performers under stress must have mental development of the operator as the foundation. Mental development was found to take the form of exposure to and understanding of the psychological stress that causes disorder in the target environment. Von Clausewitz said that the extent to which we believe our operations are coordinated and well times will be found to be “not so in

reality, and all that is exaggerated and false in such a conception manifests itself once in war” (1982, p. 165). Further stated, “The danger which war brings with it, the bodily exertions which it requires, augment this evil so much that they may be regarded as the greatest cause of it” (p. 165).

Marshall (1978), contended that the greatest performance-inhibiting factor in the stress environment was an incomplete understanding of how human nature generates erratic response. He spoke implicitly about the physiological and psychological effects of stress on performance when he reflected that:

It is beyond question that the most serious and repeated breakdowns on the field of combat are caused by failure of the controls over human nature. In minor tactics the almost invariable cause of local defeat is fundamentally the shrinkage of fire. In the great number of instances this shrinkage is the result of men failing to carry out tasks which are well within their power. . .these things being true, it is an anachronism to place the emphasis in training and command primarily on weapons and ground rather than on the nature of man (p. 38-39).

Asken (2010) and Cannon-Bowers & Salas (1998) found that training paradigms must be comprehensive, structured, carefully sequenced, and predicated upon understanding the environments inherent stressors and their effects on human psychology, physiology, and subsequently performance. These human performance researchers believed that explicit training related to the psychology of performance under stress was mandatory for success in any training program, and they all acknowledged regrettably that few tactical organizations use these effective programs.

It was very interesting that a vast majority of both internal and external survey participants agreed with such authorities as Von Clausewitz and Marshall that explicit training to prepare the mind for the conflict environment predicated effective performance under stress. It was further both interesting and alarming that the internal research revealed that the ICFD provides no such training. Also, the external survey instrument showed that a majority of participants have no formal training to increase awareness regarding the physiological and psychological effects of stress. Of those organizations that did provide such training, a small minority endeavored to provide that training in a comprehensive and sequenced fashion. These findings supported the contention of Asken (2010) and Cannon-Bowers & Salas (1998) that the most profitable training models are not proliferate in the fire service.

While the models and associated initiatives and objectives of TADMUS Stress Training and Stress Exposure Training were found to be effective for promoting performance and survival under stress (Cannon-Bowers & Salas, 1998), it was Asken's Warrior Mindset model that was found to be most applicable to the American fire service. Asken's model address "a synthesis of current work in a comprehensive and structured manner; specifically, direction on how to use such techniques for performance enhancement in a variety of military and police skills (including high stress situations) to manage the performance skewing effects of stress" (2010, p. xiii). Asken contends that the concepts and techniques presented in Warrior Mindset training "have application beyond military and police work. They are the foundation for excellence in performance in any area of human endeavor and achievement" (p. xv). It is significant to note also that Dr. Asken has a fire service background and refers specifically to many firefighting applications in the Warrior Mindset training model. As of the writing of this research project, he

is revising his 2010 book into a fire service training paradigm, which will be called the Valor Mindset (personal communication, March 14, 2013).

The Warrior Mindset paradigm (Asken, 2010) is interesting in that it represents a comprehensive and sequenced initiative that seeks to provide explicit training to cover the mental and psychological aspect of performing in a dangerous and stressful environment. Further, it provides research-validated techniques and skills to promote the effective anticipation and recognition of physiological and psychological changes that in the worst case can render a firefighter totally ineffective.

The Warrior Mindset also teaches skills to confront and overcome those adverse changes related to stress, and provides a model by which those mental skills can be effectively incorporated into real-time, scenario-based training that can increasingly approximate the fireground. In this way, firefighters may be trained to appropriately understand their environment and their involuntary reactions to it, and may be transformed into more resilient operators and robust problem solvers. In this way, even the novel situation may have been rehearsed both mentally and physically, and firefighters will be less prone to a descent into chaos when faced with increasingly dangerous, stressful, and novel conditions. As such, the performance of firefighters under stress will be bolstered, and the likelihood of survival at dangerous emergency scenes will be increased.

