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Panic Development Mechanisms And Preventive Methods Analysis

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PANIC DEVELOPMENT MECHANISMS AND PREVENTIVE METHODS ANALYSIS

by

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Inga Wuerges
27 March 2014

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ABSTRACT

Panic Development (PD) is one of the most important areas of Human Factors research due to its debilitating effects during high stress operating conditions in extreme environments. High levels of anxiety and panic evoke incidents that are a real threat to mission success and may result in fatalities. Human Space Exploration ushered in a new era for extreme environments within human performance capabilities. A delicate balance of crew selection, training, and systems' design is critical for mission success and human survival.

This research investigates possible panic development profiles and methods for preventing panic through realistic training. Extreme environments on earth include deep sea diving, mountain climbing, high altitude skydiving, base parachute jumping, and flying which serve as a test medium for future space exploration training programs. This research focuses on realistic training scenarios during the intense military flying exercise Red-Flag Alaska at Eielson AFB, AK. The high-paced scenario-based training environment is ideally suited for the testing of a pilot's understanding, familiarity, and coping mechanisms during induced panic states. The survey questionnaire centers on how realistic training techniques improve the pilot's ability to deal with a stressful environment, recognize and control panic in future situations.

Training to recognize, overcome, and prevent panic development in the future through realistic scenarios is an essential element of the successful outcome of a mission.

CHAPTER I

INTRODUCTION

A peaceful space environment engulfs an astronaut in soothing darkness. Only her own breath is audible during a routine maintenance Extra-Vehicular Activity (EVA). All of a sudden, a piece of orbital debris wreaks havoc and leaves the astronaut stranded in space far from the International Space Station (ISS) (Cuaron, 2013)[1]. A brilliant night sky full of stars and a half moon comforts three crew members on a voyage across the Pacific Ocean. A routine mission in a United States Air Force (USAF) KC-135R tanker aircraft becomes nonstandard when, without warning, the cockpit goes dark and all electrical systems are lost (Aviation Safety Brief, USAF)[2]. A multitude of colors explode in front of an eager diver when he finally sees a beautiful coral for the first time on his first dive. He performs a routine oxygen check and notices that his oxygen tank is almost empty. With the surface left far above, his breathing rapidly increases (Morphew, 1996).

The three situations developed in completely different mediums: space, air, and water, but the human reaction to all three will most likely be the same – panic. The extent to which physiological and psychological manifestation of panic will develop in these three scenarios depends on multiple factors such as available resources, personality types, and level of training.

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[1] Movie "Gravity"
[2] Privileged Information, USAF Aviation Safety Brief

Physiological effects will depend not only on the individual involved, but on the environment and any resources available within that environment: space suit, back up batteries, extra oxygen tank. The manifestations of psychological effects involve a complex process and greatly vary from person to person. However, psychological experiences closely relate to physiological outcomes. The positive event progression leads to effective problem solving: maneuvering towards a space craft, reconnecting generators, and sharing oxygen to resolve the situation. The negative progression is a complete freeze-up: floating in space, staring at a dark instrument panel, and uncontrollable hyperventilation with no attempt to remedy the situation.

Physiological and psychological training is equally important for a cohesive crew compliment. From selecting a compatible crew by personality type, to an extensive training level, physiological and psychological preparedness is vital to effective problem solving in high stress situations. Realistic training scenarios are the key to successful missions, for they create a link between physiological and psychological balance and prevent panic development.

The Problem

Panic Development (PD) is one of the most serious conditions that can develop while performing high risk tasks in extremely difficult environments. It is a widely occurring psychological state in high-risk performers such as astronauts, pilots, and divers. However, panic is not a very well researched, discussed, or covered training topic in general. "Panic is not only misunderstood, we too often fail completely to take it into consideration" (Tognazzini, 2004).

Fully developed panic can cause such debilitating effects on human performance during high stress situations in extreme environments, that it can lead to a complete freeze-up, fatal consequences, and overall mission failure. However, panic development and preventive methods in Human Factors research are rarely considered as a serious consequence to incidents and accidents in high risk operations. Research into panic experiences is challenging due to severe restrictions on experimentation with human test subjects, difficulty creating a realistic training environment to induce panic or near panic episodes, and the extreme diversity of human physiological and psychological abilities. Since human test subject limitations will not change, the need for realistic training programs within the prescribed limitations is a vital necessity. Due to wide variation in human subject capabilities and possible training environments, the mathematical modeling supported by statistical data helps to tailor realistic training scenarios.

Another reason panic is not well researched is because panic events are very rarely discussed between high risk performers themselves. Extreme environment participants usually share a strong "Type A personality" trait and rarely acknowledge being bothered by panic. Also, since panic episodes are rarely discussed, the training objectives required to prepare participants for such occurrences during real life situations are hardly ever met within training environments. Human Space Exploration ushered in a new era for high stress environments. The need for properly tailored training programs became necessary. Human integration with complicated Space Shuttle systems and staggering amounts of visual and auditory presentations at a moment's notice can be severely overwhelming for the improperly or insufficiently trained astronaut.

Mission crewmembers must endure cramped environments while aboard a space vehicle, prepare for an unexpected possibility of a solitary stay on an alien planet, and withstand long separations from family and friends. Depending upon proper training received prior to the high stress assignment, any situation may result in an instant success or failure of the mission. Three important interactions between humans (Human-Human), machinery (Human-Hardware), and surroundings (Human-Environment) will dictate an overall understanding how the event is progressing, or an overall Situational Awareness (SA). Positive SA ultimately determines an ability to recognize and control panic while accurately executing required mission protocols.

Mathematical modeling and theoretical predictions can lead this difficult area of Panic Development (PD) experimentation to where it can be better understood. Many factors are involved in bringing about PD. A better understanding of PD will enable a more accurate training program that can target specific stimuli to induce such events to better prepare trainees for real life scenarios. Specifically targeted questionnaires will aid in determining the validity of set training programs and highlight any necessary changes to the stressors or parameters. Accurately induced PD episodes during training scenarios will increase the future survivability of the subjects.

A Brief Overview of Previous Research

Manifestations of stress, panic triggers, and the environment in which many debilitating events occur have been researched since the early '30s (Selye, 1936). However, the focus on Human Performance in Extreme Environments became more relevant with development of more sophisticated diving equipment, mountain climbing oxygen breathing apparatus, and ultimately, NASA's space missions. All manned space missions, especially long-term missions, are always associated with multiple combined stresses. The necessity to accomplish mission goals successfully is most important when the window of opportunity is small and the risks associated with tasks are extremely high. Fast paced situations are usually coupled with an unpredictable sequence of events leading to stress that can develop into panic episodes among the crew.

To address multiple variables for a successful mission, an attempt has been made to select the most appropriate candidates for specific missions based on psychological stability, physiological compatibility, and cognitive abilities (Heslegrave & Colvin, 1993). Research has shown that even the most qualified candidates can develop psychological issues and negative physiological manifestations of stress that can have an impact on mission success. The wide range of human psychological and physiological abilities can present a staggering problem for researchers, training facilities, and actual mission progress monitoring.

The idea of high quality training has always been at the forefront of many high risk ventures like flying, diving, climbing, and space travel. Only recently however, attention has turned to specifically targeted realistic training scenarios. A very limited amount of research has focused on realistic scenarios for stress and panic training modules. The US military and NASA have dedicated the most effort in this research due to the importance it has on mission success. The benefits of combat training are significant (Red Flag - Alaska Fact Sheet).

Today's fast evolving technologies, ever more complex settings to live and perform in, and more challenging stressors present a unique experience for humans in extreme environments. The mere "rote memorization" training techniques are not enough to address rapidly changing situations. The proposed “Transactional Approach” views “Human-Hardware-Environment” as a continuously interacting medium. A more in-depth approach is a better way to build precise training environments to cover multitudes of complicated variables (Cuevas, 2003).

Importance to the Field

Panic development is extremely important to be aware of in high risk environments where human performance is vital to the success or failure of the mission. Usually these high-risk endeavors such as space exploration, human flight, and planetary research are extremely expensive, take a long time to prepare, and yet are of the utmost importance to humanity. They contribute to our understanding of our environment, our place in the universe, and our survival as a species. However, Panic Development in the Human Factors field is not yet well researched or completely understood.

Introducing humans to extreme stress or inducing panic is very difficult. The imposed limitations prevent subjecting humans to risky experiments. It is challenging to conduct research in extreme environments. Also, research subjects are apprehensive in discussing personal experiences. Realistic training scenarios can be developed to resolve the panic development research limitations, simulate desired extreme environment events, and teach preferable methods to deal with dangerous situations (engine-out procedures). The methodical research into stress, panic, and identifying stressors is vital in understanding how humans react to panic and cope with stressful events while operating in extreme environments. Properly tailored realistic training scenarios will provoke desired human reactions and foster positive coping mechanisms during actual high stress operations.

Mathematical modeling can identify the most appropriate scenario parameter that will directly correlate training objectives to desired learning objectives. It will eliminate less effective or completely irrelevant steps to solve a problem. For example, statistical model variables show that in 100 engine-out situations, 60% of the time shutting down the engine first and 40% of the time releasing extinguishing agent first results in a successful mission. A tailored realistic training will be developed around accomplishing engine shutdown as a first step in solving this undesirable engine-out situation. A realistic training scenario will introduce an aircrew to a potential stressful situation and possibly will help control the stress and avoid panic in an actual emergency.

My research focuses on answering if the realistic training scenarios/hands-on portions of exercises help in identifying stress or panic and prepare subjects to better control panic development in future situations.

CHAPTER II

LITERATURE REVIEW

Human Performance in Extreme Environments

Human performance in any environment is a combination of individual psychological and physiological abilities. ”Environments in which humans are not naturally suited and which demand complex processes of psychological and physiological adaptation” are called “Extreme Environments” (Manzey & Lorenz, 1999). Human performance in extreme environments raises new and challenging considerations when designing platforms and training human subjects.

Space, the final frontier, and an extreme environment, has fascinated humanity for millennia. With advances in technology, space finally gives us a true glimpse into future possibilities. Hall, et al. (1982) recognized human’s potential in space. The complex tasks such as rapid response to unforeseen emergencies, self-contained operations, vehicle control, enhancement of instrument flexibility, simplification of complex systems, backup reliability, equipment repair and improvisation, investigation and exploration cannot be left alone to remote systems (Hall, von Tiesenhausen, & Johnson, 1982). From the first human space exploration mission it has been evident how important man is to space flight. For example, the crew of NASA’s Space Shuttle Columbia (STS-9) reprogrammed an otherwise nonfunctioning device in space and turned the mission into a success. The Soviet Investigator Khachatur’yants (1981) agreed that the automated space systems' reliability is greater with manned space flights, due to the ability to repair them, wherever they may be.

The importance of a properly tailored training program to improve human integration with hardware, environment, and other humans for a total situational awareness is critical (Nicogossian, 1984). Space flight is a complex endeavor and precise training scenarios are difficult to develop due to multiple unknown variables. However, human behavior in extreme environments such as space can be similar to many experiences in other activities people perform on earth. Examples of such activities include: flying, diving, mountain climbing, and sky diving.

Human subjects, who participate in risky endeavors, usually have personality characteristics similar to those performing tasks in extreme environments in space. These characteristic include extraversion, emotional stability, conformity to social norms, and seeking thrill and experience by socialized means (Freixanet, 1991).

Understanding human behavior in extreme environments will help develop the selection process and training requirements for a successful mission. Utilizing psychological assessments, European Space Agency (ESA) was able to identify 77.7% of successful candidates (Fassbender & Goetters, 1994). Successful candidates are extraverts and emotionally stable (Raglin, 1997). State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1972) also proved to be useful in predicting voluntary withdrawal from the flight training when tested on naval aviator candidates (Bucky & Spielberger, 1973). Many isolation and confinement experiments (ICE) were put together such as Closed Life Support, Lunar-Mars Life Support Test Project (LMLSTP), and Biosphere 2 to evaluate human performance during closed ecological systems that resemble space missions (Putnam, 2005; Collins, 2003; Rygalov, Wheeler, Fowler, Dixon, & Bucklin, 2006; Allner M. M., 2009). The LMLSTP project evaluated crew selection, composition, training and preparation, family inclusion, educational briefings, in-mission tracking, operational interventions, and post-mission repatriation (Holland & Curtis, 1998).

The range of human behaviors during dangerous conditions in extreme environments will be driven by many factors. The time it takes for a situation to develop, the location and severity of a situation, and situational awareness at the time of occurrence will determine human behavior. For example, a critically wounded mountain climber on top of a cliff will act different than a superficially injured climber hanging in midair half way up the mountain. Another example with a compounding emergency is in an airplane (electrical failure followed by engine fire) during a night flight over the ocean where situational awareness is diminished versus an unexpected engine failure during a day flight with multiple available emergency landing fields. Human subjects will experience various amounts of stress during different types of situations. Such stress can mean the difference between gathering all available concentration, recalling training procedures, or completely paralyzing and leading the human subject to a panic state.

Panic development will also vary in a different environment from space, to sky, to mountains, and water, but the panic development mechanisms will remain similar. During an emergency situation, a ground based operator will have a full mission support and no harm flying from the control station (in the case of Unmanned Aerial Vehicle (UAV) piloting). A fighter pilot flying an aircraft at flight level (FL) 250 (25,000 ft) will deal with diminished resources at altitude. An astronaut at the International Space

Station (ISS) will have extremely limited amount of support and resources in space (Steel G. D., 2003). These environments will dictate the range of stress that can progress into a panic behavior. Different environments can be used to devise effective realistic training programs.

Stressors

Psychological, physiological, and environmental stressors will affect every crewmember during any given mission (Suedfeld, 2001). Environmental stressors such as noise, temperature, and capsule size can have a significant impact on group adaptation and functioning (Bishop, Santy, & Faulk, 1999). The key to minimizing or eliminating stressors is to study and understand how they negatively influence humans and their overall performance (Cuevas, 2003).

Psychological Stressors

Psychological stressors occur during group or individual interactions. Social stressors include: being away from friends and family on Earth, lack of privacy, crowding stress, isolation, confinement, interpersonal friction, and intercultural issues (Cuevas, 2003; Collins, 2003; Heslegrave & Colvin, 1993). An astronaut can become withdrawn or experience depression on long duration missions due to lack of social connectivity with everyone back on Earth (Manzey & Lorenz, 1999; Suedfeld, 2001; Cuevas, 2003). The Human-Hardware-Environment design will have to evolve for future long duration space missions to allow astronauts to connect with loved ones on Earth, resolve the privacy issues, allow for required minimum individual space, and improve selection process for multi-national crews. The goal is to keep everyone stress free and focused.

Psychological stress will manifest into behavioral, social, emotional, and even physical issues (Epstein, 1983; Manzey & Lorenz, 1999). Psychological stressors will affect how astronauts perform mentally, deal with group settings emotionally, and even react physiologically (Kraft, Lyons, & Binder, 2003). As future space missions become more complex, and as humanity prepares to depart for other planets and moons, crew selection processes and training environments will have to address more intricate issues.

Physiological Stressors

Physiological stressors in space such as micro and macro gravity, noise, environment, circadian rhythm disruptions, and fatigue will add to an ongoing psychological stress (Cuevas, 2003). Microgravity can induce space sickness, muscle degeneration, changes in vision, vestibular and proprioceptive processes (Cuevas, 2003). Due to space sickness, astronauts will need time to adapt before any major work is scheduled (Albery & Woolford, 1997). Decreased physical work capability due to muscle strength and body fluid shift will have to be addressed in hardware design (Manzey & Lorenz, 1999; Cuevas, 2003). Macrogravity effects to the brain are especially dangerous during launch and reentry where decreased blood flow can result in visual, memory, and central processing impairment (Cuevas, 2003). During high-G_z forces study, women maintained brain oxygen content better and were superior at coping with high-G_z compared to males (Chelette, 1997). On the other hand, males adapt better to conflicting visual-vestibular stimulation (VVS) compared to females (Viaud-Delmon, Ivanenko, Berthoz, & Jouvent, 2000).

The appropriate size of a vessel must be designed to carry required supplies and a crew for the duration of a mission. Crew comfort in such a foreign and extreme environment will be vital to mission success. Noise levels can range from a simple nuisance to eventually interfering with communications, work, and sleep (Cuevas, 2003). The circadian rhythm disturbances are already unique to space environments. Any further sleep degradation from other stressors can have negative effects on productivity (Wickens, Gordon, & Liu, 1999).

Future missions are becoming longer and more complex. Flights beyond four months can have effects of cumulative fatigue on astronauts (Myasnikov & Zamaletdinov, 1996). Fatigue can set in during critical mission phases and any further physiological stress will have severe effects on mission outcome (Manzey & Lorenz, 1999). Performance of even not too complicated tasks is significantly affected when subjects are awake for more than thirty hours straight (Chelette, 1997). Circadian rhythm disruptions and sleep disturbances have a debilitating effect on performance in space. They could have such serious consequences as an increased chance of an accident or incident (Mallis & DeRoshia, 2005).

Stress

Stress is “a state of mental tension and worry caused by problems or something that causes strong feelings of worry or anxiety” (Merriam-Webster.com, stress, 2014). The evolution of the stress concept has been developing since the 1930’s (Selye H. , 1936; Selye & Fortier, 1950; Selye H. , 1973; Selye H. , 1976; Koolhaas, et al., 2011). Interaction between the individual and the environment is usually used to investigate stress (Salas, Driskell, & Hughes, 1996). The stimulus-based (e.g., cockpit noise) or the response-based (e.g., headache) approach is standard practice when measuring stress (Cuevas, 2003). The difficulty in diagnosing and evaluating psychological states stems from cultural and individual privacy concerns in discussing ethical issues, revealing psychological problems, mental health concerns, and crew compatibility matters (Myasnikov & Zamaletdinov, 1996). There is a relationship between health, behavior, and gender differences in psychophysiological response to stress (Baum & Grunberg, 1991).

The significance of studying and understanding psychological and physiological aspects is extremely important for long duration space flights due to limited medical support (Myasnikov & Zamaletdinov, 1996). Stress can undermine person's sense of control and lead to illusory perception of controllability that can be exceedingly dangerous in extreme environments (Friedland, Keinan, & Regev, 1992). If unmanaged, stress can ultimately lead to a panic episode.

Qualitative descriptions of stress in models have been done by Selye (1974), Lazarus (Cognitive Appraisal Model, 1975), and Spielberger (Integrative Spielberger's Model of Anxiety, 1987) (Selye H. , 1974; Lazarus R. S., 1975; Spielberger C. D., 1987). The Spielberger's Model of Anxiety modeled after McGraths's (1970) Model of Stress shows fluid interactions between cognition-appraisal-perception from stressor introduction to addition of stress (McGrath, 1970; Spielberger C. D., 1987).

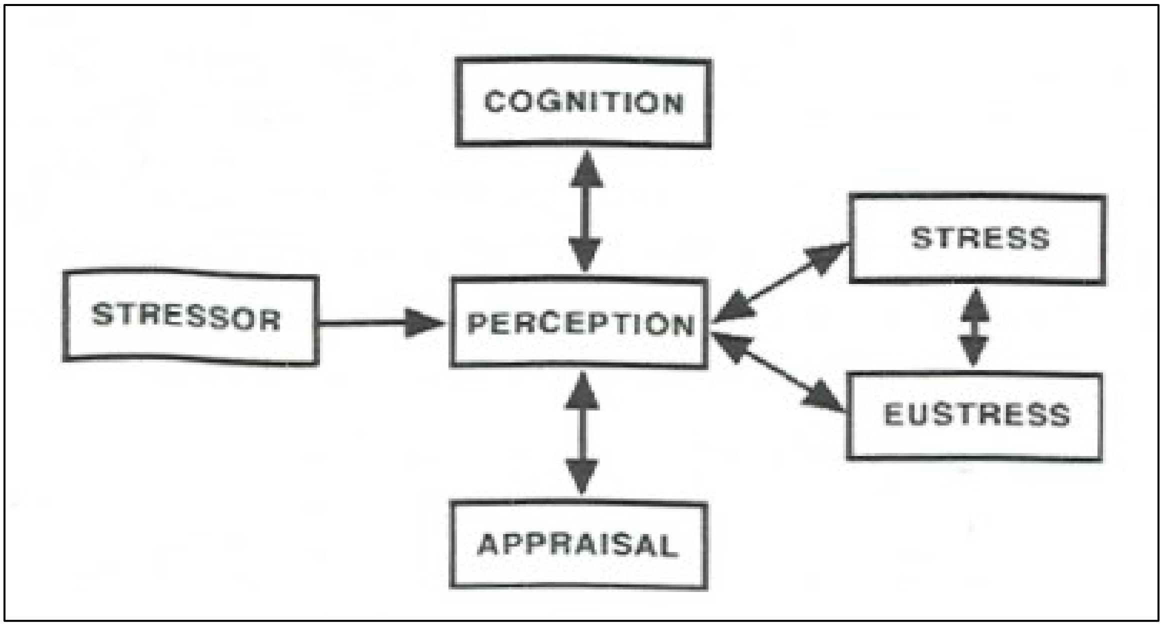


Figure 1. Schematic illustration of stress adapted from a model presented by Spielberger.

Stressors, psychological or physiological, are a starting catalyst for developing stress and panic. High workloads, for example, can create stress that will impede situational awareness, increase errors, and decrease mission effectiveness (Whitmore, McQuilkin, & Woolford, 1997).

Perception requires understanding of the situation. Once the stressor enters our perception two processes of cognition and appraisal simultaneously attempt to solve the problem. The transactional approach in studying stress combines cognitive appraisal to a single role (Cuevas, 2003). Perception is a total Situational Awareness (SA) of the developing situation.

Cognition is information processing and knowledge application. Operators in extreme environments must develop mental capabilities to change preferences while solving a problem to a logical conclusion. Training is vital to processing information and applying knowledge correctly.

Appraisal is Human-Human, Human-Hardware, and Human-Environment interactions. Effective interface between humans, machinery, and environment leads to reduced stress and enhanced problem solving capabilities. An ability to asses and utilize all available resources is an effective appraisal skill (Steel G. D., 2003). Training may help mitigate miscommunications between crew, operate complex machinery, and relax in a crowded environment.

Modern lifestyle characteristics are quite different from the life of our ancestors. They had a choice to flee from an imminent danger, to fight, or to freeze-up and die (Johnson D. A., 1997). Once the decision was made, it would propel them to their survival or demise. After the danger passed, the body's physiological and psychological functions would return to normal. In today's fast paced existence, the "fight or flight" response in our bodies does not dissipate fully (Putnam, 2005). The body's response to stress, the general-adaptation-syndrome (G-A-S) described by Selye and Fortier (1950), is largely dependent upon the nervous system. The G-A-S develops in three stages: 1) the alarm reaction, 2) the stage of resistance, 3) the stage of exhaustion (Selye & Fortier, 1950). The tempo of today's everyday life is too fast to eliminate stress all together (Selye H. , 1955; Eck, Nicolson, & Berkhof, 1998). The constant agitation leads to a more distressed life style and more panic prone developments (Fleming, Baum, & Singer, 1984; Baum A. , 1990).

How the subject perceives and manages stress can have positive or negative outcome in a given situation. Training to recognize the onset of stress can dramatically improve individual coping mechanisms. Stress management is important not only during but also prior to missions as a long term learning process (Manzey, Schiewe, &

Fassbender, 1996). Physiological (breathing) and psychological (meditation) relaxation techniques can help manage stress and avoid panic development (Manzey, Schiewe, & Fassbender, 1996; Goyal, et al., 2014).

Extreme environments present a certain amount of stress. Flying seems to produce a variety of different physiological and psychological stresses throughout the entire flight (hand flying vs autopilot) (Wilson, Skelly, & Purvis, 1999). If a stressor such as engine failure enters a pilot's perception, immediately the pilot can tell which engine failed from a cockpit instrument (appraisal). The pilot shuts down the failed engine (cognitive ability). It is a straight forward feedback loop. Once the stress is considered, the entire process becomes complicated. Stress is a qualitative measure and is difficult to predict due to wide variations between subjects and events (Selye H. , 1976). The traditional measure of stress "in terms of cause and effect" mentioned by Cuevas (2003) (interactions between individual and environment) does not explain the individual variations. Not only can two subjects react to the same stimuli differently, but the same subject can react differently to the same stimuli on a different day (Wickens, Gordon, & Liu, 1999).

A relationship-based or transactional approach may be used to better understand the intricacies of stress (Lazarus & Folkman, 1984; Steel G. D., 2003; Cuevas, 2003). In that particular approach, the individual will perceive stress when "exceeding his or her resources and endangering his or her well-being" is evident (Lazarus & Folkman, 1984). Stress is caused by an individual's perception of a given situation (Baum, Singer, & Baum, 1981). The training techniques developed using the relationship-based approach will have to address the subjective nature of stress and focus on an individual's ability to mentally prepare for a positive response to a stressful event (Stokes & Kite, 1994).

Eustress vs Distress

The Spielberger's model divides stress into helpful – eustress and harmful – stress (Spielberger C. D., 1987). Selye (1975) calls negative stress – distress (Selye H. , 1975; Mason, 1975; Selye H. , 1976b). Distress or bad stress leads to Panic Development. Chronic distress can persist long beyond the physical presence of the stressor (Baum A. , 1990). Eustress or good stress motivates to resolve the situation and get back to normal operations. Selye coined the word eustress (Selye, 1974). Eustress is a positive value and distress is a negative value to stress. An extreme state of distress is panic and eventual freeze-up where mission failure is to be expected. Perception shares inputs from distress and eustress to continually asses the mission. Distress and eustress are also interactive and contribute to a total value of stress. Distress-eustress continuum from transactional model of stress is most relevant for capsule environments (Steel G. D., 2003). Training scenarios can teach subjects how to alleviate distress and promote eustress during emergency situations to successfully complete the mission.

For example, a pilot successfully shuts down a failed engine, and it catches fire (additional stressor). The total stress level rises. If the training was inadequate to deal with this situation (cognition), or the cockpit layout is confusing (lever position) to resolve the engine fire (appraisal), the pilot will be distressed. Total stress is more eustress when training to deal with such an event was addressed and intuitive cockpit design considered. Eustress is useful in coming up with a solution and positive mission outcome. Realistic training must create a wide variety of scenarios for subjects to have a comprehensive understanding of distress versus eustress.

Physiologically stress can be measured by body temperature, sweating, and heart rate (Haywood & Spielberger, 1966). Wilson, Skelly & Purvis (1999) measured pilot heart rates (HR) during an actual emergency in an aircraft as well as a simulated emergency in a simulator device. The actual emergency raised the HR more than 50% versus the simulator which raised it to around 13%.

Measuring stress by psychological attributes is more complicated. To measure subjects' susceptibility to anxiety, State-Trait Anxiety Inventory (Spielberger et al., 1983) and Anxiety Sensitivity Index (R. A. Peterson & S. Reiss, 1987) can be used to predict future panic episodes. Military basic training recruits who scored approximately 20% in the upper range on the Anxiety Sensitivity Index experienced panic attacks (Peterson & Reiss, 1987; Schmidt, Lerew, & Jackson, 1997). The psychological baseline will depend on an individual honestly assessing his/her stress levels during normal operations and panic states. Combining both physiological and psychological baselines will give the most comprehensive understanding of personal coping mechanisms. It will help develop preventative methods during realistic training scenarios. Mathematical modeling can help estimate how much distress versus eustress contribute to overall stress and consequently to mission success or failure.

Panic

Part of the definition for panic in a dictionary is "a state or feeling of extreme fear that makes someone unable to act or think normally" (Merriam-Webster.com, panic, 2014). A state or feeling of fear experienced by the trapped astronaut, pilot in a malfunctioning aircraft, or a diver at the bottom of the ocean could make them unable to act or think normally. Anxiety and panic are primary psychological factors to cause diving accidents and fatalities (Morgan, 1995). To panic is to realize that the resources one possess are not enough, or do not meet the needs to resolve the situation and complete the mission successfully. The data from 1976 to 1988 estimates that 19% of scuba fatalities involved panic behavior (McAniff, 1990). Panic would not develop in a situation where someone could maintain a state or feeling of normal stress and continue to perform or think normally. Effective coping occurs when there is a balance between environmental demands and available resources (Heslegrave & Colvin, 1993).

The resources we possess can determine the outcome of the mission and the level of stress involved in a given mission. The realistic training scenarios have to be based on available resources and must allow the ability for a subject to come up with an alternative plan. Uncertainty is not knowing or understanding about an unfolding situation that induces anxiety and leads to panic (Schmitt & Klein, 1996). Being informed is a good way to reduce the chance of panic (Johnson D. A., 1997). This is especially prevalent in more complex systems and environments, where it is impossible (and may become overwhelming) for an operator to train on every possible malfunction. High risk activities in extreme environments become high stress events. Fifty four percent (data sample of 245) divers experienced at least one episode of panic (Raglin, 1997).

The development of panic behavior can be slow or instantaneous. The two separate timelines, rapid or slow, may or may not lead to a complete freeze-up type of behavior. However, it will lead to inability to resolve the situation successfully. Both state and trait anxiety scores were significantly lower compared to initial test when flight students experienced induced anxiety (Bucky & Spielberger, 1972). The training scenarios therefore must be developed as realistic as possible to induce high stress and panic. The Video-recorded Stroop Color-Word Test is an effective anxiety provoking test (Leite, Seabra, Sartori, & Andreatini, 1999). Subjects must learn to recognize negative effects of panic and return to normal operating parameters as soon as possible. Training helps develop panic preventive methods which include muscle memory, breathing techniques, and managing stress effectively. If trained properly, preventive methods will reverse or entirely stop undesirable effects of panic and lead to a safe completion of a mission. However, if the scenarios are not realistic enough, the operator might not enter a high stress panic zone and not learn how to recognize onset of panic.

We constantly interchange between normal operations and panic states. Astronauts, pilots, divers, firefighters will enter these states often. During slow and rapid situation developments there is a recognizable moment of pause or a boundary layer between normal operations and a panic state. If the departure from normal operations is imminent or already occurring, the ability to remain in a boundary layer before slipping into a panic state is highly desirable. It's a brief pause before taking action and returning to a normal state.

High stress environment led a pilot to depart normal operating parameters during an engine failure in flight. He entered a panic state and shut down a perfectly operable engine (MacPherson, 1998). Engine failure and a panic state led another pilot operate a wrong throttle and crash an airplane short of runway (Aviation Safety Brief, USAF)[3]. The muscle memory during engine shutdown worked perfectly due to Emergency

[3] Privileged Information, USAF Aviation Safety Brief

Procedure (EP) training, but it did not stop the pilot from shutting down a good engine. The realistic training scenario would focus on recognizing panic states during high stress events and teach subjects how to use the boundary layer to take a deep breath, confirm with other crew members, or delegate tasks to a calmer observer before aggravating the situation and further departing normal operations.

Appraisal

It is difficult to estimate or appraise an outcome of a particular situation without a proper understanding (cognition) of what a crewmember, the data, or the environment is telling the operator. On a Soyuz-T5-Salyut 7 mission, 19 indicators for the dynamic evaluation of mental state (14 for individual and 5 for group) were used to objectively evaluate psychological maladjustment (Myasnikov & Zamaletdinov, 1996). Psychological and physiological wellbeing of a person can be negatively affected by individual interactions, group dynamics, hardware malfunctions, and environmental inadequacies. It is very important to properly understand all the triggers that can jeopardize the mission success. Good judgment cannot be applied to increase situational awareness if Human-Human, Human-Hardware, and Human-Environment integration is misunderstood, inadequate, or is overall broken.

Human Factors

"Human Factors discovers and applies information about human behavior, abilities, limitations and other characteristics to the design of tools, machines, tasks, jobs, and environments for productive, safe, comfortable, and effective human use" (Chapanis, Garner, & Morgan, 1985). Human exploration is an important and ongoing process. Remote sensing of celestial objects through early telescopes led humanity to an actual exploration of space by people. The choice between remote or human exploration reveals an intricate balance between risk assessment, mission requirements, and available resources. Human exploration is expensive, dangerous, and sometimes not feasible. Robotic missions that do not pose threat to human life, can be less expensive, but always lack the on-site expertise of the human explorer. Even though missions to Mars and beyond are not attainable by human explorers due to financial or technological constraints, the data already gathered on Human Factors in extreme environments can help us better prepare for missions in the future. Human Factors will play an overall role in success or failure of that mission.

The consideration for human psychological limitations is as much and sometimes more important than physiological. Human Factors explores an appropriate integration of Human-Human, Human-Hardware, and Human-Environment relationships for a successful mission. The inappropriate or misunderstood interactions between crewmembers will lead to crew breakdown and mission failure. The undesirable relationships can be a major cause of stress during the mission and even escalate further into a state of panic. Tools must be designed with the environment such as space or underwater and human limitation in that environment such as weightlessness or bulky gloves in mind. Loosing tolls in space will create stress. It can rapidly progress to panic, if the mission cannot be completed successfully without them. Hands-on training is extremely important in familiarizing the operator with the environment and hardware to be used during the particular mission.

Sociobiology and Human-Human Integration

Sociobiology, the systematic study of the biological bases of social behavior, improves our understanding of Human-Human interactions in extreme environment operations. “Psychosocial factors impacting on human behavior and performance in extreme environments are critical components of mission success” (Bishop, Santy, & Faulk, 1999). In a 20-year period spaceflight had to be terminated three times for psychological reasons (deteriorating mood, poor performance, or interpersonal issues) (Putnam, 2005). The better we understand social behavior, the more likely it will lead to improved coping techniques in a stressful situation. Folkman (2001) divided coping into two problem-focused and emotion-focused techniques (Steel D. G., 2005). Those coping techniques may be incorporated in a training curriculum and used in future short and long duration missions.

NASA has studied extensively how much space astronauts need, length for a specific mission, and what personality compatibilities are optimal for a crew compliment. Seventeen cubic meters per person is optimal for a six-month mission according to NASA research (Putnam, 2005). University of California, San Francisco researchers at the San Francisco Veterans Affairs Medical Center (SFVAMC) identified cultural differences during American and Russian combined mission on the Mir space station as an important aspect in future endeavors (Boyd, 2001). The interactions between scientists in space and on the ground had great benefits for solving problems and positive likeminded relationships (Nicogossian, 1984). The experience gained from studying and evaluating psychological states of cosmonauts is invaluable in utilizing future long duration flights to the maximum extent possible (Myasnikov & Zamaletdinov, 1996).

Military deployments can be analogous to long duration (3 months deployments) or short duration (1 month deployments) space missions or polar expeditions (Lloyd & Apter, 2006; Oliver, 1991; Palinkas, 1987). They follow the established positive and negative productivity and psychological stability cycles discussed by Myasnikov and Zamaletdinov (1996) and Nicogossian (1984). The Lewis & Clark Expedition group dynamics are also comparable to long-term space missions (Allner & Rygalov, 2008).

Fatigue will increase conflicts among crew members (Myasnikov & Zamaletdinov, 1996). Fatigue is evident and cumulative during the entire deployment. To minimize the negative effects of fatigue during space missions, stressful tasks are scheduled during optimal morning and afternoon times. Astronauts follow a set work-rest schedule and eliminate monotony as suggested by Myasnikov and Zamaletdinov (1996). Deployments, most of the time, cannot cater to psychological needs of the operator. Fatigue during deployments has a negative effect on crew interactions and optimal crew functions.

Euphoria, or transient elevations in mood, occurs during the initial stages of the mission or deployment. The positive psychological mood is also felt after a successful accomplishment of a task or a mission and again towards the end of the space flight or deployment (Myasnikov & Zamaletdinov, 1996). I felt physiologically and psychologically energetic at the beginning of my deployments.[4] At low points during the mission, mid-mission or after difficult situations, a person can exhibit signs of depression, neurosis, and negative personal traits (Myasnikov & Zamaletdinov, 1996). Approximately one to two weeks into deployment, the monotony sets in and the

[4] Deployment discussions are from my personal experiences during multiple deployments and conversations with deployed members

motivation and productivity levels diminish. Myasnikov and Zamaletdinov (1996) recommend re-connecting with family and friends back home, using psychological support (such as community groups, participating in on and off base activities during deployments), and developing individual interests and relaxation techniques.

Short duration missions (up to 15 days) have more psychological tensions than long duration missions due to workload increase, sleep deprivation, and lack of relaxation and alone time (Myasnikov & Zamaletdinov, 1996). Three stages found by Rohrer in submariners go through excitement and anxiety (first stage), boredom and depression (second stage), and increased aggressiveness and emotional outbursts (third stage) (Putnam, 2005; Collins, 2003). During short deployments, the same cyclical effects described by Putnam (2005) were felt by all crewmembers just in a more compressed and exaggerated manner.

Five phases of task performance capability were evaluated against the psychological state of a cosmonaut and described in the Space Biology and Medicine Guide (Space Biology and Medicine Guide, 1983; Nicogossian, 1984). The Familiarization Phase (Initial) had fluctuations in productivity and emotional tensions and lasted from 5 to 7 days. The Optimal Phase yielded stable and efficient performance with appropriate psychological effects and lasted from 10 to 15 days. The Full Compensatory Period showed significant symptoms of fatigue. High psychological and emotional tensions were due to high workloads. The Unstable Compensatory Period – increased fatigue, evidence of emotional instability, and changes in sensory perception levels were noted. The Final Phase starts 2 to 3 days prior to return from space and is high on emotional and work performance efficiency levels.

Group dynamics play a vital role in mission success. Incompatible crew members can disrupt interpersonal relationships, decrease productivity, degrade performance, and contribute to stress development (Myasnikov & Zamaletdinov, 1996). Future space missions to Mars and beyond will have to consider larger groups compared to today's International Space Station (ISS) crews. Deployments have mixed group dynamics. The environment changes from tree crewmembers in a cockpit to hundreds of deployed members living in a tent or trailer together. Most space missions today concern small group subtleties.

Myasnikov and Zamaletdinov (1996) and Manzey, et al. (1995) identified crew selection, psychological training, and crew support as three areas of focus to prepare small groups for successful missions. Crew selection should be complimentary and similar. It is possible to analyze the answers from personality tests to generate quantitative and qualitative measures to be used in selection process (Myasnikov & Zamaletdinov, 1996). The military developed BAT (Basic Aptitude Test) for pilot selection and AFOQT (Air Force officer Qualifying Test) for officer selection. "Psychological compatibility" is important for a group to become a well-functioning entity (Gazenko, 1980). NASA takes psychological factors such as needs, values, interests, and attitudes into consideration when selecting astronauts. Decisiveness, emotional reactivity, and creative ways of approaching problems are good commander traits (Myasnikov & Zamaletdinov, 1996). High levels of emotional reactivity, energetic behavior, and high adaptability are good traits for long duration missions (Myasnikov & Zamaletdinov, 1996).

“Crew compatibility will certainly be of primary importance as the quality of social interaction and communication between members will be critical” (Putnam, 2005). During my first deployment as a co-pilot, I had a very decisive (the task had to be done immediately and only his way), but not socially expressive (very limited interpersonal communications) aircraft commander. The entire crew dynamic broke down almost immediately. During my deployment as an aircraft commander, I had an experience with a co-pilot who could not follow orders. It was puzzling, because we got along just fine on the ground. I struggled with multiple approaches to resolve an escalating situation, but nothing worked. I had a choice to remove him from my crew and fly with another co-pilot. In contrast, the removal of a crewmember during any space or remote exploration mission is not possible.

“Even optimal selection processes do not ensure effective functioning in flight” (Myasnikov & Zamaletdinov, 1996). Special psychological training can improve those odds. The goal of group training, which can take from a few months to several years, is to develop interpersonal relationships and bonds before an actual mission (Myasnikov & Zamaletdinov, 1996). Unclear communications, interruptions, and improper terminology can have stressful effects during group interactions (Manzey, Schiewe, & Fassbender, 1996). Nonverbal versus verbal communication can be more effective in a noisy environment or with a multicultural crew. However, untrained crews in nonverbal communication can have gross misunderstandings with members from a different country (Manzey, Schiewe, & Fassbender, 1996). Feedback skills and interpersonal conflict management skills were called by Manzey, et al. (1996) “indispensable”.

Human-Hardware Integration

"In deciding whether to allocate tasks to men or to machines, it is important to understand the capabilities and limitations of both" (Nicogossian, 1984). With rapidly advancing technologies, modern systems are now more challenging on our perceptual and cognitive abilities, rather than physical (O'Brien & O'Hare, 2007). Operations in extreme environments can induce cognitive-perceptual impairments that are difficult for operators to identify (Brill J. C., Mouloua, Hancock, & Kennedy, 2003). Fatigue impairs astronaut's performance capacity that leads to errors in executing operational tasks (Myasnikov & Zamaletdinov, 1996). Brill, et al. (2003) developed the Multi-Sensory Workload Assessment Protocol (M-SWAP) to better understand cognitive-perceptual impairments and aid in designing better extreme environment technologies.

The design complexities of machines, instruments, or systems today are tremendous. Human-Automation benefits human performance, workload, and Situational Awareness (Hancock, et al., 2013). Clarissa, a fully voice-operated procedure browser on the International Space Station (ISS), enables astronauts to be more efficient with their hands and eyes (NASA, 2005; Carey, 2005). The ability to monitor, inspect, and repair systems are critical to mission success (Nicogossian, 1984). However, the bigger challenge is to present relevant information to an operator in a timely manner (Welford, 1958). Information excess challenges and overwhelms operators and can be exceedingly dangerous in an extreme environment. The Department of Defense (DOD) is transforming information-technology systems into a Global Information Grid (GIG). Maj Bass and Maj (Ret.) Baldwin (2007) are concerned that the GIG may overwhelm the operator with information presented at the wrong time, at the wrong level of detail, and without proper analysis. This may lead to situational awareness break down. If the information is presented without relevance, the operator may concentrate on a data point that does not represent the true picture of the entire situation and make the wrong decision on an inverted perspective. A single piece of irrelevant data diverts focus from the broader picture (Bass & Baldwin, 2007).

Nicogossian (1984) suggests if the man is to operate in space successfully, the space-borne systems must be appropriately developed to support such complex integrations. He also infers that such diverse fields as artificial intelligence, robotics, behavioral psychology, economics, and human factors engineering must be at the cutting edge of research and development (Nicogossian, 1984).

The ultimate human integration into a vehicle's hardware could come as a remote heart rate monitoring (Wilson, 1999). Heart Rate, as shown by Wilson (1999) during an inflight emergency monitoring study, is an accurate stress response measure. The aircraft systems malfunction notification software is potentially linked to pilot's HR monitor. During an emergency (fuel leak), it would sense an increase in pilot's heart rate. If the system is not sensing an increase in heart rate, it would "assume" the pilot is not aware of the developing situation. The alert system would increase in intensity (red fuel panel light) or add another warning (auditory horn). There are two potential negative outcomes of this type of integration. Pilot must be able to get rid of nuisance warnings that can be very distracting during high stress events. Exaggerated warning is a major distraction while dealing with minimal system error.

Schmitt and Klein (1996) identified four basic causes of uncertainty. They are missing information, unreliable information, ambiguous or conflicting information, and complex information. Since the uncertainty leads to anxiety, and if not corrected, may develop into a panic event, the hardware design to minimize such uncertainties is critical. Johnson, et al. (1983) suggests designing efficient systems which preserve and extend unique human capabilities. Analysis of expert white-water rafting guides, general aviation pilots, and emergency ambulance dispatchers led to a development of multi-media tools for training based on Cognitive Task Analysis (CTA) (O'Hare, Wiggins, Williams, & Wong, 1998).

Human Factors and Environmental design

Understanding Human Factors allows for a proper environmental design that is comprehensively human centered. A psychological phenomenon associated with environment is now viewed as the person-environment system (Steel G. D., 2003). Fleming, et al. (1984) consider stress and coping mechanisms part of environmental events, psychological processes, and physiological response. Transporting humans to space, maintaining fighter pilot superiority in the air, or supplying oxygen to a deep sea diver involves a complex systems' design. Human Factors fields involved in Human-Machine-Environment integration must consider an efficient human operation. The design must address privacy issues, efficient habitable volume, and aesthetic concerns (disorientation, wall color) (Putnam, 2005; Steel G. D., 2003). The more complex the system design, the more robust training program must be developed to address the effects of the system instabilities. Potential areas of instability such as pilot's oxygen and pressurization systems (F-22 fighter aircraft) and astronaut's space suit recirculation system are likely to cause long-term uncertainty and chronic stress (Baum & Fleming, 1993).

Life support systems can produce noise levels that make it difficult to communicate (Manzey, Schiewe, & Fassbender, 1996). Whitmore, et al. (1997) identified a relationship between habitability, performance, and workload. Negative impact on cognitive capability such as decision making, psychological state, and situational awareness can be linked to environmental issues (Holland D. , 1995). The habitability issues, such as inadequate work and living space design, can have an impact on mission effectiveness (Whitmore, McQuilkin, & Woolford, 1997). Bishop, et al. (1999) also identifies environmental stressors as a significant influence on group adaptation and functioning.

Putnam (2005) considers environmental design one of the major concerns in human factors area. The design must balance functionality with aesthetics; maximizing working/living space while minimizing mass and weight. Protection against the harsh environment of space (radiation shielding), life support system integrity (waste management), and overall reliability are of paramount importance (Putnam, 2005).

Designing to prevent Stress

Once we become aware of how stressors work, designing to prevent them becomes more manageable. A comprehensive overall Human-Hardware-Environment selection and design can be a way to prevent further stress. Baddeley (1972), Graybiel & Knepton (1976), Hancock & Warm (1989), Manzey, Lorenz, & Poljakov (1998) identified the potential cognitive-perceptual impairments while operating in extreme environments and under stress. For a transactional model approach, design must "minimize the individual's perceived experience of stress" (Cuevas, 2003).

The selection process will fit the operator to the task or the task to an operator (Welford, 1973). Training will enhance the capabilities to accomplish the task. Also, once the task is learned and repeated multiple times during the training scenario, it becomes less overwhelming, better manageable, and understood. This process will lessen the stress of performing the task under pressure for the first time and keep the stress levels from developing into panic. Selection process, training, and in-flight support are designed to enhance individual's capabilities in managing stressful situations and avoiding panic escalations (Cuevas, 2003).

The selection process is usually tailored to identify specific personality traits that deal better in high stress extreme environments. Psychological approaches to predicting panic in stressful settings are helpful in selection process (Collins, 2003). Spielberger's State-Trait Anxiety Inventory is useful in testing the trait anxiety levels in a training environment (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). Some of the personality traits such as extraversion, internal locus of control, high self-efficacy, "hardy" behavior pattern, and problem-focused coping strategies are better suited to tolerate stress and difficult situations (Cuevas, 2003).

Successful aviators, astronauts, and arctic expedition members share similar positive mental health profiles (Bartram, 1995; Rose, Fogg, Helmreich, & McFadden, 1994). Extraverted and emotionally stable are better in dealing within a group setting than introverts. As long as missions are composed of at least two crew members, extraversion is preferred to introversion. An internal locus of control is also preferred over an external one (Stokes & Kite, 1994; Bowers, Weaver, & Morgan, 1996; Milgram, 1991).

High self-efficacy, or belief in one self's ability to accomplish a task, is also a highly sought after personality trait for stressful occupations (Bandura, 1986). Hardy people may be able to resist or tolerate the effects of stress better. It is possible to use tailored training scenarios to get everyone to some level of personal hardiness. Also, it is highly encouraged in developing targeted training scenarios to help other subjects who do not possess ideal traits, but exhibit willingness to learn. Such training may help identify negative behaviors and learn positive behaviors to successfully accomplish high stress extreme environment missions (Cuevas, 2003). Any further stress reduction techniques and prevention in extreme environment operations such as maintaining productive hierarchies, traditional eastern mediation approaches, or individual physical exercises, should be investigated.

Cognition and Training

Research has shown that actions taken by an operator in an extreme environment might not necessarily be the optimal option for that situation (Nicogossian, 1984). Marques and Howell (1979) showed that the decision making process is a function of several kinds of cognitive information. Extreme environments require optimal cognitive and behavioral performance in a wide variety of situations (Paulus, et al., 2009). Prior knowledge of the data source, intuitive memories of past and similar concurrences, simplification rules (heuristics) employed by the operator, and operator's systematic biases are types of cognitive information. Cognitive Task Analysis (CTA) for defining systems design and training requirements was useful in developing multi-media tools for training rafting guides and general aviation pilots (O'Hare, Wiggins, Williams, & Wong, 1998). In order to develop a good cognitive information processing background, training is essential. A good training scenario generation should be able to generate large number of realistic scenarios (Demirel & Willemain, 2002). Video game offers realistic training scenarios to Marines (Grandfield, 2004).

The individuals process incoming information differently from one another. To make sure that the operator applies the data correctly, it is important to train him or her to accurately comprehend the information and execute appropriate actions. An examination of learning process during critical incident training revealed how trainees fixate on specific conditions after rule based training (Neal, et al., 2006). Training structure and design must address proper rule learning process (rule does apply versus does not apply during a particular scenario). Practice may improve performance in most important areas of operation (Spielberger C. D., 1959). Leaders can be taught to handle uncertainty and relieve stress and anxiety in crewmembers (Schmitt & Klein, 1996).

Actions required to deal with the situation presented through instrumentation can be immediate or a gradual step by step resolution. In extreme environments, the subject usually deals with an explosive emergency. Crewmember response times during actual in-flight emergencies can range from 1 second to 41 seconds (Terrence, Gilson, & Hancock, 2003). It is critical to assess the threat appropriately in a timely manner and resolve the situation satisfactorily (Salas, Driskell, & Hughes, 1996; Suedfeld, 2001). In extreme environments the decision often must be made quickly at the expense of accuracy. In such environments the margin of error is small and can mean life or death for the operator (Cuevas, 2003).

Stress, especially distress, in extreme environments is very dangerous. Training must be specifically targeted in dealing with quick actions during critical scenarios. It is important to be able to predict how certain individuals will react to stress and cope with the rigors of the mission (Steel D. G., 2005). Bishop, et al. (1999) expressed that actual environmental stressors cannot be replaced in a simulation during isolation and confinement studies. As Wilson (1999) has shown with the heart rate monitoring, there is a distinct difference the way pilot perceives the threat and reacts during the actual inflight emergency versus a simulator ride. "No one has ever died in a simulator". It is a real challenge to come up with training scenarios realistic enough to measure by physiological processes (heart rate) or individual perception (psychological distress) (O'Connor, Raglin, & Morgan, 1996). Performance stress can increase errors and high stress may double the time it takes to complete manual tasks (Heslegrave & Colvin, 1993). Training to increase performance skills and practicing complex tasks (in a simulator or actual flying) can lead to reduced stress and panic development and improved mission success (Manzey, Schiewe, & Fassbender, 1996).

Cognitive skills training were examined by O'Brien and O'Hare (2007) to identify if this training can overcome limitations and impact complex dynamic task performance. Loftus, et al. (1975) found during a full-scale simulation of an Apollo mission that the procedural tasks reliability was affected by training levels and by the provision of feedback concerning performance. They showed that a self-correcting capability is more important than a low rate of error incidence in a complex system. Gerathewohl, et al. (1957) showed that with repetition, perceptual-motor (eye-hand coordination) performance during weightlessness improved to that found under normal conditions (training during vertical dives in a jet aircraft).