The research determined that members of the ICFD have a demonstrated need for this sort of training. The internal survey showed that nearly all respondents had both experienced and believed others had experienced performance diminishing effects of stress. It was also determined that no training is provided to teach firefighters how to recognize and overcome those effects. Finally, a significant majority of ICFD respondents indicated that they believed

that some training program that explicitly addressed the physiological and psychological effects of stress would increase their effectiveness on the fireground.

Another significant and surprising finding related to the internal survey instrument was that 100 percent of ICFD members surveyed believed that real-time, scenario-based drills were the best training method to promote effective performance on the fire ground. Nearly 90 percent allowed that these types of drills were essential for effective performance, and nearly 85 percent contended that the ICFD did not provide enough of this sort of training.

The results related to the desire for mental and psychological development training, as well as the expressed sentiment that the ICFD did not provide enough physical training to promote operational effectiveness under stress was an unexpected finding. It was believed in accordance with some literature review findings (Asken et al., 2010; Cannon-Bowers & Salas, 1998; Grossman & Christensen, 2008 and Marshall, 1978) that tactical operators may have little appreciation for the value of psychological training, particularly due to the notion that acknowledging performance shortcomings, particularly in the tactical environment, creates discomfort and for that reason is generally avoided. The results of the internal survey may be interpreted to show that the dynamic described in the literature review does not exist within the ICFD. This finding was both unexpected and encouraging.

Also, the result that showed that ICFD members desired more training related to both the mental and physical aspects of performance under stress was unexpected. It is a reality, based on my experience as a member of the ICFD command staff that the members of the ICFD are becoming progressively saturated with operational and administrative responsibilities. Escalating emergency commitments, extensive training requirements, thousands of company-level commercial inspections and a demanding Center for Public Safety Excellence (CPSE) re-

accreditation process have left ICFD firefighters and company officers stretched to the limit. Existing demands for time and attention are so significant that it was predicted that the survey would show that ICFD members did not desire augmenting the current aggressive training curriculum in any meaningful way. This result may be seen to exponentially reinforce the need for stress training, and it is believed that an ICFD committee to consider adoption of the Warrior Mindset training model would find a willing and committed membership.

The literature review and research answered the fourth research question by revealing that the ICFD should incorporate a training model that explicitly addresses the following topics: (a) the nature of the fireground, (b) the relationship between psychological function and stress, (c) the physiological and psychological effects of stress on tactical performance, to include phenomena such as auditory exclusion, inattention blindness, and others defined in the literature review, (d) developing cognitive and behavioral skills to promote effective tactical performance, (e) practicing cognitive, behavioral, and tactical skills in real-time, scenario-based drills that approximate fireground stressors. Finally, an overriding finding is to consider adoption of Dr. Mike Asken's Warrior Mindset training paradigm, which was found to be the most effective and comprehensive training program available for adoption by the ICFD.

Recommendations

The results of this research substantiated the contention that tactical performance – and by association the very notion of survival – is predicated on a clear understanding of the causes of stress and the associated effects on tactical performance. The results further reinforced the hypothesis that the ICFD has never provided training explicitly designed to explore the pervasively uncertain nature of the fireground and the subsequent barriers to situational awareness. Nor has the organization developed, delivered, or provided training designed to

establish awareness of the causes of stress on the emergency scene and the associated physiological and psychological effects stress has on tactical performance. The findings satisfied the purpose of the research, which was to determine how fireground stress impacts performance, and to determine what models or methods exist to train operators to recognize and minimize the effects of stress on performance. In accordance with the research purpose, and in an effort to promote effective performance and survival under stress, the following recommendations are submitted:

1. The most significant recommendation is to adopt the Warrior Mindset model for enhancing tactical performance and survival on the fireground, which addresses subsequent recommendations 3 through 9.
2. Clearly define the similarities between the nature of warfare and the nature of other forms of conflict – particularly the fireground – in order to validate for department members the findings which come from military sources.
3. Clearly define the primary importance of mental/psychological awareness training, and how tactical performance is predicated on the mental aspect of performance.
4. Clearly define how neurological function changes when individuals are subjected to fireground stressors.
5. Clearly define how those changes in neurological function precipitate physiological and psychological processes that can inhibit tactical performance.
6. Clearly and specifically define how physiological and psychological effects of stress can diminish tactical performance.