Training scenarios designed to identify panic must be on both the individual and group level (Cuevas, 2003). Correct scenario generation during training can be extremely important on human decision making process (Demirel & Willemain, 2002). "Stress Exposure Training (SET) has been shown to effectively mitigate the adverse effects of stress on performance in high-demand, high-risk conditions" (Cuevas, 2003). The Cope Thunder exercises were developed after devastating losses in the air during Vietnam War. After the first 10 sorties were flown, survivability went up 90%. The Cope Thunder (later became Red Flag) exercises taught the aviators how to survive the first 10 missions.

USAF Survival School presents the similar level of introduction to stressful situations. The SET training, for example, is organized around three phases. They are education, skills training, and application. USAF Survival School goes a step further and introduces the subjects initially to a scenario without any education or skills training. It is an eye opening and unforgettable experience. The stress levels are so high that panic is absolutely evident at the initial shock. When the scenario is reintroduced later, after proper training skills and coping techniques are taught, the difference is undeniable. The stress levels are much lower and panic is nonexistent.[5] Majority of participants who went through survival training felt it was extremely realistic, 96% said they are now definitely better prepared for real world situations, and feel confidence in their abilities to perform key objectives.[6]

Wilson, Skelly & Purvis (1999) further postulated that the heart rate return to normal levels after an inflight emergency can be attributed to emergency training that gave pilots confidence in their abilities to deal with a dangerous situation. Psychological

[5] Personal experiences at USAF Survival School
[6] Program Evaluation Survey, Fairchild AFB, Nov 2009.

training can also contribute to a better functioning crew. Manzey, et al. (1995) called it "social competence" training. The team building training program also proved to be successful. Tuckman (1965) identified four stages that members progress through while participating in a team building exercise. They are testing, dependence, intragroup hostility, and development of group cohesiveness. The time it takes for a group to become coherent varies upon individual motivation, previous relationships, and training intensity (Myasnikov & Zamaletdinov, 1996). The crews that progress through all the stages before beginning the mission have a better chance of functioning effectively versus the group that still deals with some of the stages during the mission (Myasnikov & Zamaletdinov, 1996). During social competence training the most important skills to address are communications and interpersonal skills (Manzey, Schiewe, & Fassbender, 1996).

Perception and Situational Awareness

The concept of situational awareness (SA) becomes more important as technologies advance and the demand is placed on human ability to understand (cognition) and evaluate (appraisal) complex situations (O'Brien & O'Hare, 2007). An operator can set goals and priorities, determine risks, recognize targets and opportunities, and improvise under unforeseen circumstances even when faced with incomplete information (Bejczy, 1982). Extreme environment operators are even more reliant on SA for mission success due to increased stress, hostile environments, and lack of resources (Steel G. D., 2003). The importance of SA has been identified in aircraft pilots by Endsley (1993), Endsley & Bolstad (1994), and O'Hare (1997) and military personnel by Federico (1995) and Randel, et al. (1996). "Lack of SA in complex environments has been shown to have tragic consequences" (O'Brien & O'Hare, 2007). Three-quarters of the aircraft controlled flights into terrain (CFIT) accidents reported between 1978 and 1992 (which accounted for 4000 deaths) were due to loss of SA by the crew and not mechanical failures (Woodhouse & Woodhouse, 1995). Human error accounts for 70% to 80% in civil and military aviation incidents and accidents (Shappell & Wiegmann, 2000). Spielberger's (1983) Model of Anxiety becomes an overall integrated and interrelated model between appraisal, cognition, and stress to enhance perception of a given situation. Perception plays a vital role in an overall Situational Awareness (SA).

The two commonly used definitions of Situational Awareness are by Endsley (1995) and Companion, et al. (1990). Endsley's (1995) definition of SA: "The perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future". She further breaks SA down into three major components. They are perception (level 1), comprehension (level 2), and projection (level 3) (Endsley, 1995). To become fully aware of a situation, the operator must be able to detect and collect the presented information. Then he or she must comprehend it and take correct action.

Companion, et al. (1990) defines "The ability to extract, integrate, assess and act upon task-relevant information is a skilled behavior known as "Situational Awareness"". In both cases, Situational Awareness is a process. Spielberger's Model of Anxiety also describes a process and a continuous feedback between stressor, cognition, appraisal, and overall stress. Some of us are better than others in developing a "big picture". Cognitive processes such as attention, memory, perception, time-sharing, and special ability are at the center of maintaining situational awareness (O'Brien & O'Hare, 2007).

Information excess and loss of situational awareness are also extremely prevalent in today's fast moving technological advances (Bass & Baldwin, 2007). How subjects perform complex tasks under stress was tested by Mialet et al. (1996) by assessing their ability to monitor a routine task, temporal preparation, visual detection, memory span, and visual spatial attention and memory (the ACE battery test). High state anxious subjects displayed impairment in executive functions and a speed accuracy trade-off in a divided attention task (Mialet, Bisserbe, Jacobs, & Pope, 1996). Training scenarios to address attentional performance impairments is vital in high risk performers.

CHAPTER III

METHODOLOGY

Theoretical Modeling Approach for Study

The development of methods for panic dynamics analysis will always be contemporary and valuable. The suggested conceptual approach in this research based on probabilistic risk analysis methodology indicates a diverse panic development process. Math models help to outline the boundary between normal mission development (even under high stress and risk conditions) and those mission development patterns which potentially could lead to failure. Methods for uncertainty estimates are discussed. Based on this mathematical analysis, previously obtained qualitative conclusions regarding panic development and control have been confirmed, and some new conclusions formulated. Limitations in simulation of high risk conditions are also discussed.

Theoretical modeling and math model development are attempted in order to develop and summarize major measurable constituents of anxiety development process. The preliminary work by Dr Rygalov and Wuerges was presented at COSPAR Assembly in Montreal, Canada (Rygalov & Wuerges, 2008). Spielberger's (Spielberger et al., 1987) anxiety/panic development graphical model is taken as a basis for math modeling (Ref. Figure 1.).

Major element of this model is a balance between power of stressor and categories of mitigating factors such as cognition/theoretical preparedness and appraisal/conclusion development based on integration between theoretical preparedness and experience. If cognition and appraisal are adequate to the level of stress experienced, the individual remains in the area of eustress (or functional stress). If stress significantly exceeds the integrative complex of cognition/appraisal, then inevitable shift into the area of stress and distress happens with subsequent dis-functionality and inability to resolve the problem on rational basis. This delicate balance can be described on the basis of Fokker-Planck statistical-deterministic equation in order to define those variables critical for description of the above mentioned balance. Finding for basic relations between those variable would lead to more in depth understanding of panic (as an acute form of stress) development and control procedures construction.

Math Modeling Method

Fokker-Planck Equation: Statistical Effects in Average Evolution of Process.

We will use here the form of Fokker-Plank equation suggested earlier in math research for statistical effects in population growth:

$$\frac{\partial \psi}{\partial t} = \frac{1}{2}\frac{\partial^2}{\partial X^2}[D(X)\psi] - \frac{\partial}{\partial X}[M(X)\psi] \qquad (1)$$

Where,

ψ(X, t) = the function of distribution for probability of mission development **X** at the time **t**;

X = the stage or degree of mission accomplishment

M(X): is the function characterizing average tendency in evolution of statistical process, mission **X** development

D(X): is the function characterizing mean quadratic deviation of the process from its average value, mission **X** at the time **t**, and can be expressed in a different versions most closely describing statistical nature for chosen mission.

Equation (1) represents the most general classic version of Fokker – Plank form combining deterministic **M(X)** and statistical **D(X)** components of analyzed process. For every specific process those components (functions) have to be defined and determined independently (based on nature of considered mission and environment).

In this analysis we consider only steady state ultimate distributions for probability **ψ(X, t)**, when **∂ψ/∂t = 0**. Then, equation (1) could be written in the form:

$$\frac{1}{2}\frac{\partial^2}{\partial X^2}[D(X)\Phi(X)] = \frac{\partial}{\partial X}[M(X)\Phi(X)] \qquad (2)$$

The solution for this equation is probability distribution **Φ(X)** for stage (degree) of mission accomiplishment **X**.

As it is shown in earlier works of Svirezhev et al. and Haken, and can be confirmed by direct integration, equation (2) has a solution:

$$\Phi(X) = \{Const/D(X)\} \times e^{2/\frac{M(X)dX}{D(X)}} \qquad (3)$$

Where, **Const** could be determined from obvious statistical fact $\int \boldsymbol{\Phi(X)dX = 1}$, where integration is conducted in the reasonable range of **X**.

Approximation for mean tendency in the process of mission development M(X)

Mean tendency **M(X)** in uncertain mission implementation could be described by the supportive model which includes basic elements for any mission development:

$$\frac{dX}{dt} = \alpha SX - P$$

$$\frac{dS}{dt} = -\frac{Q}{V} \times \alpha SX + \frac{Q}{V} P$$

Where:

X: characteristic (or degree) of mission accomplishment;

S: limiting mission accomplishment resource (factor);

α: specific rate of mission development;

P: environmental stress caused degradation in mission development;

Q: limiting resource (factor) expenditures for mission accomplishment;

V: environmentl where mission is in the progress volume.

Multiplication of the first equation by **(Q/V)** and following summation for both equations lead to:

$$\frac{Q}{V} \times \frac{dX}{dt} + \frac{dS}{dt} = 0$$

And $QX + VS = Const = M_0$ - is the material conservation principle describing relations between mission resource S and mission accomplishment degree X, where, $\mathbf{M_0}$ is the total preliminary accumulated mission development factor (resource). From this equation we can express **S** through **X** and substitute into the first equation for **X** dynamics. Then, it is easy to get this form:

$$\frac{dX}{dt} = \alpha \left(\frac{M_0}{V}\right) X \times \left[1 - \frac{X}{(M_0/Q)}\right] - P$$

This equation could be represented in unitless form by normalizing mission development degree **X** by its maximum $\mathbf{M_0/Q}$ (assuming preliminary accumulated resource is sufficient for mission implementation):

$$\frac{dX}{dt} = \alpha \left(\frac{M_0}{V}\right) X \times [1 - X] - \frac{P}{M_0/Q} \qquad (4)$$

Equation (4) phase – diagram is shown on Fig. 2 just for visualization purposes, and it is easy to see two steady state solutions for **X** on horizontal axes:

- The smaller one is not stable;
- another solution, which is bigger, is stable and represents the dgree of mission accomplishment and always less than potential mission maximum achievable **(M_0/Q)**.

However, if we increase environmental stress load **P/(M_0/Q)**, those two steady-states get closer and under certain value for **P** (stress level) could become both unstable indicating system stabily limit toward environemntal stress load. Above this value any system mission/environment is definitely unstable and could not function properly for extended times.

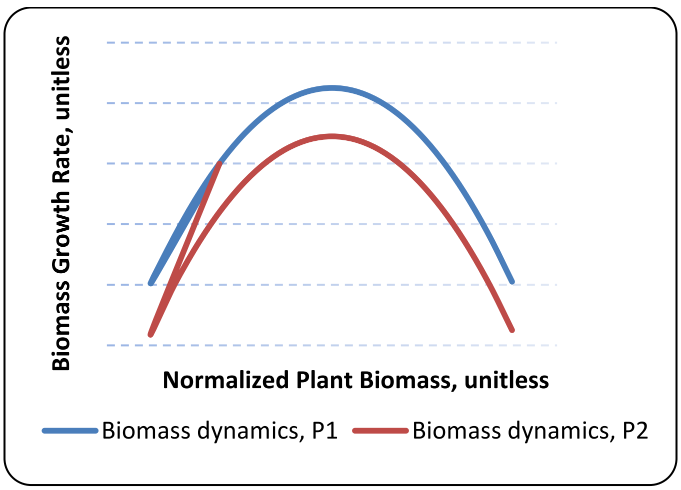


Figure 2. Phase diagram for equation (4). It describes mission development dynamics in stressful environment, as higher mission stress (from environment) load **P** (**P2** > **P1**) as less stable the system mission/environment becomes.

Thus, finally for further considerations we can choose mean tendency in the process development as a right part of equation (4), not normalized:

$$M(X) = \alpha\left(\frac{M_0}{V}\right)X \times \left[1 - \frac{X}{M_0/Q}\right] - P \qquad (5)$$

Equation (5) describes so far the average rate of mission development in a stressful environment:

- as mission development degree X start to grow it happens according exponential function;

- as mission coninues to develop further it leads to limitation by one of the critial factors (denoted as S in this specific case) and consequently mission development slows down.

This is most logical way to define M(X) for Fokker-Plank equestion deterministic part. But different definitions for other cases of interaction between mission and environment are also possible.

Approximation for Dispersion D(X)

D(X) characterizes mean quadratic deviation and depending on applied model of statistics could be expressed in different versions. For this research we chose most common and general Gaussian statistical model, where **α** represents an average value of specific mission development rate and **σ** is mean quadratic deviation, then dispersion **D(X)** for equation (1) will take the form of function:

$$D(X) = \sigma\left(\frac{M}{V}\right)X^2 \times \left[1 - \frac{X}{M/Q}\right]^2 \qquad (6)$$

Where, **σ** is mean quadratic deviation in a statistical model for specific mission development rate **α**, which deviate from average value due to environmental instabilities (stresses). Therefore, **σ** could be interpreted at the same time as metric for system instabilities caused generally by the environmental uncertainty.

Definition for D(X) could be done differently for different cases. In this version we assume that mission specific development rate α is distributed according widely applied

Gaussian statistics. Consequently mission specific development rate defined by (5) can fluctuate at maximum in the phase of maximum mission development, and minimal fluctuations are observed at the system states where mission does not develop or develops at the rate close to zero (two steady state points in Fig. 2). Again depending on considered process statistics dispersion could be defined differently.

Solution for final statistical distribution

Substituting (5) and (6) into (3), and conducting integration to get:

$$\Phi(X) = \frac{[Const/(\sigma M)/V] \times X^{2(v-1)}}{[(1-X)/M/Q]^{2(v-1)} \times exp[-f(X)]}$$

Where:

$$\mathrm{f}(X) = \left[\frac{8P}{\sigma XM/V}\right] \times \left(\frac{1}{2} - \frac{X}{M/Q}\right) \Big/ \left(1 - \frac{X}{M/Q}\right)$$

and

$$\mathrm{v} = 4\frac{\alpha}{\sigma} \times \left(1 - \left(\frac{2QPV}{\alpha}\right) / M_0^2\right)$$

Where we can substitute $\left(\frac{2QPV}{\alpha M}\right) = 2M_c$, $M_c = \left(\frac{QPV}{\alpha M}\right)$ could be interpeted as amount of limiting mission development environmental factor spent for mission implementqation; it also can be considered as fundamental constant of the system mision/enviroment.

Φ(X) can be approximated by distribution in Taylor series around average plant biomass value $X = \frac{1}{2}\frac{M_0}{Q}$, because potentially aschievable maximum in mission accomplisment can not be more than $X_{max} = M_0/Q$:

$$\Phi(X) = 1 - \frac{16P}{\sigma(M_0^2/VQ)} \times \left(1 - \frac{2X}{M_0/Q}\right) \sim 1,$$

where **X** varies around ~ ½*M/Q.

Therefore, for the first order approximation analysis we can use:

$$\Phi(X) = \left[\frac{Const}{\sigma M_0/V} \times X^{2(\upsilon-1)}\right] / \left[1 - \frac{X}{M_0/Q}\right]^{2(\upsilon-1)} \quad (7)$$

Expression (7) describes first order approximation for steady-state (final) probability distribution of mission accomplishment degree **X** which is limited by some known environmental stress-factor. It is easy to conclude based on analysis of (7) that certain values of $\nu = \alpha/\sigma^2$ parameter are required for final probability of mission toward 'mission accomplished' state. This parameter can be interpreted as:

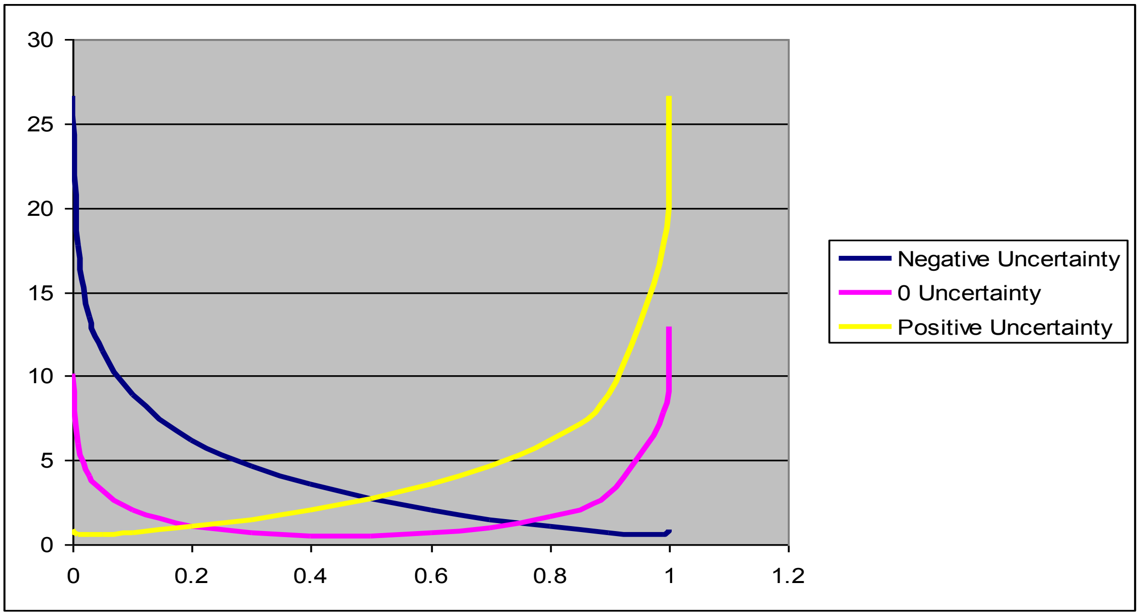


Figure 3. Mission mitigation factors power/Mission uncertainty degree.

Probability of a success for exploratory mission depending on the values of an uncertainty factor $\boldsymbol{\nu = \varepsilon/\sigma^2}$ (standard excel spread-sheet calculation software).

$\nu = \varepsilon/\sigma^2$ = Promoting mission success factors/Gaussian mean quadratic deviation from 'norm'

- $\nu_1 = -0.19$ ($\nu_1 < 0$, motivation for mission is not sufficient – mission fails)
- $\nu_2 = 0.79$ ($\nu_2 \sim 1.0$, motivation for mission is sufficient – mission successful)
- $\nu_3 = 0.27$ ($1 > \nu_3 \geq 0$, uncertain motivation – uncertain mission success)

Reason for Study

The reason for this study is to research the effectiveness of realistic training scenarios in recognizing panic development and successfully preventing panic in the future. The research into panic development and control is very limited and the goal is to have a better understanding of preventative methods. The study establishes the importance of knowing what panic is, controlling it, and preventing it in the future. The contribution of stress to panic development is also investigated. The simple questionnaire type of research approach is applied to this under-researched field of psychological effects under extreme environments. The study aims to provide valuable information for further research.

Previous research in the field of Human Performance in Extreme Environments uncovered a substantial amount of evidence of human behavior deviations due to variety of stressors. Perceived threat on an individual level will have different stress symptoms and varied panic development stages in different subjects. However, much more needs to be done to link common underlying triggers of stressors and better predictability of human reactions during stressful situations. The study shows that targeted training scenarios are tremendously important. Conditioning individual participants in extreme environment projects to recognize unique stressors that trigger distress to the point of panic is vital to future mission success. Mitigation of negative effects of stress during operations in extreme environments can mean life or death. Training scenarios, if developed appropriately and targeted correctly, are crucial in introducing subjects to a dangerous environment in a controlled manner.

The questionnaire has three separate areas of interest. First, if participants understand what panic is and if they had any previous experience with panic. Second, if subjects participated in any previous realistic training scenarios and if this particular exercise was realistic enough to induce stress to the point of panic. Third, confirm that realistic training scenarios help recognize and control panic. The study then compares all the answers to establish statistical significance in four selected ranges: Demographics, Realistic Training, Realistic Training and Panic Recognition, and Realistic Training Benefits.

Selection Process

All survey participants attended Red Flag – Alaska premier combat training exercise. The survey was reviewed by 354 FW Judge Advocate General (JAG) office and deemed appropriate and legal. The 353 Combat Training Squadron (CTS) Commander then approved the survey for distribution after Red Flag – Alaska 11-2 and 11-3 training exercises (July 2011 and August 2011). The survey was open from August to December 2011 on SurveMonkey web site. I targeted crewmembers in selecting survey participants. Red Flag – Alaska training scenarios are ideal in triggering stressful events in a simulated fast paced combat type of environment. The stress is further enhanced by multi-cultural allied country participants (Japanese, Polish) and multi-service participants (Army, Marines). The training environment requires fast learning, dealing with problems at hand in an expedited manner, and experience with multiple combat platforms in achieving a common goal.

Invitation to Participate

Initially the survey was available in a paper form to all the participants before they left the building after the last exercise period. This presented a few hurdles. No one was willing to stay behind and complete a survey after an intense training and I was not able to reach the target audience of crewmembers who participated in a combat training scenario. The survey was then constructed on the SurveyMonkey web site and an invitation to participate was sent via email to potential members. I targeted crewmembers from the participant database. One outlook email is only able to support 33 addressees. Three emails were sent to a total of 99 participants between August and September 2011. The email body can be found in Appendix A.

Participants' Description

Forty five out of the 99 invited, participated in the survey request. It is a 46 percent rate on participation. Out of 45 total, 17 participants were between ages 20-29, 25 participants between ages 30-39, 2 participants between ages 40-49, and 1 participant was aged 50 plus. Out of 45 participants, 42 were males and only 3 were females. Forty four out of 45 participants were aircrew and 1 out of 44 further identified himself as "fighter pilot". One out of 45 answered "Other: Integrative Stress Research" as his occupation. Even though the "aircrew" distinction was omitted, the rest of the questions about the realistic training scenarios were answered and considered valid.

The Survey

The survey (see Appendix A) consisted of 17 questions: 14 questions with a "yes/no" answer and 3 questions were open ended. Forty three out of 45 participants knew the definition and signs of panic. Only one answered no and one skipped the question. Four participants out of 45 skipped the open ended question on describing "panic" in their own words. The rest of the 41 described panic accurately and to the point: "extreme stress", "loss of control", and "inability to perform". Eleven out of 45 participants never panicked and 34 have panicked before. Thirty five participants out of 45 were able to control their panic (including one who answered never panicking before), 8 had N/A and 2 skipped the question. The following question is open ended to describe the methods of controlling their panic. Eleven out of 45 participants skipped the question and 34 answered as: "deep breathing", "concentration", and ""reverted to training".

Eight out of 45 participants did not have and 37 did have previous realistic scenario/hands-on training (military or civilian). Out of 45 participants, 12 said no, 2 skipped the question, and 31 said yes to participating in exercises realistic enough to simulate real life scenarios.

Twelve participants out of 45 did not feel stressed, 32 felt stressed during the realistic scenario/hands-on exercise portion, and 1 skipped the question. Thirteen out of 45 participants felt panic, 31 did not, and 1 skipped the question about feeling panic during the realistic scenario/hands-on exercise portion. Out of 45 participants, 13 felt that stress contributed to their panic development (even 2 participants who did not feel panic), 3 said no, 28 had N/A, and 1 skipped the question. Fourteen participants out of 45 felt that realistic scenario/hands-on exercise portion played a key role in their panic development (once again 2 participants who did not feel panic also included), 4 said no, 25 had N/A, and 2 skipped the question.

Out of 45 participants, 30 felt that realistic scenario/hands-on portion during the exercise made them aware of their panic development and control, 2 said no, 12 had N/A, and 1 participant skipped the question. Thirty three participants out of 45 agreed that realistic scenario/hands-on training will help them in future situations to control their panic development, while 6 participants disagreed, and 6 marked N/A.

Duration of the Survey

The survey was open from August to December 2011. Most of the answers were collected between August and September. The survey was kept open until the end of December for a few late participants.

CHAPTER IV

RESULTS AND ANALYSIS

Research Summary

The research was accomplished by introducing a survey to aircrews after they participated in a combat type of exercise. Red Flag – Alaska is a premier United States Air Force (USAF) combat exercise at Eielson AFB, AK. The survey was introduced after July and August 2011 exercises. The exercises last for two weeks at a time. The "Survey Monkey" web site was chosen to collect the data from August until December 2011. Ninety nine participants were invited to take part in this survey. I was able to target crewmembers from an available selection database. Forty five participants responded to this survey. All respondents, except one, were USAF pilots. The survey was designed to focus on participants' understanding of panic, previous realistic scenario/hands-on training, the relationship between stress-panic-realistic scenario/hands-on training, and future benefits.

The collected data was run through a UND Psychology Department IBM computer program SPSS, 2012. The Chi-Square statistical analysis program was used to determine statistical significances between multiple crosstabulations. Degrees of freedom (df) were calculated as the number of categories in the problem minus 1. A relative standard $p \leq 0.05$ served as the basis for accepting and $p \geq 0.1$ for rejecting the crosstabulation as valid. A value between $0.1 \leq p \geq 0.05$ was considered marginal. The

Chi-Square method takes two data samples and compares them for statistical significance only. It does not interpret the meaning of any sets of data. Validity is determined by 5% (0.05) of it occurring by chance. The null hypothesis is that two sets are independent from one another. If the data set returned ≤ 0.05, then the null hypothesis is incorrect (two sets are dependent on one another) and crosstabulation is valid. If the data set returned ≥ 0.1, then the null hypothesis is correct (two sets are independent from one another) and crosstabulation is not valid or rejected (McCall, 1970).

The following crosstabulation analysis is broken down into four sections: demographics, realistic training, realistic training and panic relationship, and realistic training benefits. The demographics portion analyzes the relationship between age, male, and female populations. The realistic training portion analyzes the relationship between stress, panic, and realistic hands-on training. Panic awareness and control through realistic training scenarios is the next portion of the analysis. The benefits of the realistic training scenarios in identifying stress and panic for future situations is the concluding portion of this chapter. All the Tables in this chapter are summaries from the Charts in Appendix C. Any further discussions that reference open ended answers from the Figures in Appendix B are left unedited with spelling errors to preserve the original survey.

Demographics Results and Analysis

Table 1: Survey Questions and Demographics.

Note: Information summarized from Figures C-1 through 23.

	Age	Sex
Sex	not significant	N/A
Age	N/A	not significant
Do you know what panic is?	not significant	not significant
Have you ever panicked before?	not significant	not significant
If yes, were you able to control your panic?	not significant	not significant
Have you had any previous realistic scenario/hands-on training (military or civilian)?	**significant**	not significant
Were any exercises you participated in realistic enough to simulate real life scenarios?	not significant	not significant
Did you feel stressed at any point during the realistic scenario/hands-on exercise portion?	**marginal**	not significant
Did you feel panic at any point during the realistic scenario/hands-on exercise portion?	not significant	not significant
If yes, do you feel that stress contributed to your panic development?	not significant	not significant
If yes, do you feel realistic scenario/hands-on exercise portion played a key role in your panic development?	**marginal**	not significant
Do you feel that realistic scenario/hands-on portion during the exercise made you aware of your panic development and control?	not significant	not significant
Do you feel that realistic scenario/hands-on training will help you in future situations to control your panic development?	**marginal**	not significant

The age of 45 survey participants ranged from 20 to 50 plus. Seventeen participants between 20-29 and 25 participants between 30-39 represent the age groups for the majority of USAF pilots (Figure B-1, Appendix B). Forty two males versus 3 females out of 45 participants is a noticeable variance, but still standard among USAF pilot population (Figure B-2, Appendix B). It did not register statistical significance between age and sex crosstabulation due to small overall variability in data in age groups and too small of a number to consider for overall variability in sex groups (only 3 females). According to research by Dindia & Allen (1992), women are more open to disclose personal experiences such as stress and panic. All 3 female participants said yes to "Have you ever panicked before?" and only a 2/3 of males (31 yes to 11 no). Future research is needed to include more females for a better understanding.

The one significant and three marginal statistical significances were attributed to crosstabulation with age only. All military pilots go through multiple training programs before becoming mission qualified. The training ranges from minimal (Flightline Driving) to hands-on (First Aid) to full on realistic scenarios (Survival Training).

The association between age and previous realistic scenario/hands-on training may become skewed as pilots become more experienced with age to encounter realistic enough training to evoke stress or panic. All age groups had at least one answer that they have not had any previous realistic scenario/hands-on training either in the military or as a civilian. Two participants in 30-39 and 40-49 age groups stated that they did not have previous realistic scenario/hands-on training, but an exercise was realistic enough to simulate real life scenarios. The conclusion may be drawn that some pilots simply do not view any previous training environments as realistic enough or that the training environments are not able to create realistic scenarios. Two participants never panicked or had previous realistic scenario/hands-on training (ages 20-29 and 30-39) and one answer was missing all follow-on questions to determine any validity.

Marginal statistical significance was detected between age and stress during realistic scenario/hands-on exercise portion. Realistic scenario/hands-on exercise portion playing a key role in panic development and realistic scenario/hands-on training helping in future situations to control panic development were also marginally significant. Further studying is needed to look into a possible correlation between different age groups and realistic training scenario development.

Realistic Training Results and Analysis

Table 2: Survey Questions and Realistic Training Scenarios.

Note: Information summarized from Figures C-24 through 32.

	Do you know what panic is?	Have you ever panicked before?	Were any exercises you participated in realistic enough to simulate real life scenarios?	Have you had any previous realistic scenario/hands-on training (military or civilian)?
Have you ever panicked before?	not significant	N/A	N/A	N/A
If yes, were you able to control your panic?	N/A	**significant**	N/A	N/A
Have you had any previous realistic scenario/hands-on training (military or civilian)?	N/A	N/A	**significant**	N/A
Did you feel stressed at any point during the realistic scenario/hands-on exercise portion?	N/A	N/A	**significant**	N/A
Did you feel panic at any point during the realistic scenario/hands-on exercise portion?	N/A	N/A	**significant**	N/A
If yes, do you feel that stress contributed to your panic development?	N/A	N/A	**significant**	**marginal**
If yes, do you feel realistic scenario/hands-on exercise portion played a key role in your panic development?	N/A	N/A	**significant**	not significant

Realistic training establishes the relationship between understanding panic, controlling it, and a key role realistic training scenarios play in panic development. Statistically there is no significance between knowing what panic is and ever panicking before. Only 1 participant out of 45 did not know what panic is even though he had panicked before. However, the statistical significance of ever panicking and the ability to control it is significant. Out of 34 participants who have panicked before, all were able to control it (Figures B-6 and B-7, Appendix B). One participant reported never panicking, but able to control it. Most participants were taking “a deep breath”, “reverted to training”, or simply “focusing on a task at hand” (Figure B-8, Appendix B) to control their panic. The ability to control panic then depends on previous panic experiences. Realistic training scenarios can simulate real life panic situations for future benefits.

Thirty one participants out of 45 reported that an exercise they participated in was realistic enough to simulate real life scenarios (Figure B-10, Appendix B). The statistical significance between ever having previous realistic scenario training (military or civilian) and an exercise being realistic enough to simulate real life scenarios is reflected in 29 participants answering yes to both. Subjects participating in more realistic training scenarios have a better understanding and a clearer baseline in evaluating future training programs. Two responses were contradicting (did not have previous realistic scenario/hands-on training, but an exercise was realistic enough to simulate real life scenarios). Four responses were consistent (did not have previous realistic training and an exercise was not realistic enough). Seven responses were precise (have had previous realistic training, but none of the exercises were realistic enough to simulate real life scenarios). All were considered in the statistical significance results. The conclusion is that the realistic scenario/hands-on training often creates realistic enough scenarios to simulate real life events.

Twenty seven participants out of 31 were stressed, but less than half (12) felt panic during an exercise that they felt was realistic enough to simulate real life scenarios. The statistical significance between realistic enough training to simulate real life scenarios and feeling stressed or panic during the realistic exercise is noteworthy. The positive relationship signifies that realistic training is capable of inducing stress or even panic. Four participants expressed that an exercise was realistic enough, but did not make them feel stressed. Almost half of the participants (19) out of 45 experienced an exercise that was realistic enough to simulate real life scenarios, but did not feel panic. The inconsistency may be due to realistic training that can successfully simulate real life scenarios and is able to invoke stress, but falls short of achieving panic development. With pilot's age and experience level, it may become more difficult to participate in realistic training that simulates real life scenarios to induce stress and panic. Most comments expressed that "true panic is very hard to simulate" and one went as far as "no training can ever replicate the real thing" (Figure B-17, Appendix B).

Stress contributing to panic development and realistic scenario/hands-on exercise portion playing a key role in panic development were also statistically significant (crosstabulated with any exercises you participated in realistic enough to simulate real life scenarios). Responses in both stress and realistic scenarios/hands-on exercise contributing to panic development when participating in an exercise that is realistic enough to simulate real life scenarios were closely related. Ten out of 13 participants who felt panic during the realistic scenario/hands-on exercise portion attributed it to stress and 12 felt that the realistic scenario/hands-on exercise portion itself contributed to panic development. Almost half of the participants (12 out of 31) who felt that the exercise was realistic enough to simulate real life scenarios credited stress and scenarios to their panic development during the realistic scenario/hands-on exercise. This is a substantial portion of the participants who can be potentially investigated further to develop appropriate training scenarios, any personality traits that were contributing factors to panic development, and further investigation into developing better panic inducing scenarios.

Twelve participants out of 37 who had any previous realistic scenario training also reported that stress contributed to their panic development. The statistical significance is marginal due to minor variability in data. The scenario contribution to panic development in this crosstabulation was not significant. However, further investigation is needed to determine how much influence the previous realistic scenario training has over stress or scenarios as a contributing factor to panic development.

Realistic Training and Panic Recognition Results and Analysis

Table 3: Survey Questions and Realistic Training Scenarios and Panic.

Note: Information summarized from Figures C-33 through 38.

	Do you feel that realistic scenario/hands-on portion during the exercise made you aware of your panic development and control?	Do you feel that realistic scenario/hands-on training will help you in future situations to control your panic development?
Do you know what panic is?	not significant	not significant
Have you ever panicked before?	not significant	**significant**
If yes, were you able to control your panic?	**significant**	**marginal**

Most survey participants, except one, knew the definition of panic. All subjects had insightful descriptions close to those discussed in a literature review. "Onset of fear or anxiety", "the body's reaction to crisis, which freezes your ability to react", "an attempt to flee from a threatening scenario", all are classic examples of the fight/flight/freeze reaction to a panic event (Figure B-5, Appendix B). Some survey participants also agreed that "realistic simulated exposure to the event", "hands on training", and "being stressed in a controlled training environment" help recognize panic development and control it in an actual situation (Figure B-17, Appendix B).

Crosstabulating realistic scenario/hands-on portion during exercise made you aware of your panic development and control with were you able to control your panic returned statistically significant. Out of 45 participants, 35 were able to control their panic, 8 responded N/A, and 2 skipped the question. Seven N/A and two skipped responses coincide with participants who answered that they never panicked. One participant never panicked but was able to control it. His follow on answers on panic were accurate and considered valid. Twenty five out of 35 participants who were able to control their panic felt that realistic scenario/hands-on portion during the exercise made them aware of panic development and control.

Forty three out of 45 participants knew what panic was. Out of 34 participants who panicked before, all of them were able to control it. Out of 45 participants, 30 said yes to realistic scenario/hands-on portion during the exercise made them aware of their panic development and control, 2 said no, 12 answered N/A, and 1 skipped the question. Out of 45 participants, 33 said yes to realistic scenario/hands-on training will help them in future situations to control their panic, 6 said no, and 5 answered N/A. If the realistic scenario/hands-on portion during the exercise induces panic, participants become aware of their panic development and control. Introduction to panic in a controlled environment prepares them to deal with it in real life scenarios.

Crosstabulating realistic scenario/hands-on training will help you in future situations to control your panic development with have you ever panicking before is statistically significant. Out of 34 participants who answered yes to panicking and able to control it, 26 agreed that realistic training scenarios will help them to control their panic development in the future. Seven participants out of 11 who never panicked before also agreed that realistic training will help them in future situations to control their panic development. Only six participants out of 34, who panicked before, did not think that realistic training will help them in future situations to control their panic. Participants who experience stress and panic during realistic training improve their ability to recognize panic in a real life scenario in the future.

"Being unfamiliar with the event" will increase stress and lead to panic development (Figure B-17, Appendix B). Realistic training scenarios, even without fully inducing panic in all participants, present an opportunity to experience and prepare for real life events in the future. Further research into understanding what makes people resistant to realistic scenario training can unlock possible training design approaches to enhance the realism and improve the training experience.

Realistic Training Benefits Results and Analysis

Table 4: Survey Questions and Realistic Training Benefits.

Note: Information summarized from Figures C-39 through 50.

	Do you feel that realistic scenario/hands-on portion during the exercise made you aware of your panic development and control?	Do you feel that realistic scenario/hands-on training will help you in future situations to control your panic development?
Have you had any previous realistic scenario/hands-on training (military or civilian)?	**significant**	**significant**
Were any exercises you participated in realistic enough to simulate real life scenarios?	**significant**	**significant**
Did you feel stressed at any point during the realistic scenario/hands-on exercise portion?	**significant**	**significant**
Did you feel panic at any point during the realistic scenario/hands-on exercise portion?	**significant**	not significant
If yes, do you feel that stress contributed to your panic development?	**significant**	not significant
If yes, do you feel realistic scenario/hands-on exercise portion played a key role in your panic development?	**significant**	**significant**

The benefits of training are undeniable. It helps in memorizing the position of a switch in a cockpit, a flow of a checklist, and enhancing an overall Situational Awareness. The statistical significance is across the entire crosstabulated column of the realistic scenario/hands-on portion making participants aware of their panic development and control. Training provides "experience with events" and "experience being stressed in a controlled training environment" (Figure B-17, Appendix B). The experience of realistic scenario/hands-on training can be as important as actually panicking during the training. The exposure to realistic training, even without the panic event, heightens our senses to pick up on any deviations from normal behavior.

The realistic scenario/hands-on portion during the exercise made 30 out of 45 participants aware of their panic development and control. Of those 30 participants, 29 had previous realistic scenario/hands-on training in the military or as a civilian, 27 felt that the exercise they participated in was realistic enough to simulate real life scenarios, and 28 felt stressed during the realistic scenario. Out of 30 participants who felt realistic training made them aware of their panic development, 13 felt panic and 17 did not feel panic during the realistic scenario/hands-on exercise portion. The data supports the assumption that participants involved in realistic scenario training find the training realistic enough and experience stress. However, even if more than half of the participants did not experience panic, they still felt realistic scenario training made them aware of panic development and control.

Out of 13 participants who felt panic during the realistic scenario/hands-on exercise, 10 said stress contributed and 2 did not feel stress contributed to their panic development. Of those 13 participants, 12 said realistic scenario/hands-on exercise contributed to their panic development. To conclude, all participants who felt panic credited realistic scenario/hands-on portion of the exercise in a successful recognition, awareness, and control of the stress that leads to the panic events.

Out of 45, 33 participants said realistic scenario/hands-on training will help them control panic in the future. Of those 33 participants, 31 had previous realistic scenario/hands-on training, 28 said the exercise was realistic enough, and 29 felt stressed. Out of 33 participants who felt realistic training will help them in the future to control their panic development, 14 agreed that realistic scenario/hands-on portion played a key role in their panic development, 2 said no, 16 had N/A, and 2 skipped the question. Even though the crosstabulation did not return significant, 13 out of 33 participants felt panic and agreed stress contributed to their panic development. Out of 45 participants, 12 did not feel stressed and 31 did not feel panic. Even if the realistic scenario training did not evoke stress or panic, the future benefits are clear in making participants aware and helping them control their panic development.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Summary

As an Air Force pilot, I have gone through many training environments. Some training scenarios lack the realism and some are realistic enough to scare even the bravest pilot. Not all training scenarios require realism to be effective. However, in a situation where my life is at stake, I would like to be prepared as much as possible. In an extreme environment, there are multiple events that can play out at the same time. Equipment failures, lack of resources, and physiological and psychological reactions of an operator all play a vital role in a stressful situation. Preparation is a key to survival. The realistic scenario/hands-on training is the best preparation strategy to a successful mission outcome.

The survey participants were pilots who experienced a simulated combat mission training environment. All participants were familiar with panic and able to describe it quite accurately. However, the answers about actually experiencing panic varied and even contradicted. Some participants were able to control panic, even when previously admitted never panicking before. A few participants never experienced panic or participated in a realistic enough training. Pilots, as well as extreme environment performers, are taught to compartmentalize, deal with the situation at hand, and move on. The lack of training to deal with psychological effects during the critical phases of the mission is not uncommon. Especially during combat mission simulations, two major portions of the scenario play against revealing the psychological distress. Unlike real combat, the shots fired do not kill the pilot and the debriefing portion of the mission only reveal the tactical errors in performance.

The discrepancy between some participants finding the exercise realistic enough, while others did not is an intriguing area for further research consideration. We all are different to some extent in the way of experiencing events, reacting to situations, and actually admitting things. The survey only had three female pilots, but interestingly enough, they all admitted that they have panicked before. As a female pilot and a fellow human being, I can admit that I have panicked at some point in my life and it is interesting to postulate that some human beings never panicked in their life. More likely, the ambiguity lies within the way the sensitive data on panic, stress, and realistic training scenarios was answered.

Most participants felt that the training scenario was realistic enough to create a stressful environment, but not all experienced panic. The focus of this study was to identify if realistic training scenarios contribute to panic development and aid in controlling it. The data received from participants that did not experience panic is important in improving the construct of the realistic scenario and creating more encompassing training environments. The in depth analysis of the data from participants who did experience panic was supportive of this study's initial expectations. Realistic training scenarios can imitate real life events and train crewmembers to recognize and control future panic occurrences better. Even though some participants did not feel panic, the value of realistic training scenarios was positively noted.

Conclusions

The research was broken down into four areas for further analysis: demographics, realistic training, realistic training and panic recognition, and realistic training benefits. Demographics did not play a major role in an outcome of this research. Younger pilots may feel "invincible" and push the limits never experiencing or admitting to panicking. Minimal experience in an actual combat zone may also influence how they perceive realism and lack of it in a training scenario. Older and more experienced pilots may be willing to discuss their panic occurrences and judge the realism of the training scenario more accurately. Only three females versus 42 males participated in this survey. The future shift from a male dominated career field to a more female aircrew dynamic can have a significant effect. This is an important area of consideration for the future research.

Panic was very well defined by all participants. Those who panicked before were able to control it by deep breathing, concentrations, and reverting to training. Most participants who had previous realistic training agreed that training scenarios were realistic enough and evoked stress. Some participants who did not feel that the training was realistic enough, they still felt stressed. However, even if the training scenarios were realistic enough, they did not trigger panic for the majority of participants. This may be due to not realistic enough training scenarios, individual variations in classifying training as realistic, and unwillingness to admit or discuss psychological events. Those who felt panic thought that stress and realistic scenarios contributed to their panic development.

Those participants who panicked and were able to control it agreed that realistic training scenarios helped them become aware and will help them in the future to control their panic development. The previous participation in realistic training scenarios is beneficial to all participants in recognizing panic in the future. Realistic training scenarios contribute to stress and panic during exercises.

The majority of participants agreed that realistic scenario/hands-on portion during exercise made them aware of and will help them in future situations to recognize and control panic development. Realistic training is a real benefit to all participants.

General conclusions from theoretical considerations

Introduced mission uncertainty parameter:

$\nu = \alpha/\sigma^2$ = ***Mission mitigation factors power/Mission uncertainty degree*** =

(will and resources to accomplish mission)/(mission environment uncertainty)

is a good approximation to make qualitative conclusions about mission outcomes. The formula may help determine if a specific mission can be accomplished or not.

Panic development decreases α component and tremendously increases the environmental uncertainty σ^2 which leads to decrease in the following ratio:

{Mission resources and personnel preparedness}/{Environmental uncertainty}.

This eventually leads to the shift of probability for mission success toward the status when mission can't be successfully accomplished.

Countermeasures to prevent undesirable outcomes for the mission have to include widely designed pre-mission training scenarios which increase α = personnel will and resources. A properly tailored training may help successfully accomplish the mission and also reduce environmental uncertainty. $\boldsymbol{\alpha \sim \sigma^2}$.

Pre-mission preparations have to include as much as possible mission environment and conditions analysis to minimize parameter σ^2 = mission environment and mission dynamic uncertainty.

Validity of Methods Applied for Analysis

The research returned a lot of data from 45 participants with 14 direct questions and 3 open ended questions. The goal of this survey was to answer if panic development and control mechanisms can be improved through realistic training scenarios. The Chi-Square statistical program was used to analyze all the questions in an attempt to establish a statistical significance for further analysis. Some ambiguity is possible due to omitted, contradicting, or open-ended answers. There is also a possibility of unwillingness to answer truthfully about stress and panic due to personal beliefs. Social research to some degree is mostly subjective, but how we analyze the gathered data can make the difference (Babbie, 2004). All the methods that were used to analyze the survey are considered valid.

Conclusions Regarding Panic Development Mechanisms

It is difficult to induce panic in subjects during the training environment. Many participants felt that training will never be able to emulate real life events. Realistic training scenarios during actual flying training may be the closest environment where extreme stress and panic can be simulated. This type of stress is close enough to panic where realistic training is enormously beneficial to extreme environments participants. Even though majority of participants did not feel panic, they all agreed that realistic training scenarios made them aware and will help them in the future to control their panic development.

Conclusions Regarding Preventive Methods Analysis

Experience comes with age. Male and female dynamic is important in discussing psychological events and designing realistic training scenarios. Participating in realistic training helps establish the baseline for realistic training construct, experience stress and panic, and ability to control panic in the future. Through realistic training scenarios, panic development can be introduced in a controlled environment. The large number of participants still did not experience panic even if the scenarios were realistic enough. Majority of participants agreed that realistic training will help them recognize panic development. Panic awareness and future ability to control panic through realistic training scenarios is a real benefit to most participants. Training is a vital part of building a positive experience for future preventative measures.

Recommendations

General recommendations from theoretical considerations

To increase mission success and minimize undesirable effects from mission uncertainty (uncontrollable panic development and precipitation), mission preparation must minimize as much as possible mission environment uncertainty. Observe in detail the environment before mission initiation to recognize any resource insufficiency to accomplish mission successfully.

Provide sufficient resources to overcome environmental deviations impacting mission nominal development.

Provide sufficient training for personnel involved in a mission to minimize risks of anxiety and panic development due to perceived insufficiency of resources. Pre-mission training on deviations from nominal parameters must be provided as accurate as possible (taking into account safety considerations).

Future Directions

The survey questionnaire returned a vast amount of data. It can be used for future research into stress, panic, and realistic training benefits. This research is essential in understanding how realistic scenarios/hand-on training improves human performance in extreme environments. The demographics of the military pilot community will be shifting in the future towards more equal male to female distribution. It is important to address this shift for better statistical outcome in a demographics portion of this study. The future research will be more diverse and return more balanced statistical outcomes.

The research into human psychological and physiological issues, especially with strong personalities involved in extreme environment operations, will always present many challenges. However, it is imperative that we understand how human subjects develop and cope with stress and panic. It is this understanding what helps develop training environments that prevent such occurrences in the future.

There are many areas for future considerations in investigating human performance in extreme environments. The underlying psychological and physiological principles of anxiety and stress are well documented and researched. However, the panic development and control mechanisms are far from being fully investigated. Individual differences are ultimately a determining factor in recognizing imbalances, dealing with stressors, and bringing the entire mission to a successful conclusion. Training settings are an excellent venue to test and prepare future astronauts, pilots, and other extreme environment operators for the upcoming missions. Most of the training scenarios are standardized and geared towards general average performer. Investigation into individually set training scenarios/hands-on portions could be a valuable future research direction.

APPENDICES

APPENDIX A

Panic Development Analysis Survey

The request to complete this survey was emailed to 99 Red Flag – Alaska 2011 exercise participants. The survey was targeting all aircrew. Two sets of request emails were sent out after two exercises: one in August and one in September 2011. The survey began in August 2011 and ended in December 2011. The survey was designed to question participants about their understanding of panic and how realistic/hands-on training scenarios relate to stress and panic development and control. The survey was anonymous and had no link to identify the participant. The survey had a total of 17 questions. Three questions were open ended/write-in. The survey was reviewed and approved by 354 FW/JA (Judge Advocate Office), 353 CTS/CC (Red Flag – Alaska Commanding Officer), and the University of North Dakota Institutional Review Board – IRB-201011-124.

Survey Request Email Body

To All, I'm a Tanker Task Force liaison officer with Red Flag – Alaska and in the process of completing my Master's Degree with University of North Dakota. I would like to request your voluntary participation in my survey. It does not contain any confidential information nor follow on contact requirements. The survey is about panic development and how realistic training exercises can help improve personal recognition of panic onset and improve survivability. It would be very valuable for my research to collect this questionnaire from participants of Red Flag, also please keep in mind any realistic scenario exercises you've ever participated in the past (Survival/Resistance).

This survey is in no way linked with 353 CTS or 354 FW. It is absolutely voluntary and I sincerely appreciate your assistance in my research. Thank you.

https://www.surveymonkey.com/s/PanicSurvey

Survey Questions

1. Age:

    a. Less than 20

    b. 20-29

    c. 30-39

    d. 40-49

    e. 50 plus

2. Sex:

    a. Male

    b. Female

3. Occupation:

    a. Aircrew

    b. Ground Personnel

    c. Medical Field

    d.

Other____

4. Do you know what panic is?

    a. Yes

    b. No

5. Please define panic in your own words (1-2 sentences):

6. Have you ever panicked before?

   a. Yes

   b. No

7. If yes, were you able to control your panic?

   a. Yes

   b. No

   c. N/A

8. If yes, please describe how did you control your panic? (Deep breathing, concentrating on task at hand, etc.)

9. Have you had any previous realistic scenario/hands-on training (military or civilian)?

   a. Yes

   b. No

10. Were any exercises you participated in realistic enough to simulate real life scenarios?

   a. Yes

   b. No

11. Did you feel stressed at any point during the realistic scenario/hands-on exercise portion?

   a. Yes

   b. No

12. Did you feel panic at any point during the realistic scenario/hands-on exercise portion?

    a. Yes
    b. No

13. If yes, do you feel that stress contributed to your panic development?

    a. Yes
    b. No
    c. N/A

14. If yes, do you feel realistic scenario/hands-on exercise portion played a key role in your panic development?

    a. Yes
    b. No
    c. N/A

15. Do you feel that realistic scenario/hands-on portion during the exercise made you aware of your panic development and control?

    a. Yes
    b. No
    c. N/A

16. Do you feel that realistic scenario/hands-on training will help you in future situations to control your panic development?

    a. Yes
    b. No
    c. N/A

17. Extra comments:

____

Thank you.

APPENDIX B

Graphical Survey Results

Figure B-1. Age Graphical Results.