7. Develop and provide training on how to recognize the physiological and psychological effects of stress on the fireground.
8. Develop and provide training on how to minimize the physiological and psychological effects of stress on tactical performance. Important for inclusion are Tactical Arousal Control, Concentration Skills, Tactical Performance Imagery, Tactical Self-Talk, and Negative Thought Stopping.
9. Practice stress minimization skills first in the non-stress environment, and continue to teach and practice skills in training environments that progressively approximate fireground stress.
10. Institute a professional development reading list that includes works referenced in this project, with particular credence given to Asken, Cannon-Bowers & Salas, Coleman, Gasaway, Grossman, Klein, Marshall, Von Clausewitz, and USMC Warfighting.
11. Require members of the ICFD Training Committee to read this Applied Research Project
12. Because this is fledgling research related to a topic that has received little fire service attention, encourage subsequent research to better understand the relationship between stress and tactical performance, and to stay abreast of emerging theories, research projects, and training models.
13. Psychologist Dr. Mike Asken is an established leader in developing comprehensive training models for emergency response organization, and is currently adapting the Warrior Mindset paradigm specifically for firefighters. The

ICFD should, immediately upon its release, analyze his training paradigm and consider its usefulness as an ICFD training initiative.

The Iowa City Fire Department is a professional organization that is dedicated to providing progressive and high quality emergency services. The thoughtful design and careful implementation of a training program that is based on the findings of this research is appropriate, responsible, and supports the mission of the Iowa City Fire Department, the American fire service, and the operational objectives of the United States Fire Administration. Adoption of the recommendations contained herein, and committed subsequent research on the topic of the effects of stress on performance, will create effective performers and resilient survivors on the fireground.

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Appendix A

Survey of ICFD Members

Effects of Stress on Tactical Performance





1. Research related to tactical operators in emergency settings indicates that mental readiness is a more important factor in successful incident outcome than is physical readiness or technical readiness. In your experience on the fireground, do you believe that the mental aspect is more important than the physical or technical aspects?

		Response Percent	Response Count
Yes		68.8%	22
No		31.3%	10
answered question			32
skipped question			0



2. Research has shown that excessive incident stress can negatively impact physiology (tachycardia, deterioration of motor skills, rapid breathing, muscle tension and fatigue, freezing-up, tunnel vision are examples). Have you experienced one or more of these on the fireground?

		Response Percent	Response Count
Yes		68.8%	22
No		31.3%	10
answered question			32
skipped question			0



3. Of the physiological effects listed in the previous question: Do you believe firefighters/officers with whom you have worked have experienced one or more of those on the fireground?

		Response Percent	Response Count
Yes		96.9%	31
No		3.1%	1
answered question			32
skipped question			0



4. Research has indicated that excessive incident stress can have negative psychological effects (poor decision making, not hearing radio communication, fear, panic, inability to recall training standards, shouting, displaying excessive anger are some examples). Have you experienced one or more of these effects on the fireground?

		Response Percent	Response Count
Yes		62.5%	20
No		37.5%	12
answered question			32
skipped question			0


5. Of the psychological effects listed in the previous question: Do you believe firefighters/officers with whom you have worked have experienced one or more of those on the fireground?

		Response Percent	Response Count
Yes		93.8%	30
No		6.3%	2
answered question			32
skipped question			0


6. Has the ICFD ever provided you with training that explicitly identified the psychological and physiological effects of stress?

		Response Percent	Response Count
Yes		6.3%	2
No		93.8%	30
answered question			32
skipped question			0



7. Please read the terms below and identify each one that has been a training topic during your time on the ICFD.

		Response Percent	Response Count
Yerkes-Dodson Law of Arousal and Response		0.0%	0
Tactical Performance Imagery	<input type="checkbox"/>	3.1%	1
Tactical Self-Talk	<input type="checkbox"/>	3.1%	1
Negative Thought Stopping	<input type="checkbox"/>	3.1%	1
Tactical Muscle Relaxation	<input type="checkbox"/>	3.1%	1
Inattentional Blindness	<input type="checkbox"/>	3.1%	1
Auditory Exclusion	<input type="checkbox"/>	3.1%	1
Stress Inoculation Training		0.0%	0
Stress Exposure Training	<input type="checkbox"/>	3.1%	1
I have not received training on any of these		87.5%	28
		answered question	32
		skipped question	0



8. In your opinion, which of the following training methods BEST enable you to be an effective operator on the fireground?