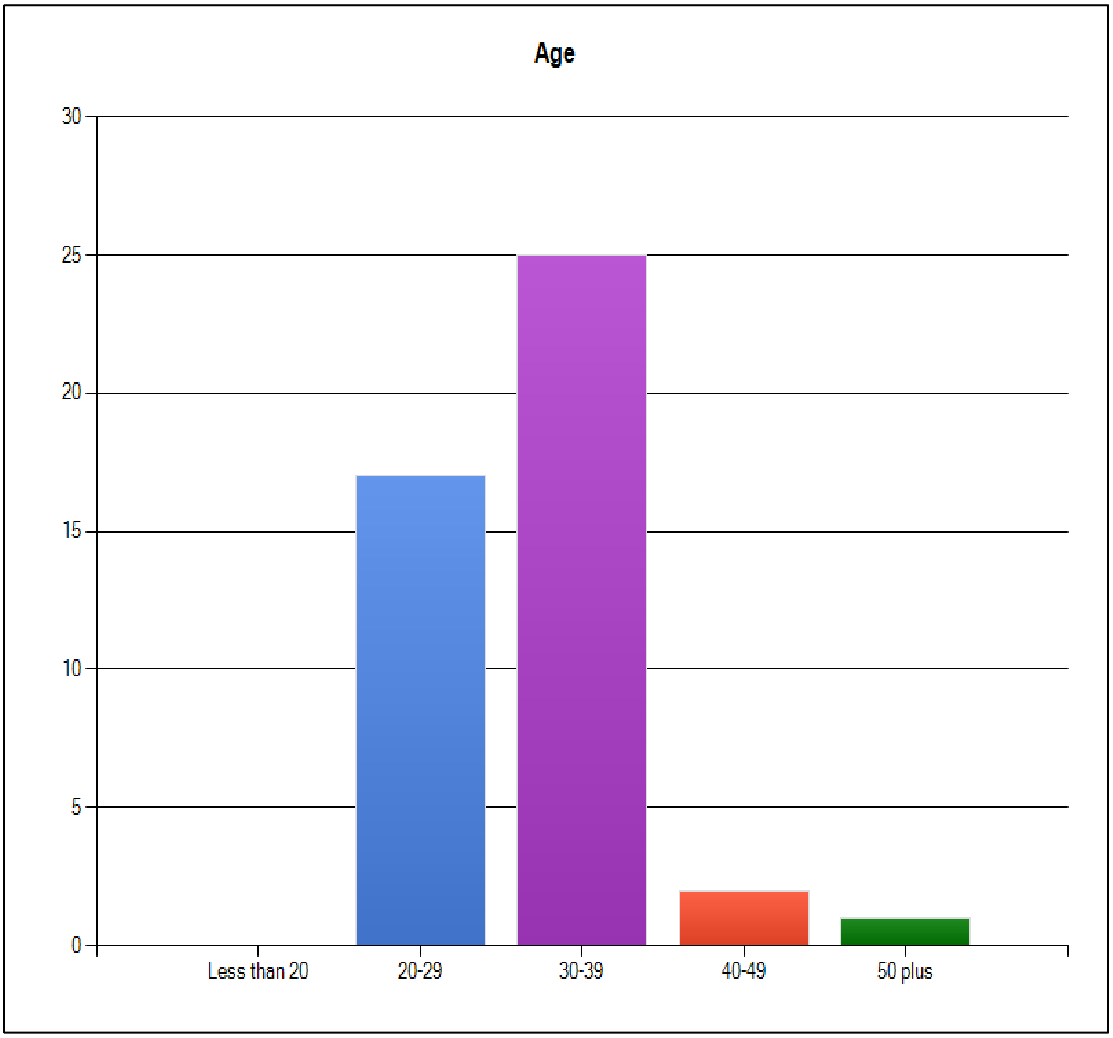


Figure B-2. Sex Graphical Results.

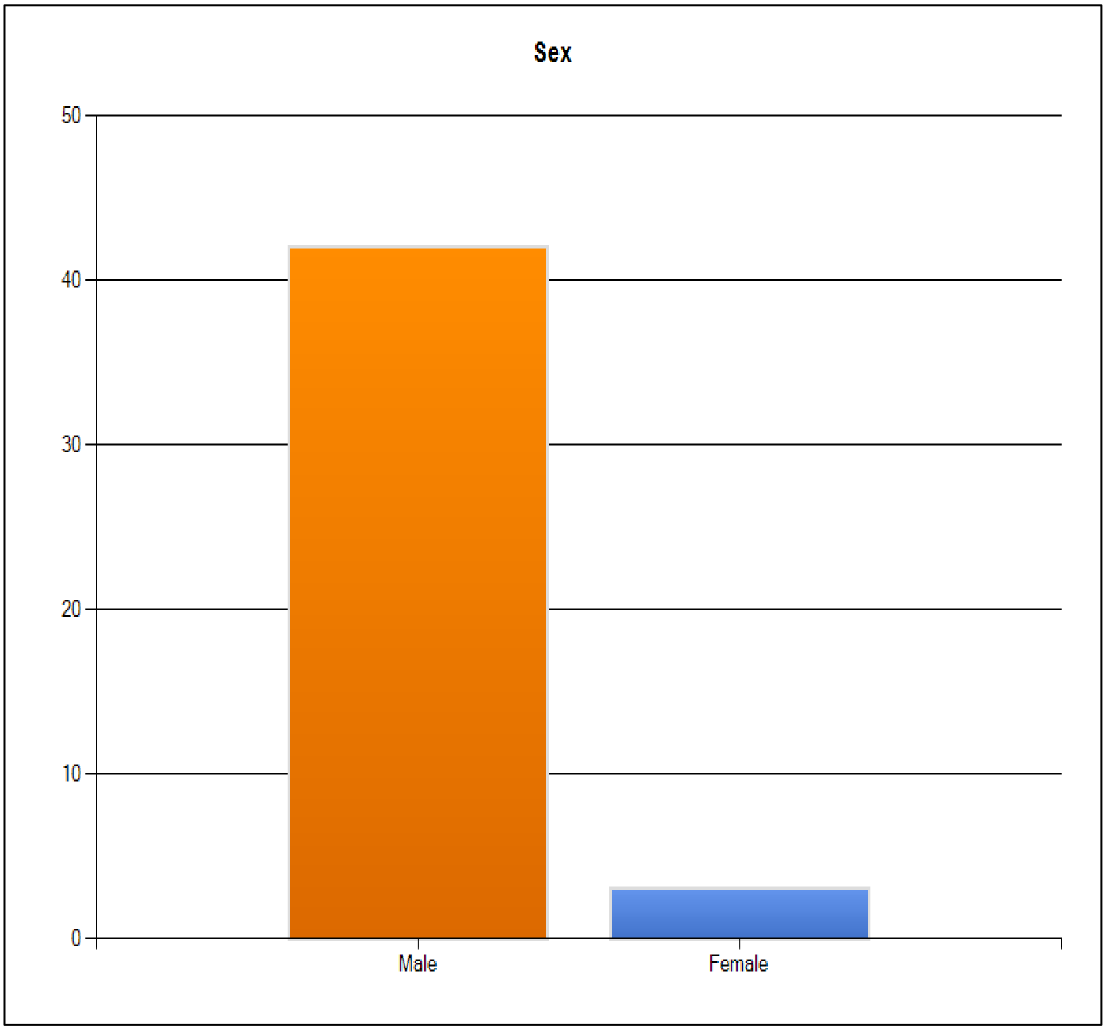


Figure B-3. Occupation Graphical Results.

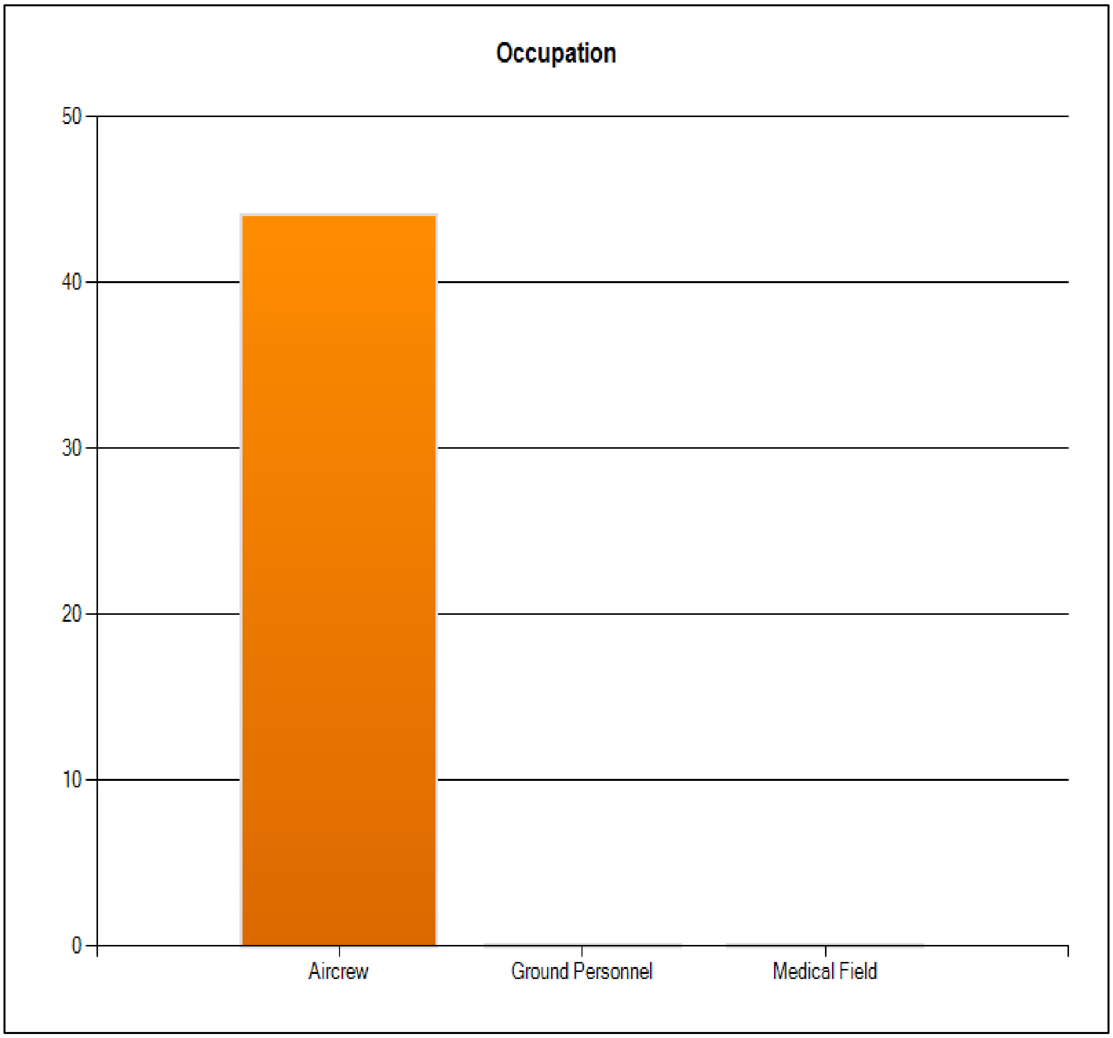


Figure B-4. Do you know what panic is? Graphical Results.

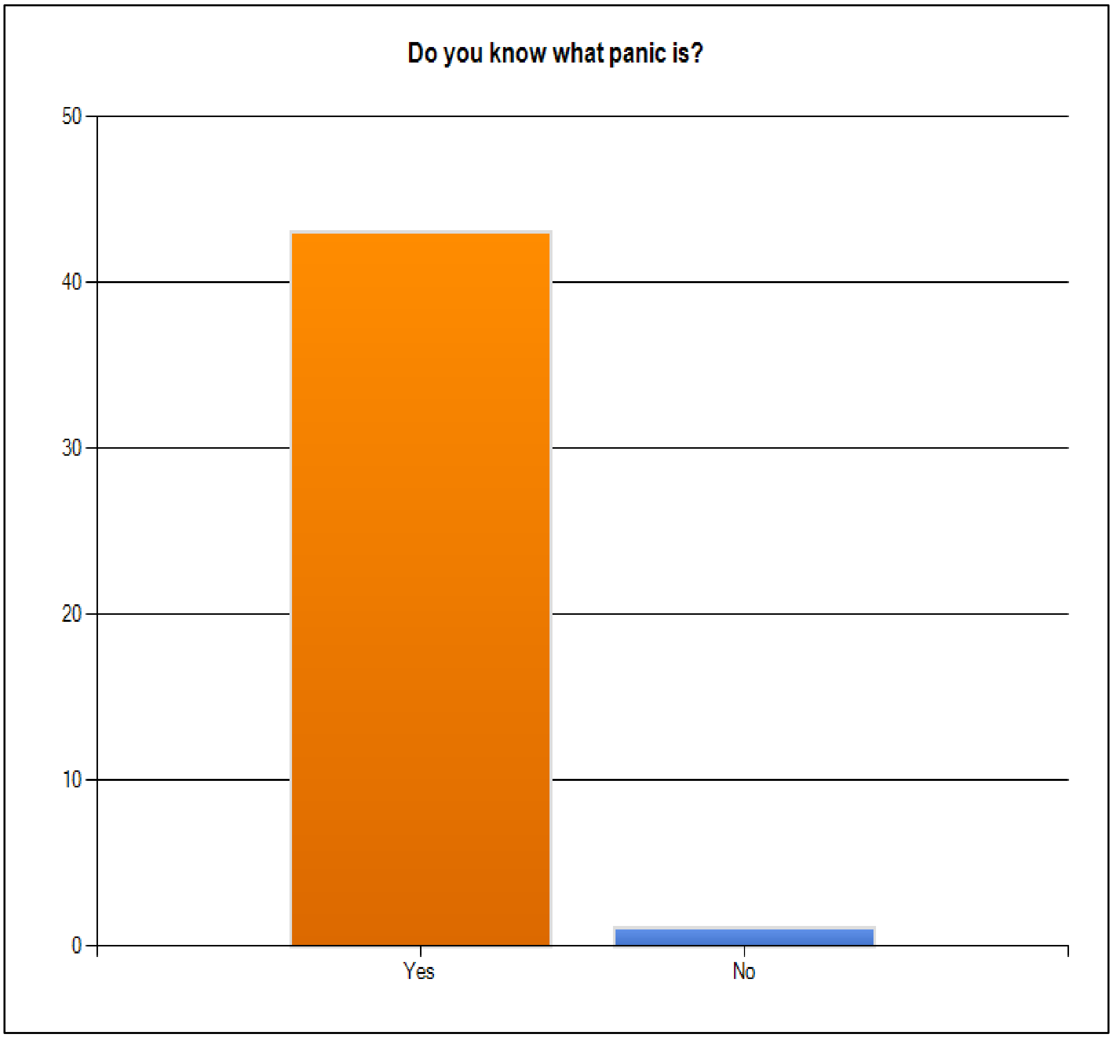


Figure B-5. Please define panic in your own words (1-2 sentences) Graphical Results.

The body's reaction to crisis, which freezes your ability to react purposefully.
Losing control of you personal ability to make rational decisions...
Panic is the inability to perform activities, duties, or solve problems due to external pressures. Those pressures cause a breakdown of decision making and problem solving abilities.
A state of uneasiness when the unexpected occurs.
A state of mind where thoughts are blurred and you cannot figure out what to do.
Not completely having control of the situation. Not being able to quickly finding and answer to a time critical descision.
Onset of breakdown in rational thought when confronted with traumatic or overwhelming circumstances.
mental or sensory overload that results in the inability to react
An enormous feeling of terror or anxiety
OH SHIT!!!!!!!!
Reacting to circumstances out of fear/irrational thought process rather than rational judgement
When you have lose cognitive ability and resort to fight/flight instincts.
A sudden on set of fear.
Panic is the loss of mental control and subjectivity that comes from a highly emotional state - often as a result of a high degree of fear or anxiety.
Intense panic that onsets quickly and dramatically affects ones ability to act or make decisions
A sudden scaredness or fright which can erode rational decision making in an attempt to flee from a threatening scenario.
An excited condition where senses and physiological conditions change. Resultes can be highly varied with individuals and symptoms may include: time compression, indecision, sharpened senses, passivity and many other symptoms which are normally not present in an individual.
onset of fear or anxiety for a given situation
Inability to think clearly and react approiately in a given situation.
Uncontrollable reactions to unforseen situations
O shit! O shit! O shit!
My wife is late, and I'm being audited by the IRS!
When you get so worked up about something you are unable to make rational decisions
An incapacitating amount of stress brought upon an individual by an event or series of events.
anxiety developed by overwhelming circumstances. When you have too much on your plate and are forced to make decisions rapidly.
Uncontrolled fear.
loss of mental functionality due to extreme stress, real or perceived.

Figure B-5. cont.

When a person becomes mentally and emotionally overwhelmed by the situation that he or she is in. This can cause difficulty in focusing on and trying to resolve the situation.
Mentally degradation on incapacitation due to fear.
Being overwhelmed by a situation which inhibits your ability to react in the correct manner
Panic is the presentation of anxiety when experiencing a situation that is beyond your comfort zone, as a pilot, when lives are at stake.
Panic is the feeling of the loss of control over a scenario. Causes can range from timing, emergencies, or lack of knowledge.
Reacting in fear without a plan.
A human response to unexpected stimuli
Panic is when something internal takes over and either your senses get stronger or you start to drop important items out. The reaction to panic is different to everybody.
Complete feeling of surprise, confusion, and loss of situational awareness. Momentarily not aware of my surrounding or environment.
moment of debilitating fright
The inability to think or act rationally and constructively through high stress moments.
The onset of overwhelming anxiety that overcomes your ability of think or function.
A state of emotion driven by fear causing one to perform acts not normal to that individual's norms.
Mental conditions (relatively rare) of comprehension for deep discrepancy between: 1. Demanding problem (task); and 2. Available resource sufficiency to find and implement solution (mostly, it is resource insufficiency conditions); accompanying the state of overexcitement what narrows further the scope of consideration for available resources.

Figure B-6. Have you ever panicked before? Graphical Results.

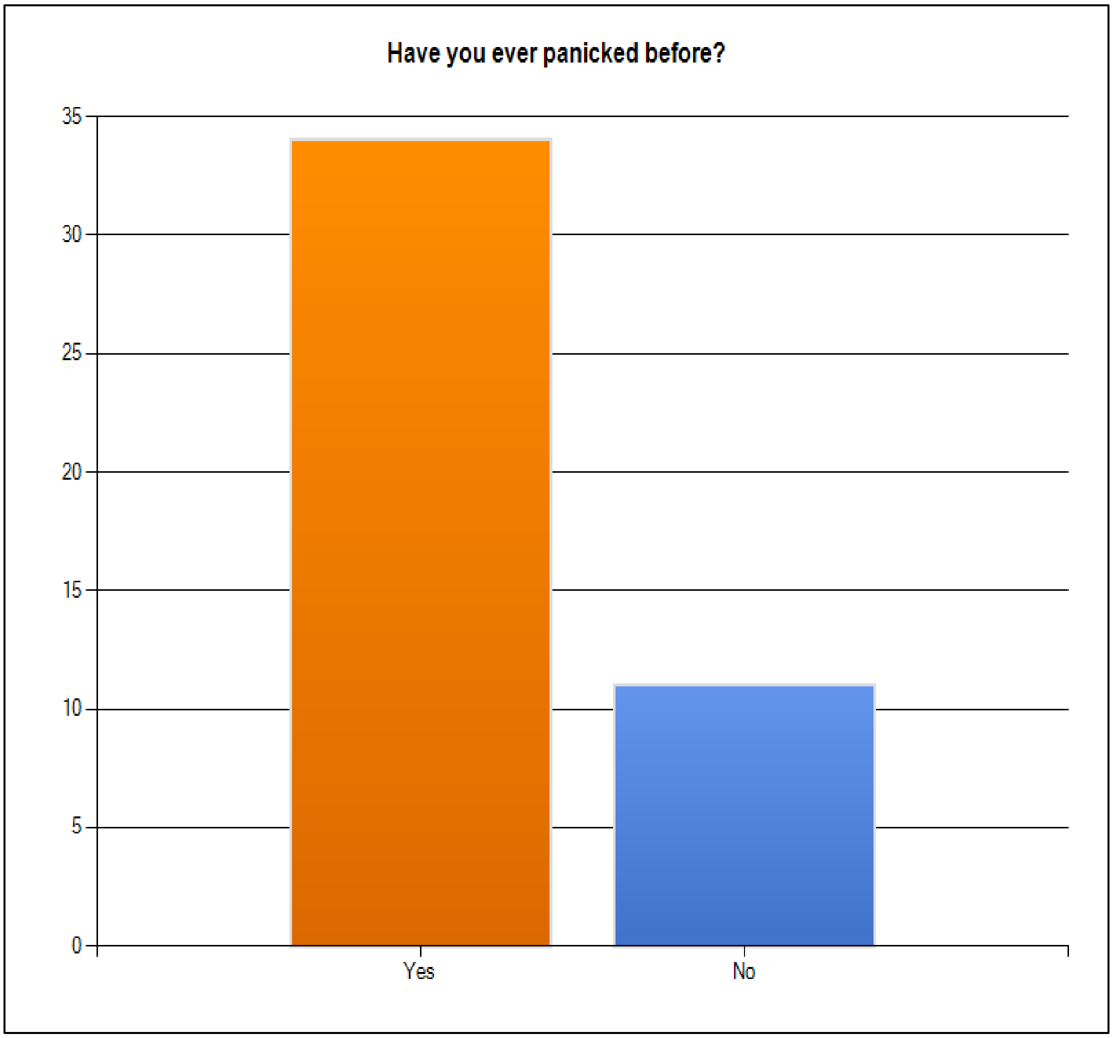


Figure B-7. If yes, were you able to control your panic? Graphical Results.

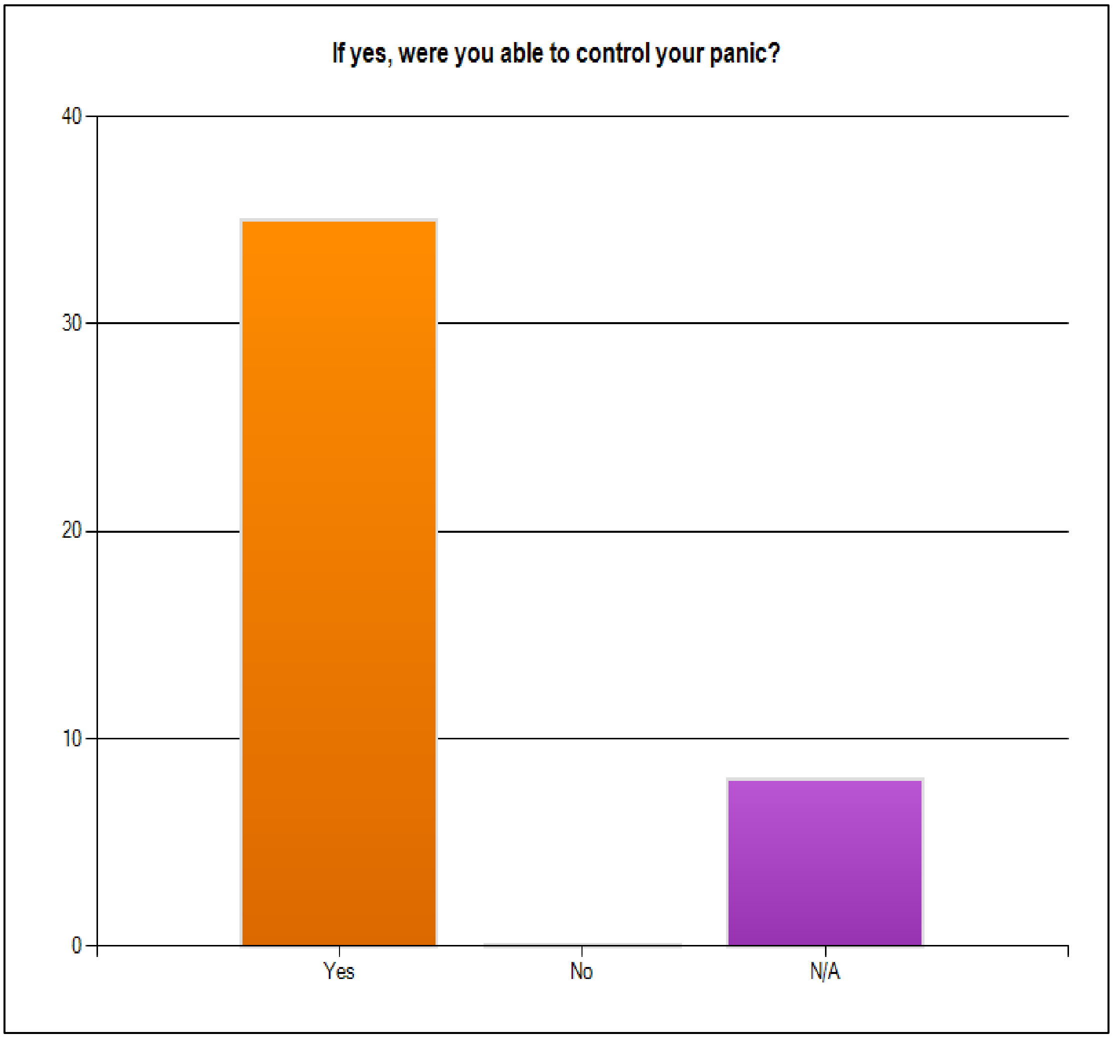


Figure B-8. If yes, please describe how did you control your panic? (Deep breathing, concentrating on task at hand, etc.) Graphical Results.

If yes, please describe how did you control your panic? (Deep breathing, concentrating on task at hand, etc.)
Open-Ended Response
Mental control
Took a deep breath, reverted to training
I can usually control panic by realizing that the situation is developing and then breathgn and concentrating on solutiosn to the problem. For me it is a realization that I could panic but force myslef to relax and look for a solution.
controlled breathing and analyzing the situation/letting the situation develop.
Concentration
Deep breathing
taking a moment to "catch up" to the situation
Deep breath, then focus on fixing the problem.
same as loss of SA
Training/concentrating on task at hand
I woke up. It was from a bad dream.
Reverting to training and concentration on the task at hand.
Ignore the causes of panic, try and re-asses from an objective POV
Recognition of what was happening and the accompanying conditions.
concentrated and did my best to control anxiety to find my way out of a situation
He said not to panic! He said not to panic!
Deep breathing, and concsiously forcing myself to remain calm.
Deep breathing
Tackle the situation one step at a time.
Concentration and controlled breathing
Focusing not on the large problem, but on smaller portions of the larger problem.
concentrating on what had to be done
Forced myself to focus on the task at hand by prioritizing more important tasks over non-essential tasks.
Concentrating on task at hand.
I fixed the situation
focus on the task at hand
I figured out a way to handle the situation.
First to realize the situation, then to asses my level of control and finally act accordingly.
Concentrate on the task at hand.
Stop, concentrate, think through the current situation logically, and breath.
focus
Taking deep breaths and fighting through it by focusing on the task at hand.
Recognition of the emotional response to the catalyst and choosing to mentally block/overide those emotions for rational thought.
Concentration on task at hand with: 1. first acceptance of worst case scenario; 2. following from this acceptance extension of scope for consideration of options; 3. selection of most optimal scenario coherent with available resources for problem resolution

Figure B-9. Have you had any previous realistic scenario/hands-on training (military or civilian)? Graphical Results.