		Response Percent	Response Count
Realistic, scenario-based hands-on drills		100.0%	32
PowerPoint		0.0%	0
Classroom lecture		0.0%	0
Magazine articles		0.0%	0
Videos		0.0%	0
answered question			32
skipped question			0



9. Do you believe that realistic, scenario-based drills that approximate the stress of the fireground are critical to making resilient fireground operators?

		Response Percent	Response Count
Yes		87.5%	28
No		12.5%	4
answered question			32
skipped question			0

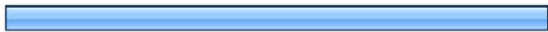

10. Does the ICFD offer an appropriate amount of realistic, scenario-based drills that approximate the stress of the fireground?

		Response Percent	Response Count
Yes		15.6%	5
No		84.4%	27
answered question			32
skipped question			0

11. Research indicates that when under stress, tactical operators revert to basic, ingrained behavior. In your opinion, does ICFD training (department, shift, company) do an adequate job of "ingraining" tactical and task-level skills so that they are second nature?

		Response Percent	Response Count
Yes		40.6%	13
No		59.4%	19
answered question			32
skipped question			0

12. Do you believe that better understanding of the effects of stress on tactical performance could give a sense of controllability on the fireground, and increased confidence in your ability to perform?

		Response Percent	Response Count
Yes		93.8%	30
No		6.3%	2
answered question			32
skipped question			0

Appendix B

Survey of Other Organizations



Methods of Training Tactical Operators for Resilience





1. What type of organization do you represent primarily?			Response Percent	Response Count
Fire Department			70.8%	63
Law Enforcement			9.0%	8
Emergency Medical Services			2.2%	2
Military			14.6%	13
Other (please comment)			3.4%	3
		Comment:		12
answered question				89
skipped question				1

2. Do your responsibilities require you to function in high-stress operational environments?			Response Percent	Response Count
Yes			95.6%	86
No			4.4%	4
answered question				90
skipped question				0

3. Do you have any influence or responsibility related to the training of operators in your organization?

		Response Percent	Response Count
Yes		88.9%	80
No		11.1%	10
answered question			90
skipped question			0

4. Research related to tactical operators in high-stress settings indicates that mental readiness is a more important factor in successful incident outcome than is physical readiness or technical readiness. In your experience, do you believe that preparing the mental aspect is more important than preparing the physical or technical aspects?

		Response Percent	Response Count
Yes		80.5%	66
No		19.5%	16
Other (please specify)			25
answered question			82
skipped question			8



5. To what degree have you witnessed disrupted tactical performance during high-stress, high-demand incidents?

		Response Percent	Response Count
On most high-stress incidents		2.2%	2
Frequently		27.8%	25
Sometimes		43.3%	39
Seldom		25.6%	23
Never		1.1%	1
	Comment:		14
	answered question		90
	skipped question		0



6. Does your organization provide any training that is intended to teach operators how to become resilient operators under stress?

		Response Percent	Response Count
Yes		30.7%	27
No		53.4%	47
Somewhat (please comment)		15.9%	14
	Comment: (please specify)		26
	answered question		88
	skipped question		2











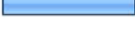
7. Does your organization provide training explicitly designed to teach operators how to recognize and combat the negative physiological and psychological effects stress has on performance?

		Response Percent	Response Count
Yes		48.8%	20
No		51.2%	21
	Other (please specify)		6
answered question			41
skipped question			49



8. If you answered YES to the previous question: Does your organization sequence training so that mastery of tactical skills is predicated on recognizing and combating the negative physiological and psychological effects stress has on performance?

		Response Percent	Response Count
Yes		32.1%	9
No		67.9%	19
	Comment:		4
answered question			28
skipped question			62



9. Which of the following negative effects of incident stress does your organization's training specifically address (if any)?