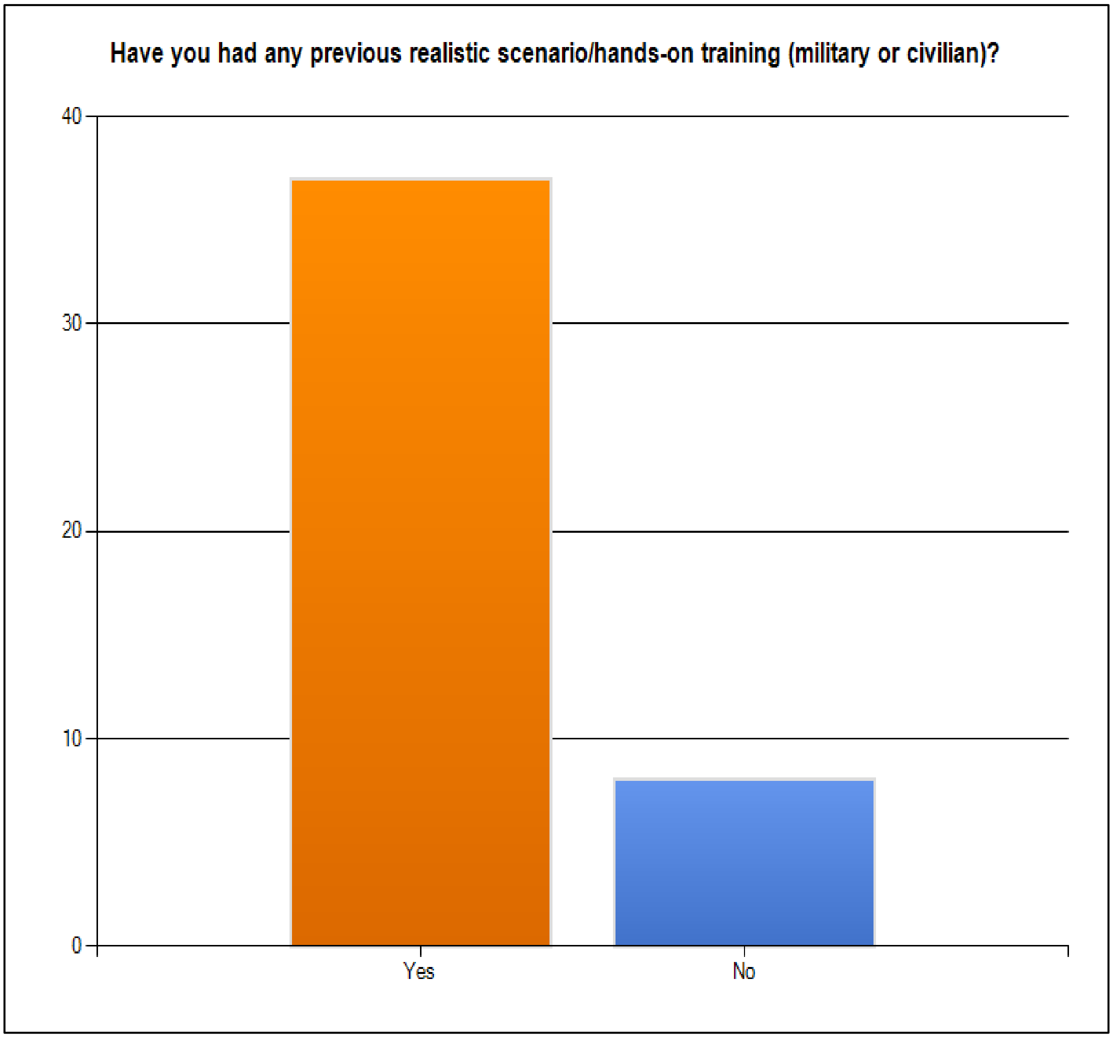


Figure B-10. Were any exercises you participated in realistic enough to simulate real life scenarios? Graphical Results.

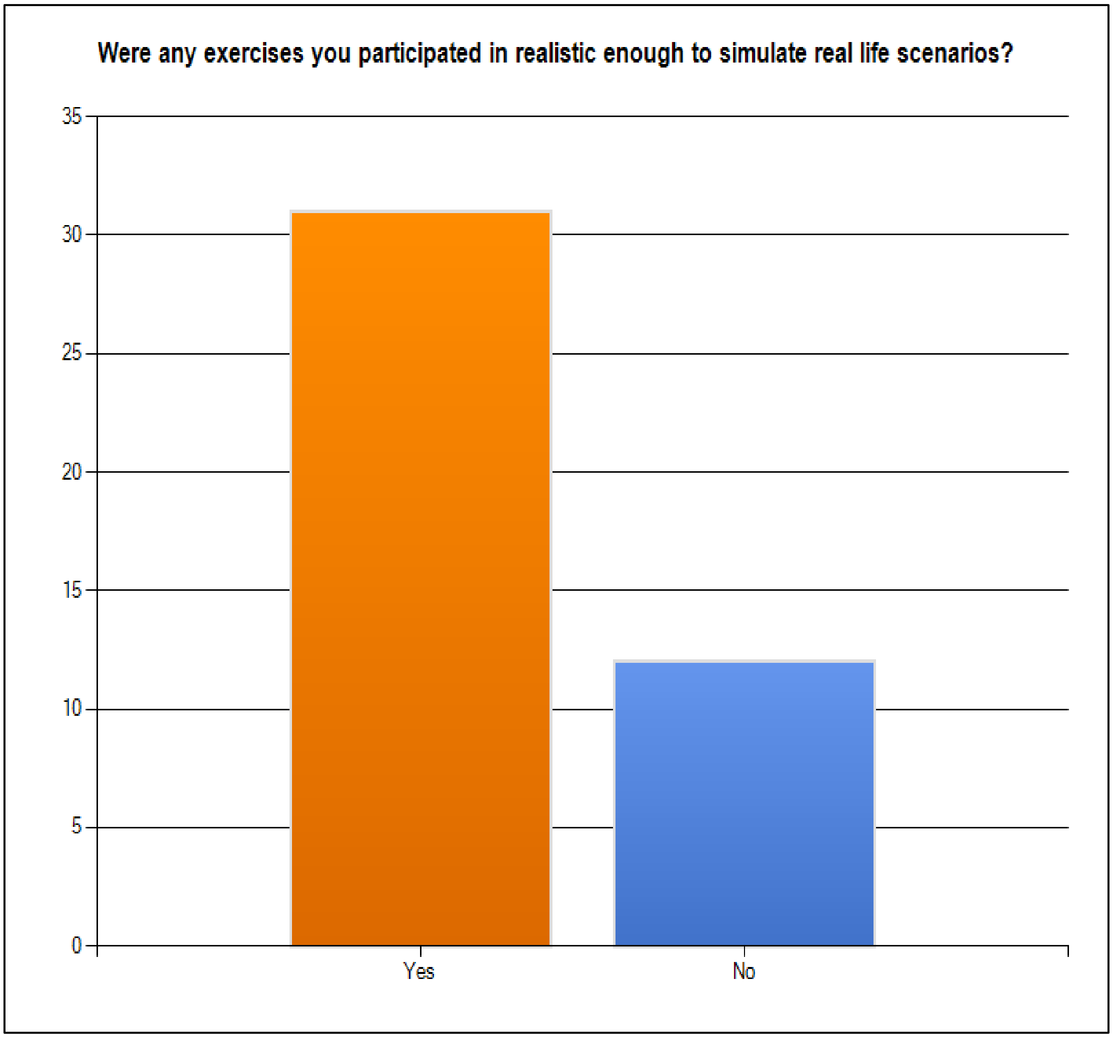


Figure B-11. Did you feel stressed at any point during the realistic scenario/hands-on exercise portion? Graphical Results.

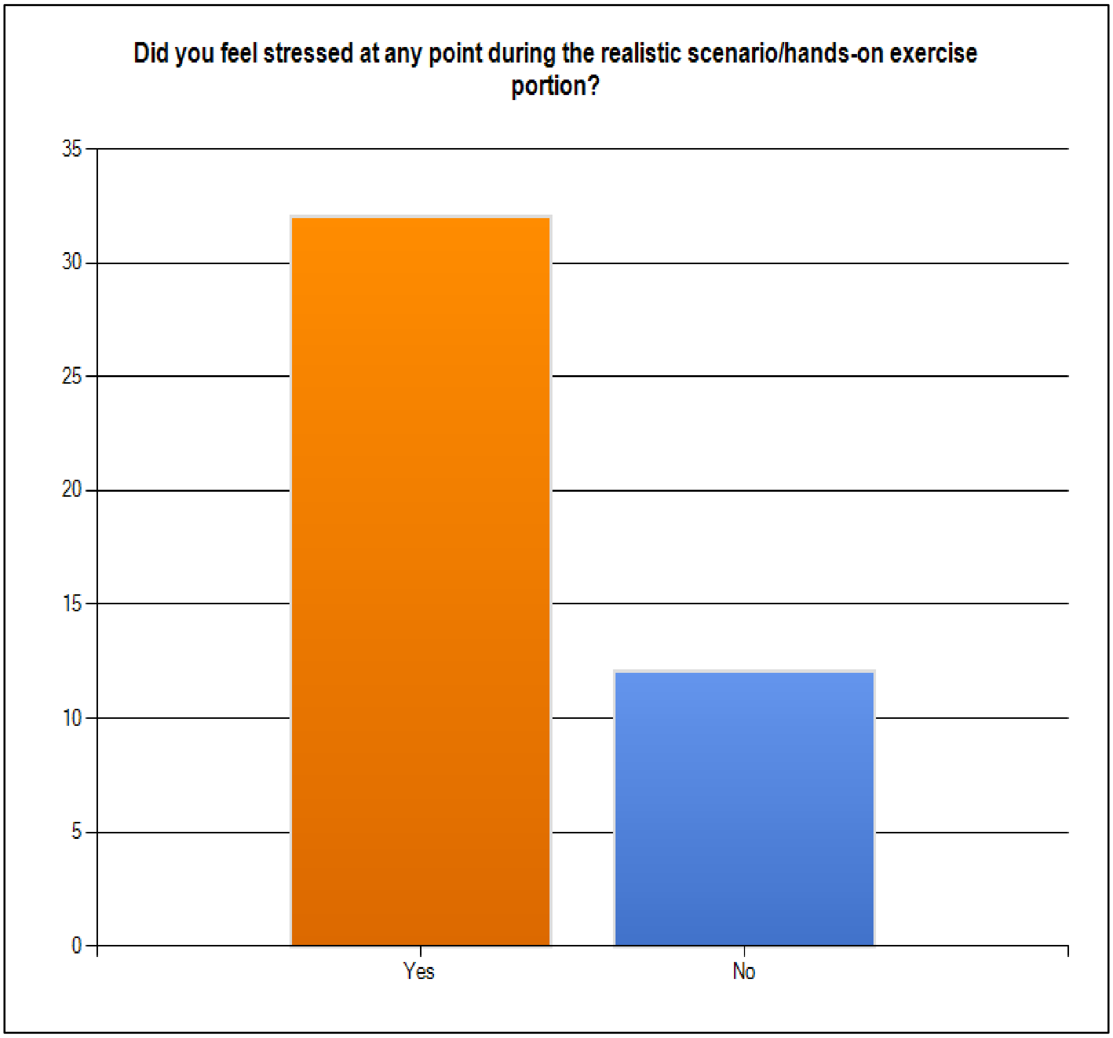


Figure B-12. Did you feel panic at any point during the realistic scenario/hands-on exercise portion? Graphical Results.

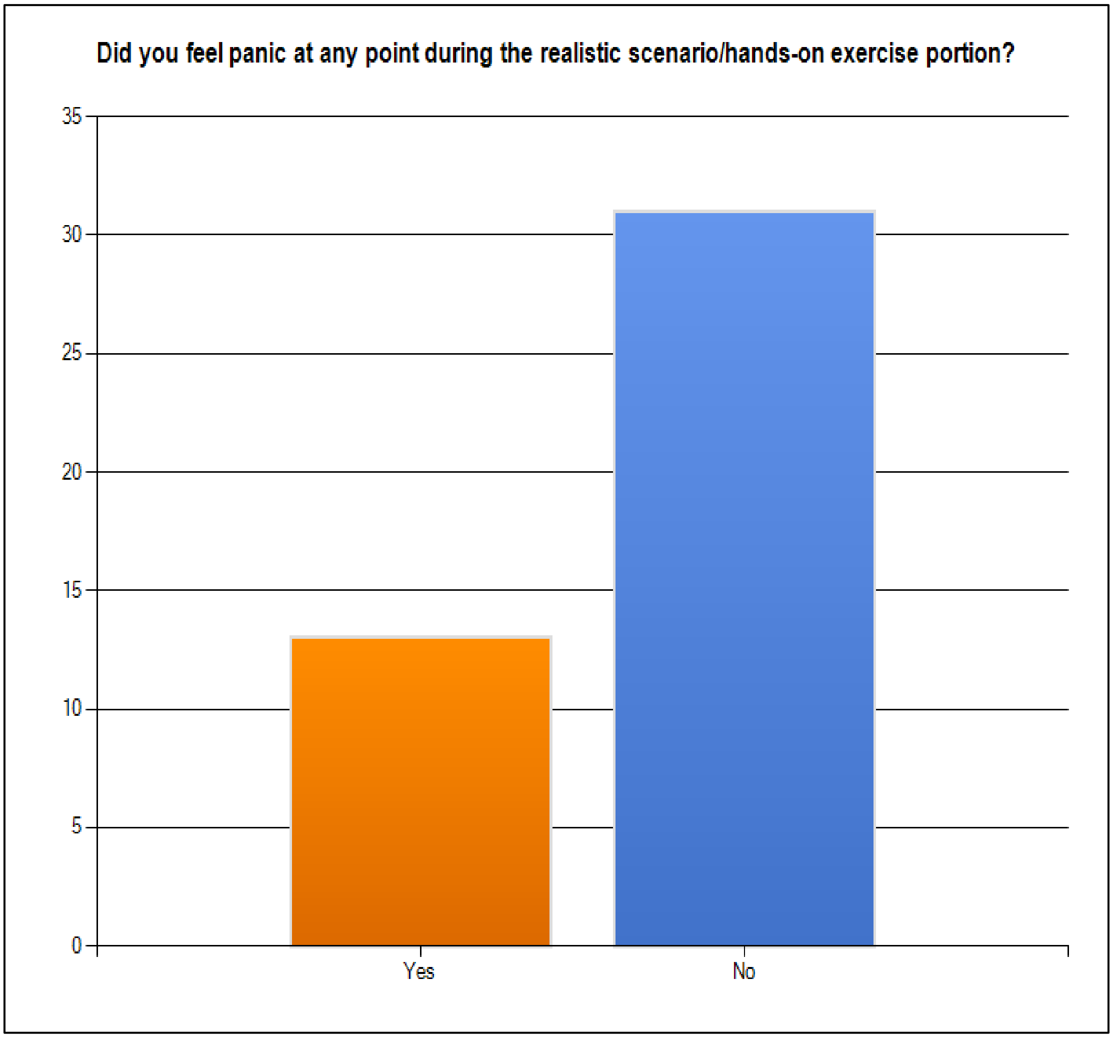


Figure B-13. If yes, do you feel that stress contributed to your panic development? Graphical Results.

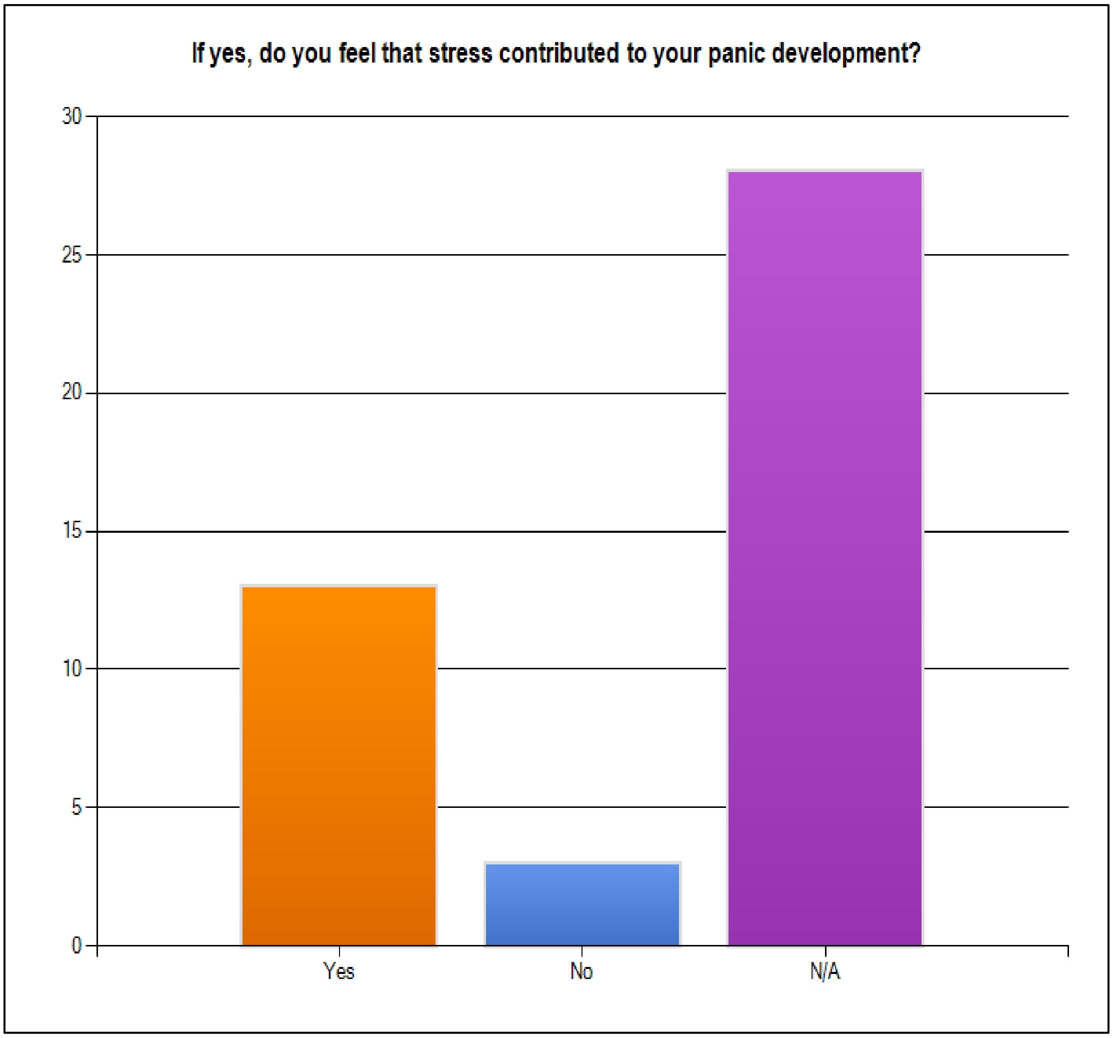


Figure B-14. If yes, do you feel realistic scenario/hands-on exercise portion played a key role in your panic development? Graphical Results.

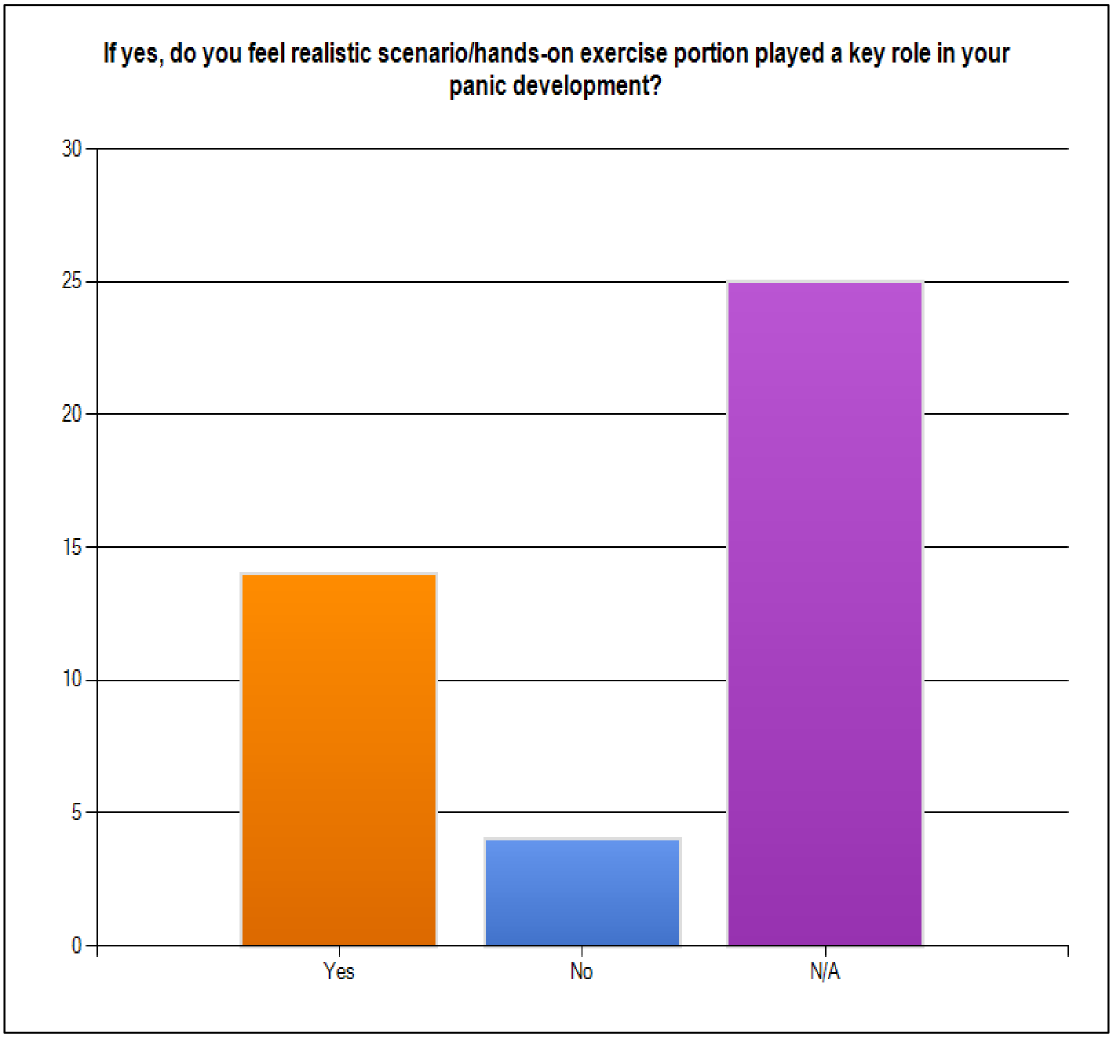


Figure B-15. Do you feel that realistic scenario/hands-on portion during the exercise made you aware of your panic development and control? Graphical Results.

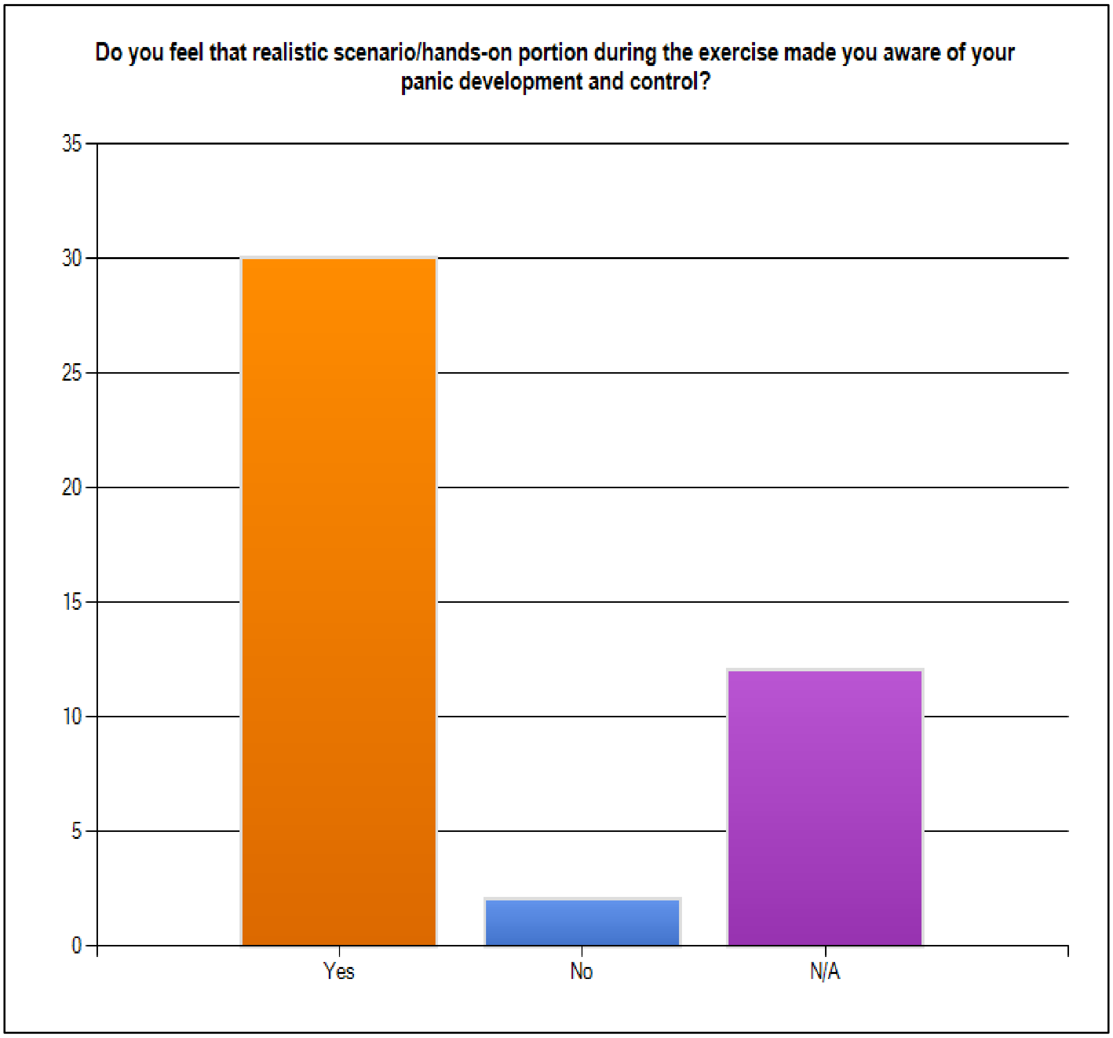


Figure B-16. Do you feel that realistic scenario/hands-on training will help you in future situations to control your panic development? Graphical Results.

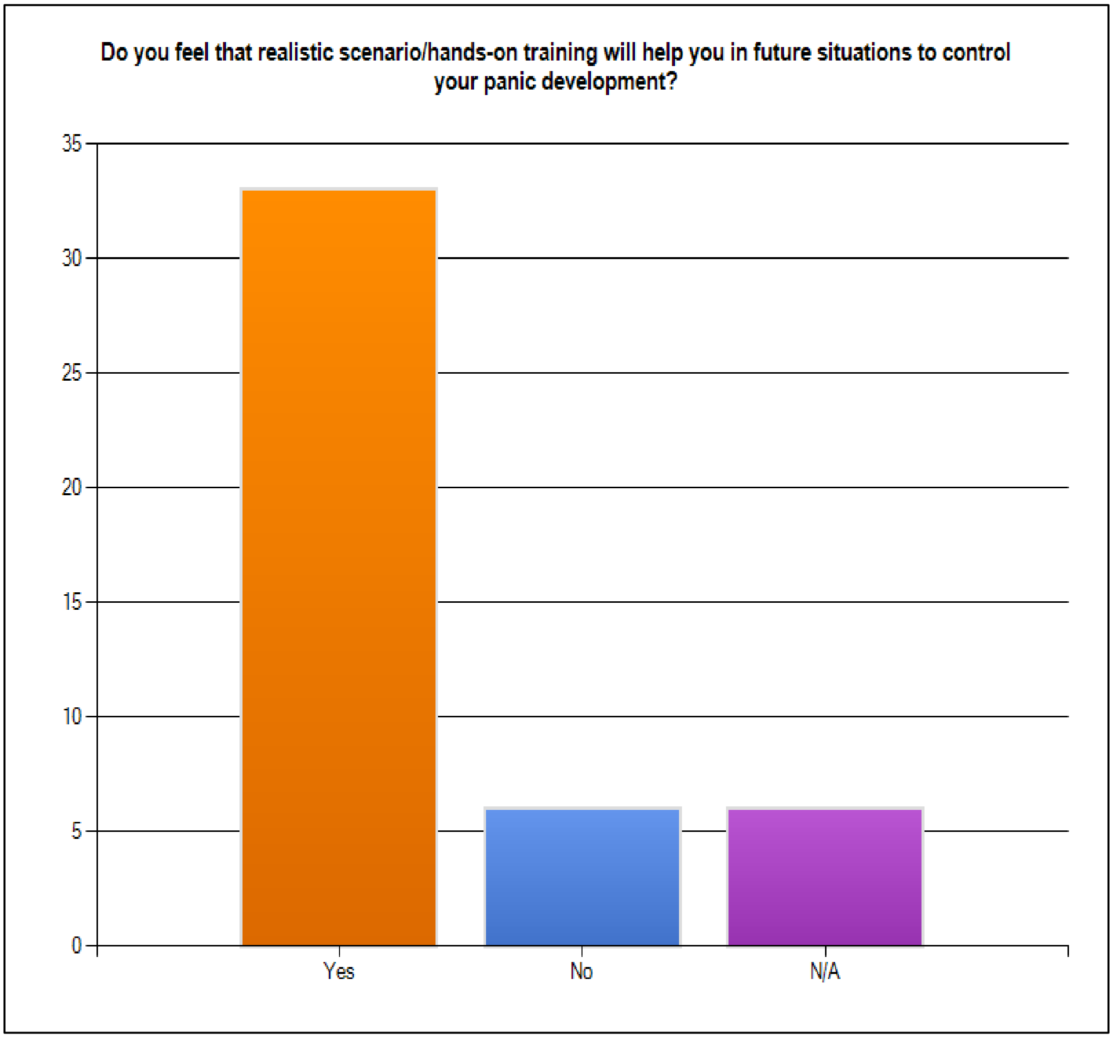


Figure B-17. Extra Comments Graphical Results.

Extra Comments:
Open-Ended Response
It has always been my opinion that panic or th einability to react correctly to situatiosn can be helped with realistic simulated exposure to the event. For me, being unfamiliar with the event leads to more pressure that training can mitigate. Like life, experience with events leads to a calmness on how to deal with the situation.
i define panic slightly different than you. exercises such as red flag are stressful rather than "panic". some stress is good to max perform your capabilities. panic to me is when something really bad has occured and that initial thought that goes through your mind. the oh crap. for example, i lose my engine when i wasn't expecting it. those initial thoughts are "panic", then training kicks in to compensate.
Combat alone will add a whole new level of stress that is not present when you know it's training
You can practice and practice but no training can ever replicate the real thing.
True panic is very hard to simulate and I have yet to see a training scenario that is effective in this regard.
none
I think hands on training helps prevent the onset of panic due to the experience gained.
I get stressed during exercises due to the supervision's inadequacy to make a decision, not from the scenario.
I do not believe realistic scenario's can induce panic in most aircrew as aircrew are trained to compartmentalize. I do not believe that these situations can truly enact panic due to the fact that aircrew will always know that it is just a training scenario, lives are not on the line. I do not believe I would ever feel panic in a training scenario unless there was a real world inject in which case the training scenario would be over.
I think if you ever expect to be in a real-life situation where you might panic, it is vital that you have experience being stressed in a controlled training environment.
Panic development depends on time (as a resource) available for problem resolution: as shorter time as more human subjects have to rely on automatic control actions. So, extensive training (specifically training in deviations from 'nominal' scenario) is required to control panic conditions. This kind of trainings does not have limits for perfection.

APPENDIX C

Chi-Square Test Results

Demographics Crosstabulation

Figure C-1. Age vs Sex Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.210[a]	3	.751
Likelihood Ratio	1.331	3	.722
N of Valid Cases	45		

a. 6 cells (75.0%) have expected count less than 5. The minimum expected count is .07.

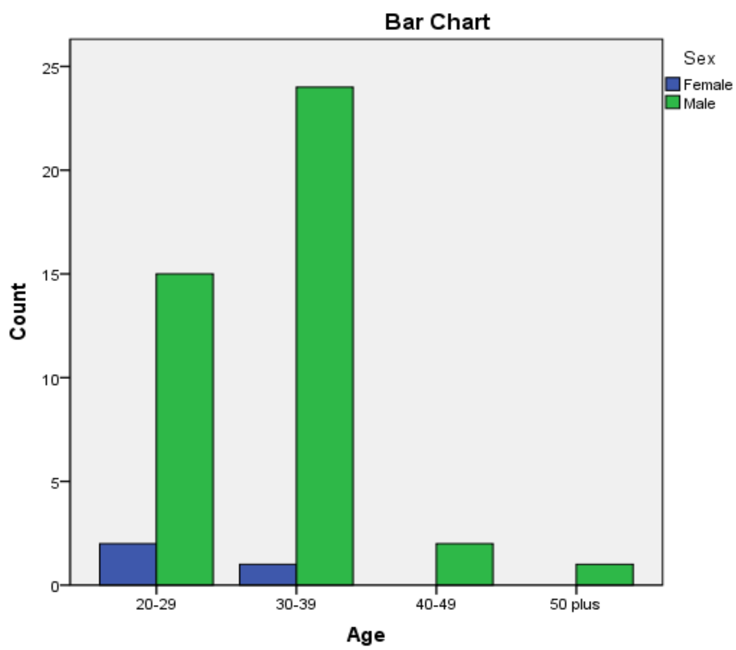


Figure C-2. Age vs Do you know what panic is? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.674[a]	6	.947
Likelihood Ratio	2.425	6	.877
N of Valid Cases	45		

a. 10 cells (83.3%) have expected count less than 5. The minimum expected count is .02.

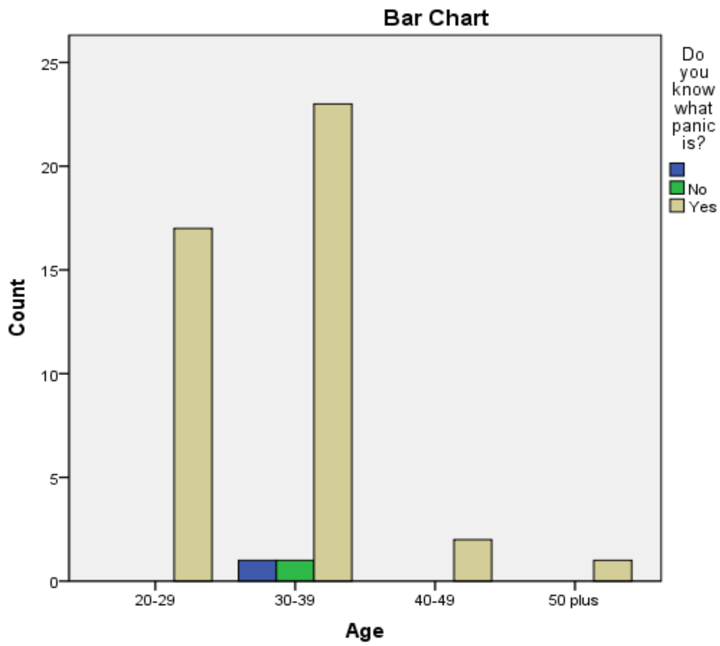


Figure C-3. Age vs Have you ever panicked before? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.200[a]	3	.753
Likelihood Ratio	1.902	3	.593
N of Valid Cases	45		

a. 5 cells (62.5%) have expected count less than 5. The minimum expected count is .24.

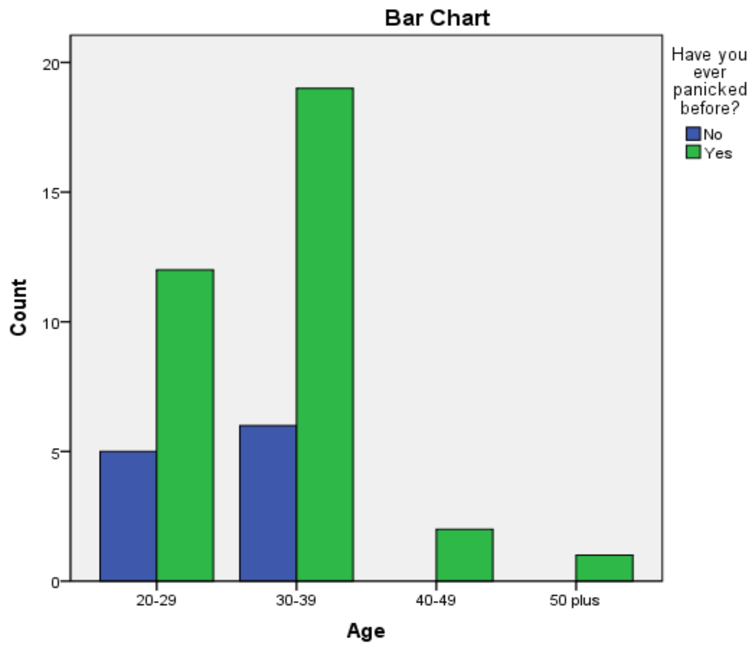


Figure C-4. Age vs If yes, were you able to control your panic? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.031[a]	6	.984
Likelihood Ratio	1.672	6	.947
N of Valid Cases	45		

a. 10 cells (83.3%) have expected count less than 5. The minimum expected count is .04.

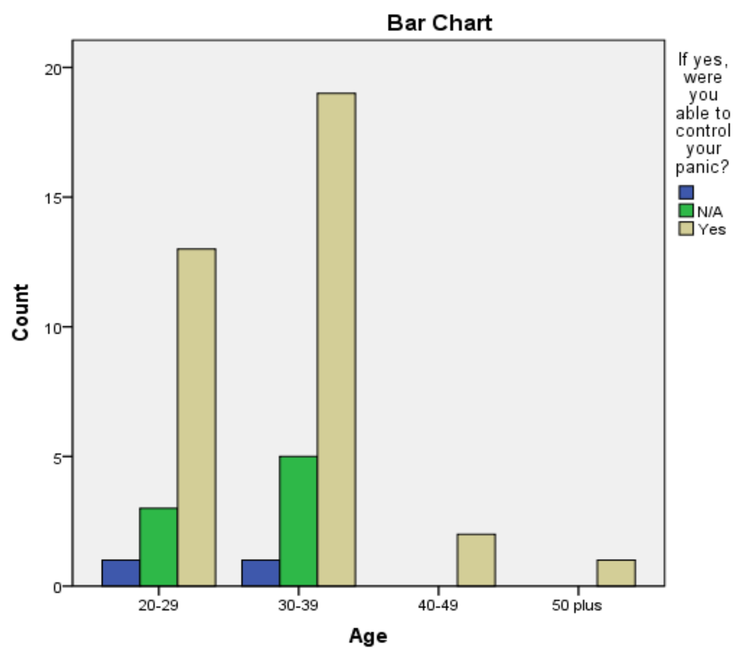


Figure C-5. Age vs Have you had any previous realistic scenario/hands-on training (military or civilian)? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.196[a]	3	.011
Likelihood Ratio	9.494	3	.023
N of Valid Cases	45		

a. 6 cells (75.0%) have expected count less than 5. The minimum expected count is .18.

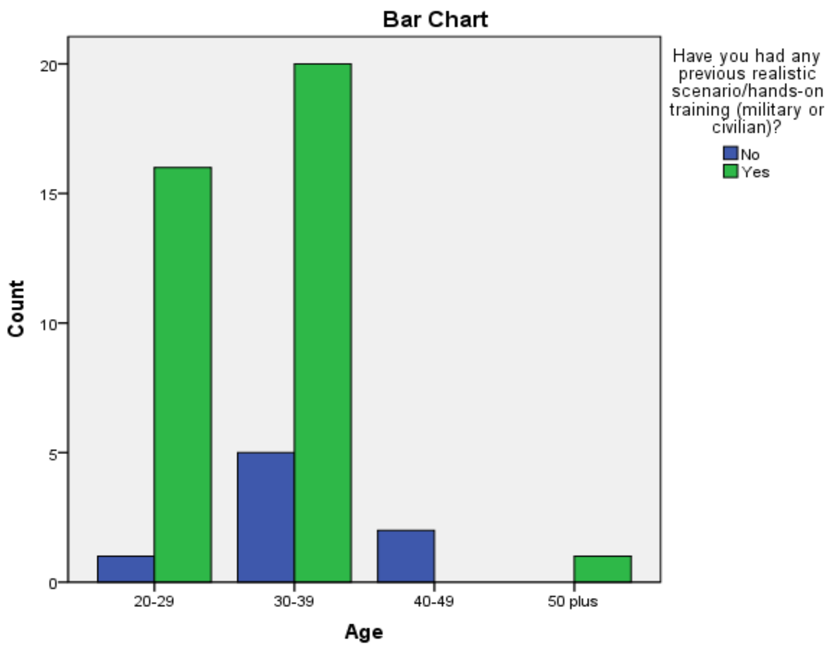


Figure C-6. Age vs Were any exercises you participated in realistic enough to simulate real life scenarios? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.371[a]	6	.627
Likelihood Ratio	5.149	6	.525
N of Valid Cases	45		

a. 9 cells (75.0%) have expected count less than 5. The minimum expected count is .04.

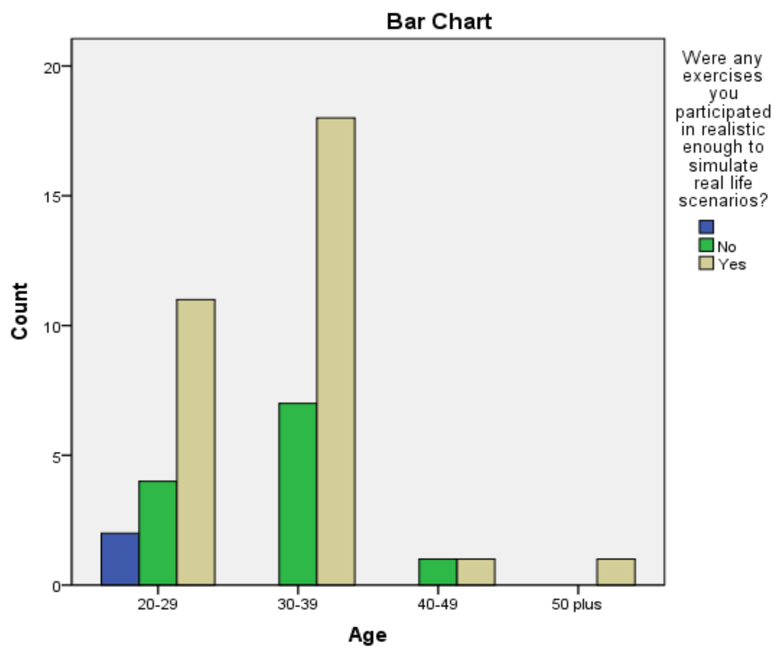


Figure C-7. Age vs Did you feel stressed at any point during the realistic scenario/hands-on exercise portion? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.936[a]	6	.063
Likelihood Ratio	13.396	6	.037
N of Valid Cases	45		

a. 9 cells (75.0%) have expected count less than 5. The minimum expected count is .02.

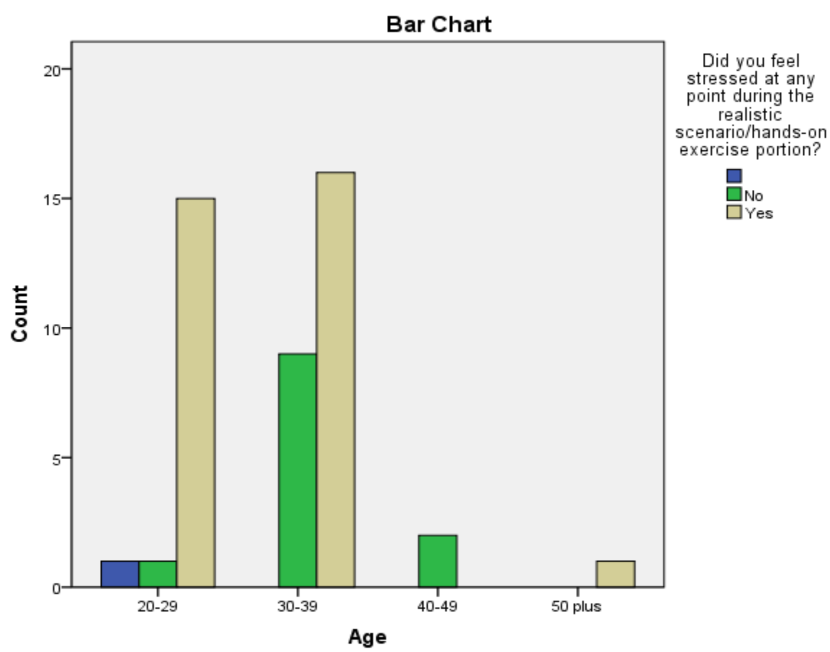


Figure C-8. Age vs Did you feel panic at any point during the realistic scenario/hands-on exercise portion? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.842[a]	6	.564
Likelihood Ratio	5.913	6	.433
N of Valid Cases	45		

a. 9 cells (75.0%) have expected count less than 5. The minimum expected count is .02.

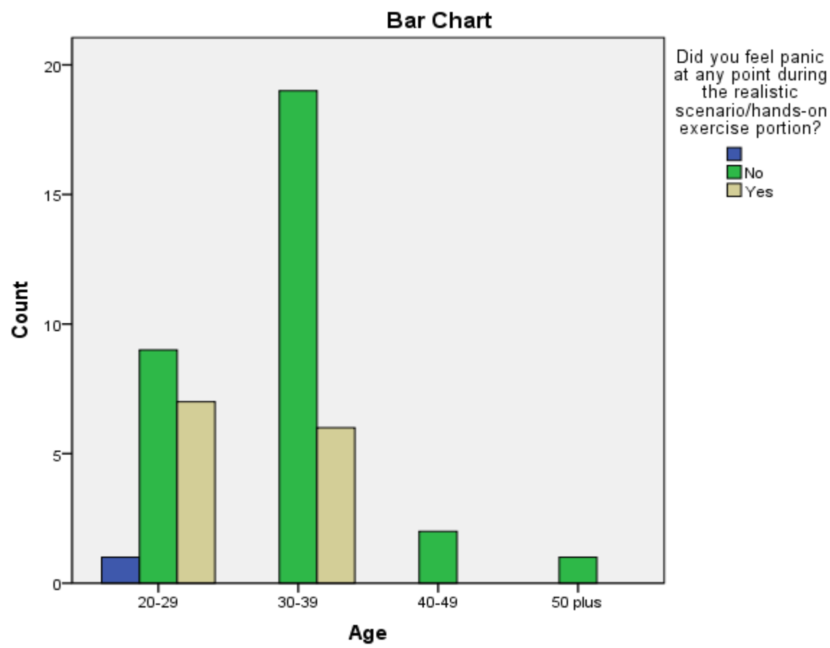


Figure C-9. Age vs If yes, do you feel that stress contributed to your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.398[a]	9	.401
Likelihood Ratio	11.251	9	.259
N of Valid Cases	45		

a. 13 cells (81.3%) have expected count less than 5. The minimum expected count is .02.

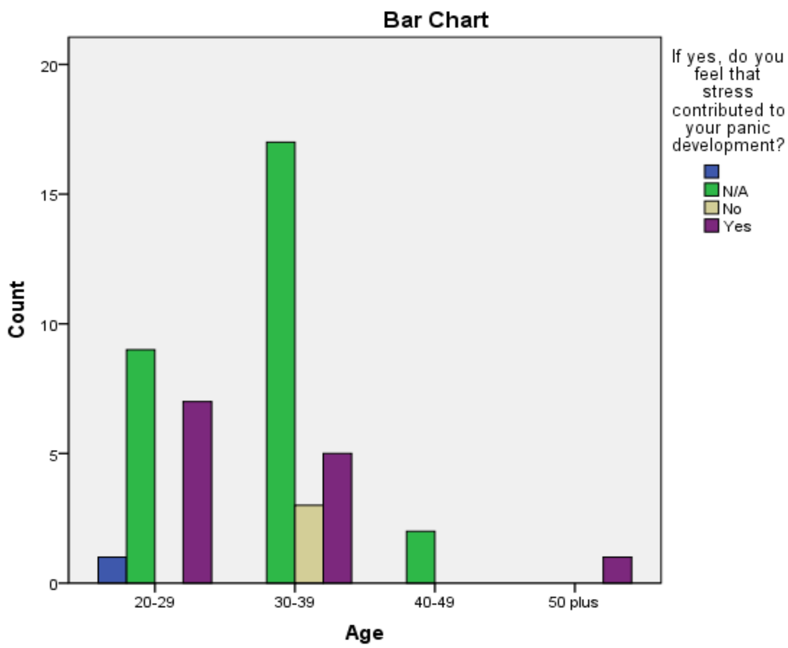


Figure C-10. Age vs If yes, do you feel realistic scenario/hands-on exercise portion played a key role in your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.829[a]	9	.071
Likelihood Ratio	12.503	9	.186
N of Valid Cases	45		

a. 12 cells (75.0%) have expected count less than 5. The minimum expected count is .04.

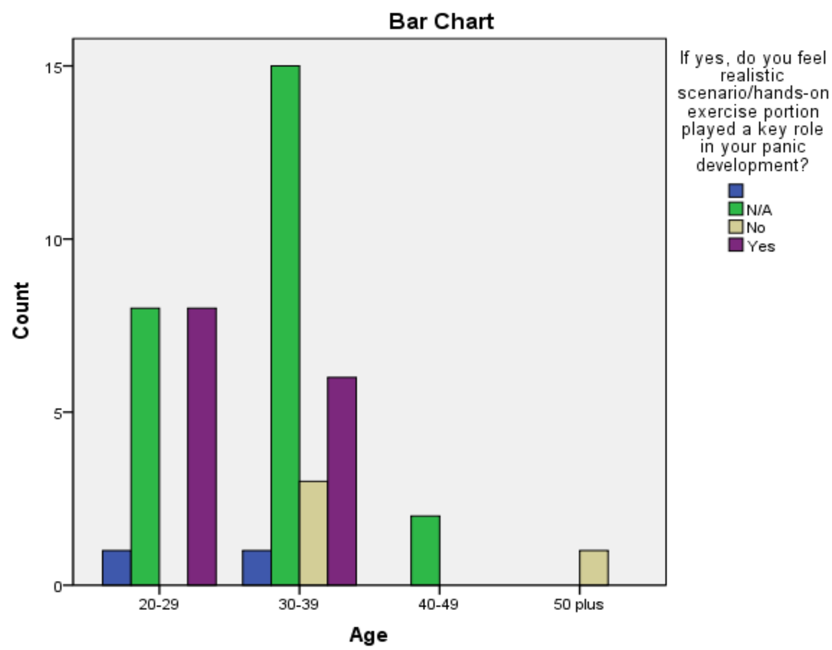


Figure C-11. Age vs Do you feel that realistic scenario/hands-on portion during the exercise made you aware of your panic development and control? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.035[a]	9	.211
Likelihood Ratio	13.530	9	.140
N of Valid Cases	45		

a. 13 cells (81.3%) have expected count less than 5. The minimum expected count is .02.