		Response Percent	Response Count
Auditory exclusion / selective hearing		12.5%	5
Inattentional blindness / tunnel vision		42.5%	17
"Freezing-up"		20.0%	8
Lethargy / lack of initiative		22.5%	9
Poor or excited radio communication		65.0%	26
Labored breathing		42.5%	17
Elevated heart rate		42.5%	17
Diminished ability to make decisions		40.0%	16
Decreased vigilance		17.5%	7
Loss of team perspective		32.5%	13
My organization does not provide specific training on any of these		22.5%	9
	Other (please specify)		6
answered question			40
skipped question			50



10. Research has shown that, for some tasks, normal training procedures (conducted under normal, non-stress conditions) often do not improve task performance when the task must be performed under stress conditions. The primary purpose of STRESS TRAINING is to prepare the individual to maintain effective performance in a high-stress environment. Does your organization provide training that approximates the conditions found in high-stress environments?

		Response Percent	Response Count
Yes		76.9%	30
No		23.1%	9
Comment:			11
answered question			39
skipped question			51


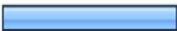
11. Stress Exposure Training (SET) is a 3-stage training intervention designed to (a) provide information regarding stress and stress effects, (b) allow acquisition of specific cognitive and behavioral skills, and (c) apply and practice those skills under conditions that increasingly approximate the criterion environment. Does your organization provide Stress Exposure Training?

		Response Percent	Response Count
Yes		29.3%	12
No		70.7%	29
Comment			6
answered question			41
skipped question			49



12. Stress Inoculation Training (SIT) builds resistance to specific stressful situations. The four steps include (a) Preparation for Provocation - mentally preparing for an event; reviewing the philosophy and strategy for meeting it, (b) Impact and Confrontation - prepping for the way the event will likely affect you; summoning practiced skills, (c) Coping and Arousel - the application of learned tactical arousal control skills to the challenge when it occurs, and (d) Review and Adjustment - reviewing behavioral and emotional management of the event to determine what worked and what did not. Does your organization provide Stress Inoculation Training?

		Response Percent	Response Count
Yes		17.1%	7
No		82.9%	34
answered question			41
skipped question			49










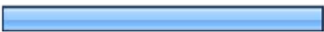



13. Does your organization provide training designed to provide operators with information regarding the nature of the stress environment in which they will perform high-risk, high-consequence missions?

		Response Percent	Response Count
Yes		70.0%	28
No		30.0%	12
Other (please specify)			1
answered question			40
skipped question			50










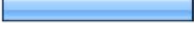
14. Does your organization provide training that is realistic, real-time, and scenario-based?

		Response Percent	Response Count
Yes		87.5%	35
No		12.5%	5
	Comment:		7
	answered question		40
	skipped question		50



15. During realistic, scenario-based training, which of the following stressors does your organization seek to utilize? More than one answer is allowed.

		Response Percent	Response Count
Environmental extremes (snow, rain, ice)		36.8%	14
Temperature extremes		34.2%	13
Diminished visibility		71.1%	27
Zero visibility		42.1%	16
Induced disorientation		52.6%	20
Poor or confusing communication		63.2%	24
Loss of communication		63.2%	24
Uncooperative / hostile subjects		60.5%	23
Introduction of unexpected / novel problems		73.7%	28
Technological / equipment failure		55.3%	21
Disabled / injured / fatally wounded team members		73.7%	28
PPE failure		42.1%	16
Other (please comment)		10.5%	4
	Other (please specify)		3
		answered question	38
		skipped question	52

16. Of the following topics related to developing resilient tactical performance in a stressful setting, for which ones does your organization provide training?

		Response Percent	Response Count
Functional physical fitness		57.5%	23
Tactical Arousal Control / Inverted U-curve / Fear Management		5.0%	2
Tactical Performance Imagery		5.0%	2
Tactical Muscle Relaxation		7.5%	3
Tactical Breathing		40.0%	16
Attention-Control Training		12.5%	5
Visuo-Motor Behavioral Rehearsal		2.5%	1
Tactical Self-Talk		10.0%	4
Negative Thought-Stopping		10.0%	4
My organization does not provide any training on any of these subjects		32.5%	13
	Other (please specify)		1
		answered question	40
		skipped question	50

17. Do you feel that your organization's training initiatives are sufficient to prepare operators to successfully recognize and combat the negative effects of stress on tactical performance?

		Response Percent	Response Count
Yes		33.3%	13
No		66.7%	26
	Other (please specify)		3
answered question			39
skipped question			51

18. In addition to the training methods and models referenced in this survey, does your organization use any other effective initiatives to develop resilient mental and physical performers in stressful operational environments?

	Response Count
	15
answered question	15
skipped question	75