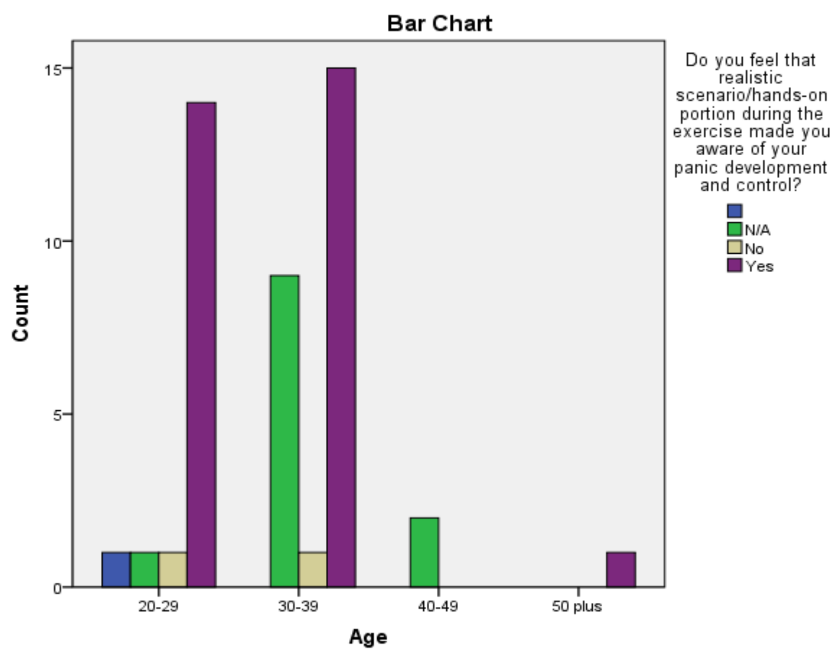


Figure C-12. Age vs Do you feel that realistic scenario/hands-on training will help you in future situations to control your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.103[a]	6	.085
Likelihood Ratio	13.413	6	.037
N of Valid Cases	45		

a. 10 cells (83.3%) have expected count less than 5. The minimum expected count is .13.

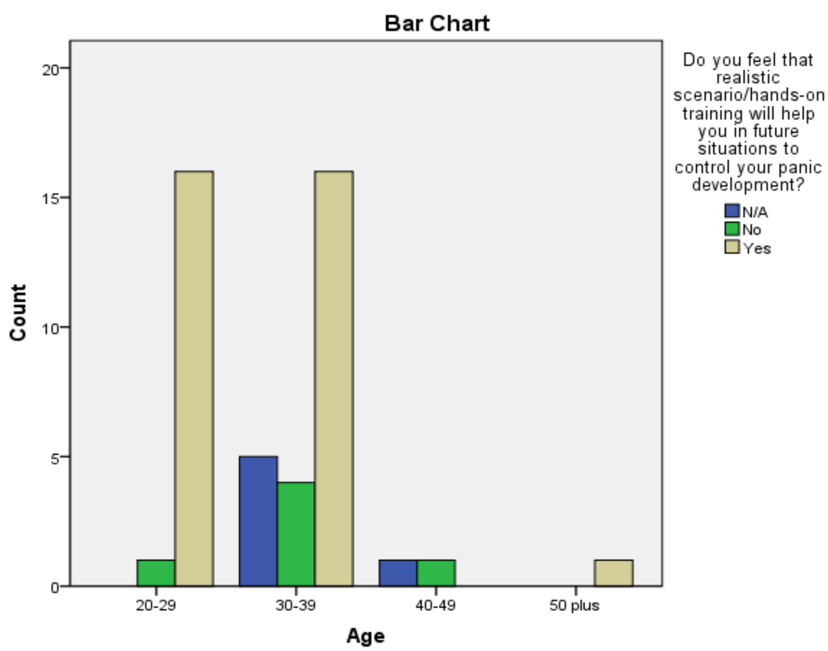


Figure C-13. Sex vs Do you know what panic is? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.150[a]	2	.928
Likelihood Ratio	.283	2	.868
N of Valid Cases	45		

a. 5 cells (83.3%) have expected count less than 5. The minimum expected count is .07.

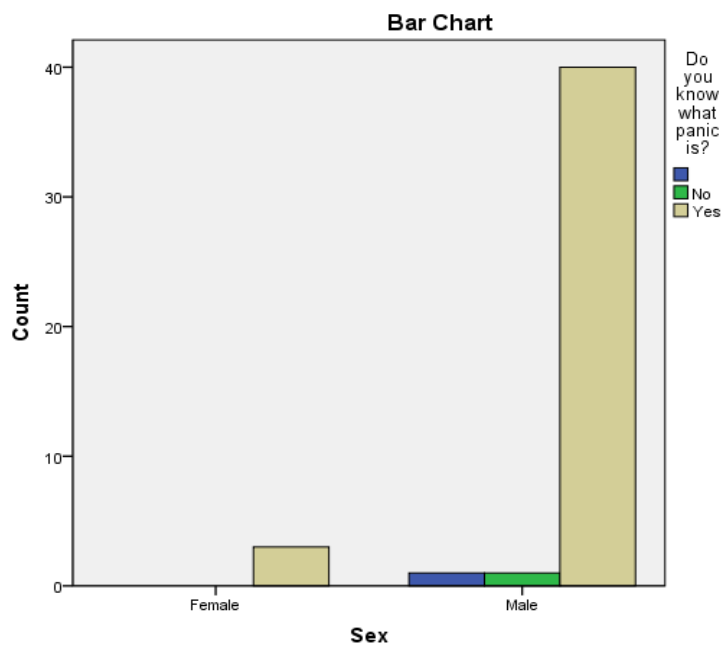


Figure C-14. Sex vs Have you ever panicked before? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.040[a]	1	.308		
Continuity Correction[b]	.105	1	.746		
Likelihood Ratio	1.750	1	.186		
Fisher's Exact Test				.565	.422
N of Valid Cases	45				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .73.

b. Computed only for a 2x2 table

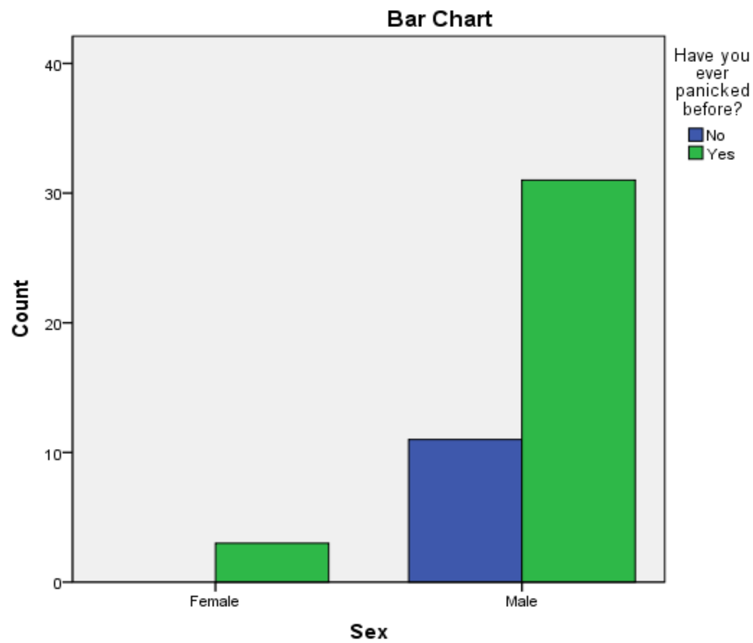


Figure C-15. Sex vs If yes, were you able to control your panic? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.918[a]	2	.632
Likelihood Ratio	1.568	2	.457
N of Valid Cases	45		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .13.

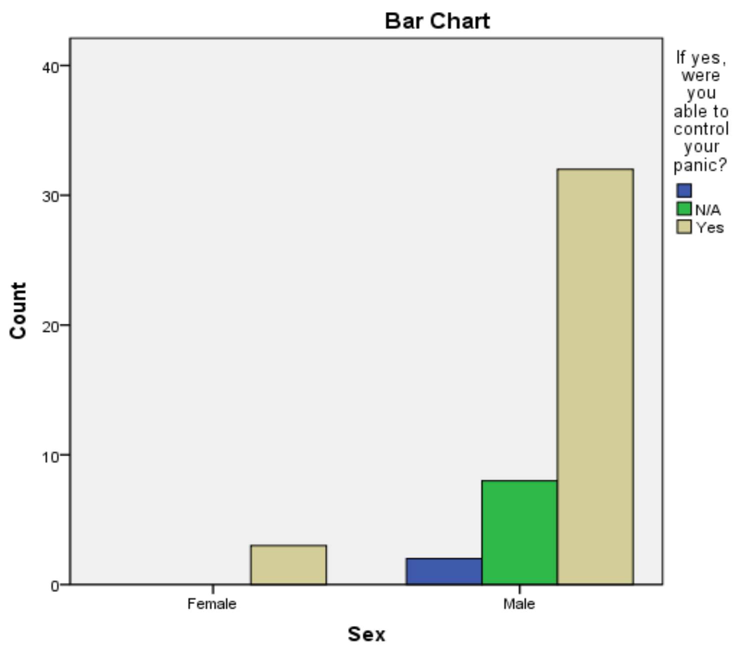


Figure C-16. Sex vs Have you had any previous realistic scenario/hands-on training (military or civilian)? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.695[a]	1	.404		
Continuity Correction[b]	.003	1	.958		
Likelihood Ratio	1.220	1	.269		
Fisher's Exact Test				1.000	.548
N of Valid Cases	45				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .53.

b. Computed only for a 2x2 table

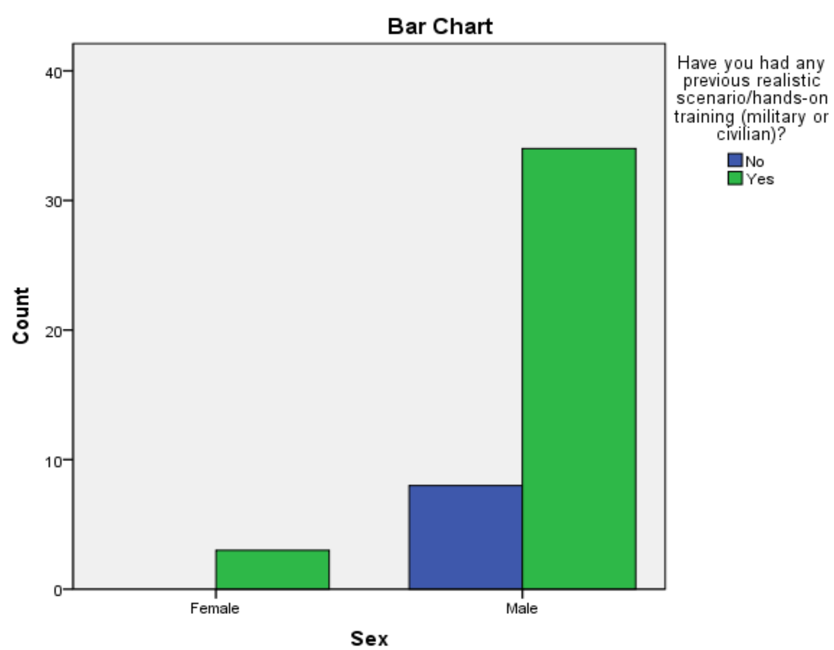


Figure C-17. Sex vs Were any exercises you participated in realistic enough to simulate real life scenario? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.452[a]	2	.484
Likelihood Ratio	2.332	2	.312
N of Valid Cases	45		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .13.

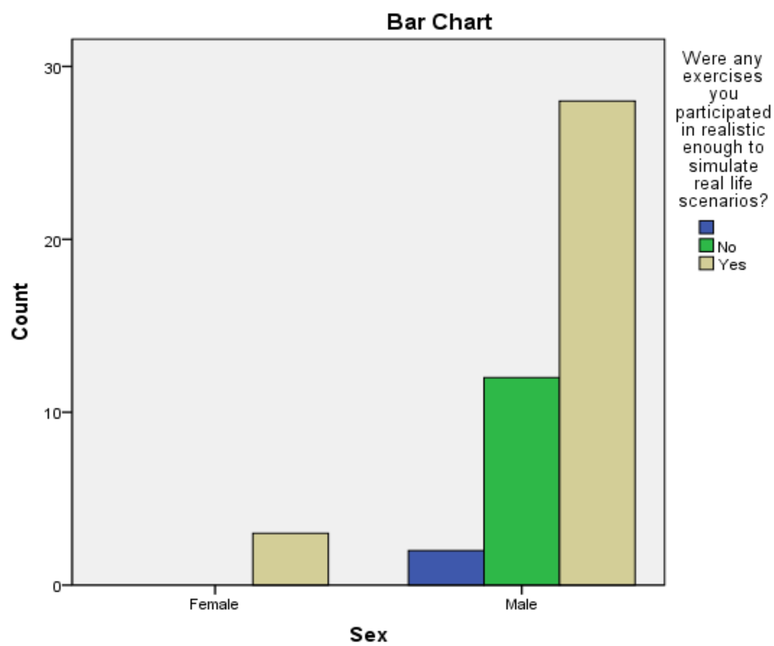


Figure C-18. Sex vs Did you feel stressed at any point during the realistic scenario/hands-on exercise portion? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.134[a]	2	.935
Likelihood Ratio	.197	2	.906
N of Valid Cases	45		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .07.

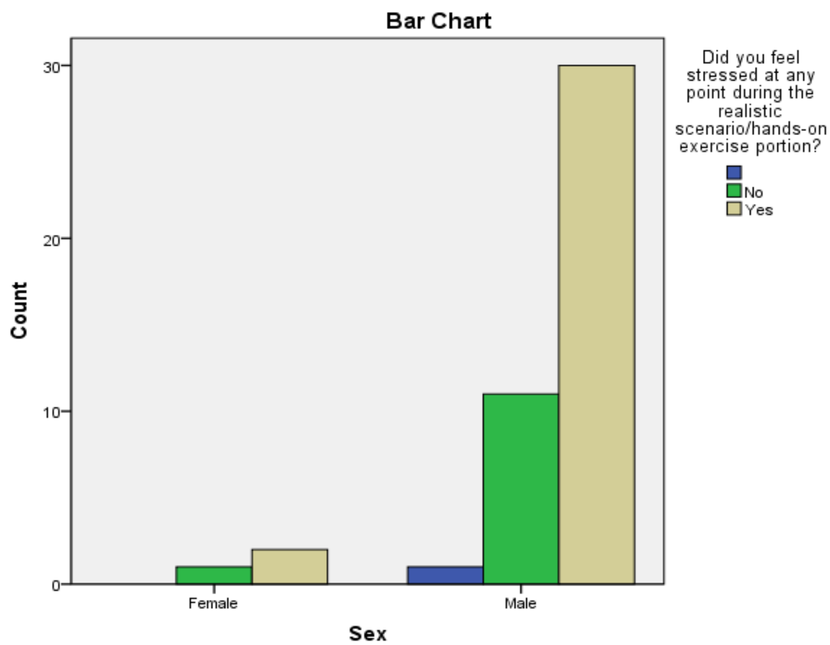


Figure C-19. Sex vs Did you feel panic at any point during the realistic scenario/hands-on exercise portion? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.249[a]	2	.325
Likelihood Ratio	2.046	2	.360
N of Valid Cases	45		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .07.

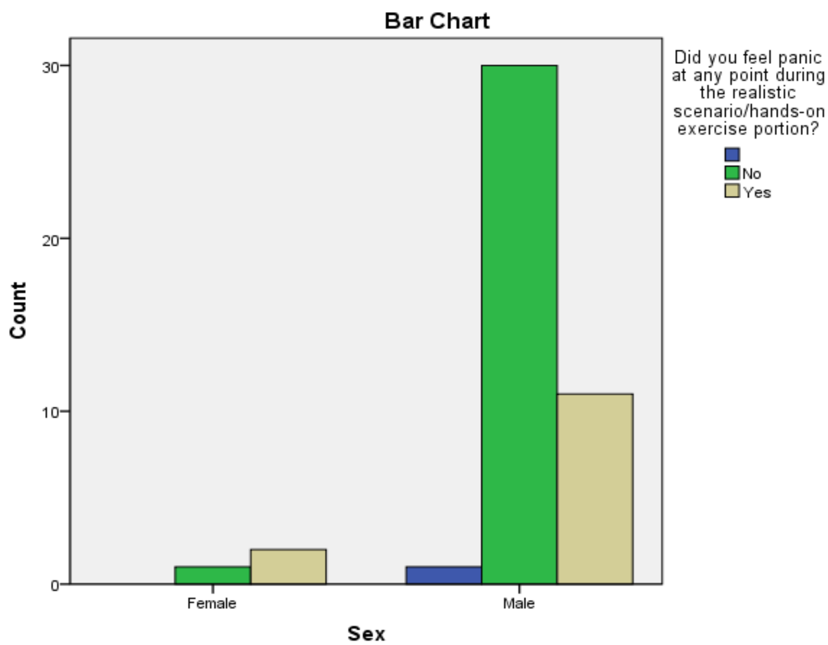


Figure C-20. Sex vs If yes, do you feel that stress contributed to your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.305[a]	3	.512
Likelihood Ratio	2.253	3	.522
N of Valid Cases	45		

a. 6 cells (75.0%) have expected count less than 5. The minimum expected count is .07.

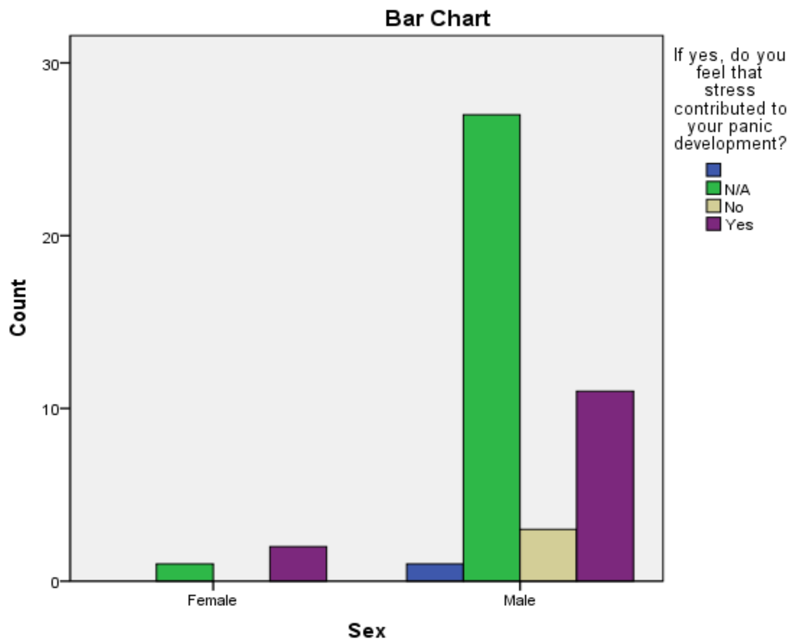


Figure C-21. Sex vs If yes, do you feel realistic scenario/hands-on exercise portion played a key role in your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.020[a]	3	.568
Likelihood Ratio	2.163	3	.539
N of Valid Cases	45		

a. 6 cells (75.0%) have expected count less than 5. The minimum expected count is .13.

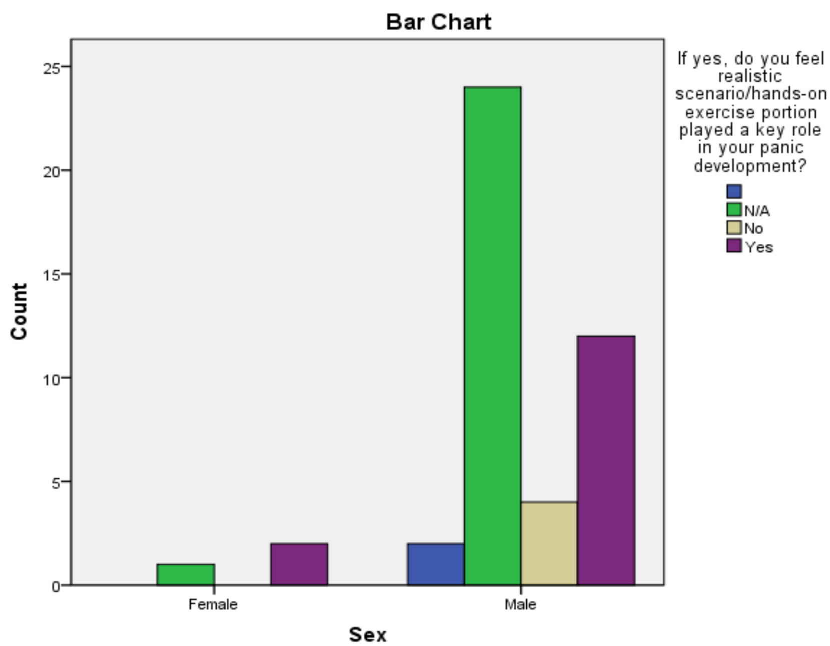


Figure C-22. Sex vs Do you feel that realistic scenario/hands-on portion during the exercise made you aware of your panic development and control? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.607[a]	3	.658
Likelihood Ratio	2.539	3	.468
N of Valid Cases	45		

a. 6 cells (75.0%) have expected count less than 5. The minimum expected count is .07.

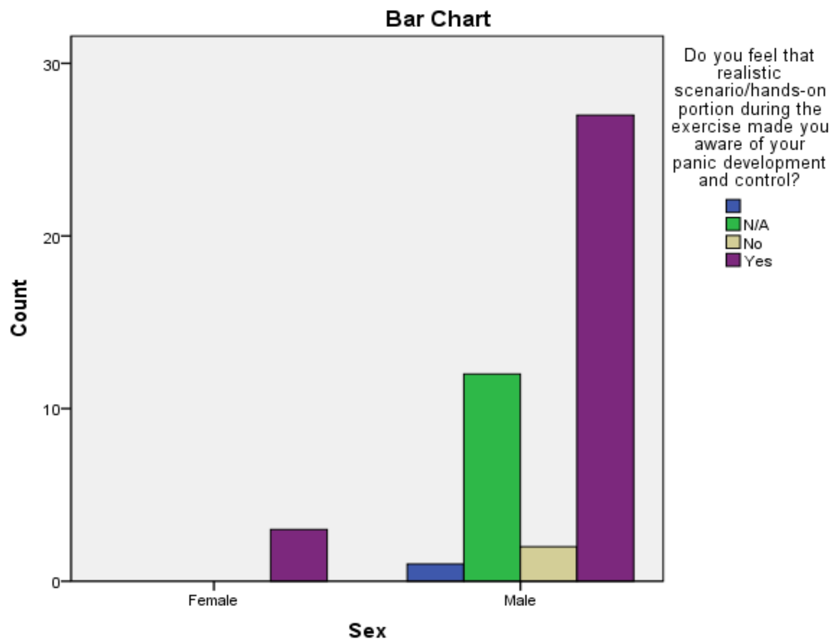
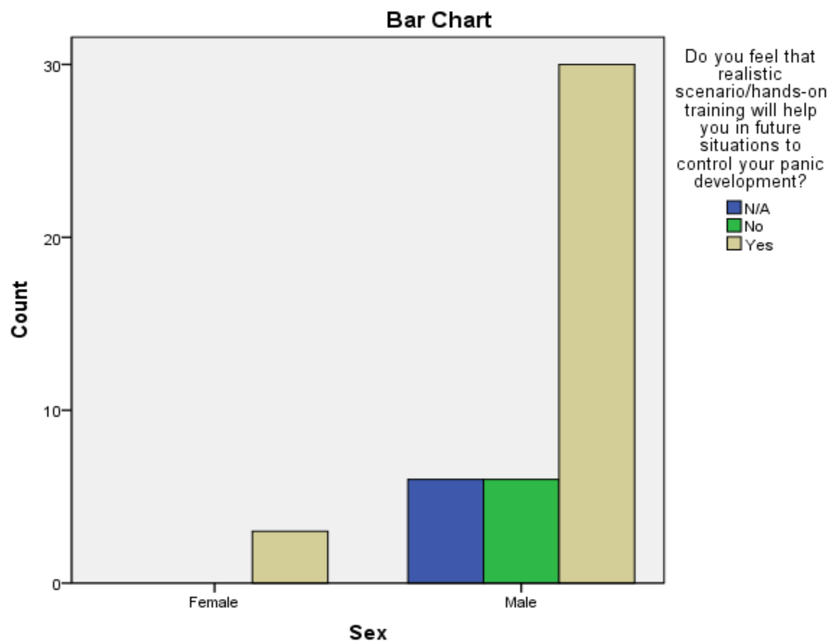


Figure C-23. Sex vs Do you feel that realistic scenario/hands-on training will help you in future situations to control your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.169[a]	2	.557
Likelihood Ratio	1.938	2	.380
N of Valid Cases	45		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is .40.



Realistic Training Scenarios

Figure C-24. Do you know what panic is? vs Have you ever panicked before? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.677[a]	2	.713
Likelihood Ratio	1.151	2	.562
N of Valid Cases	45		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .24.

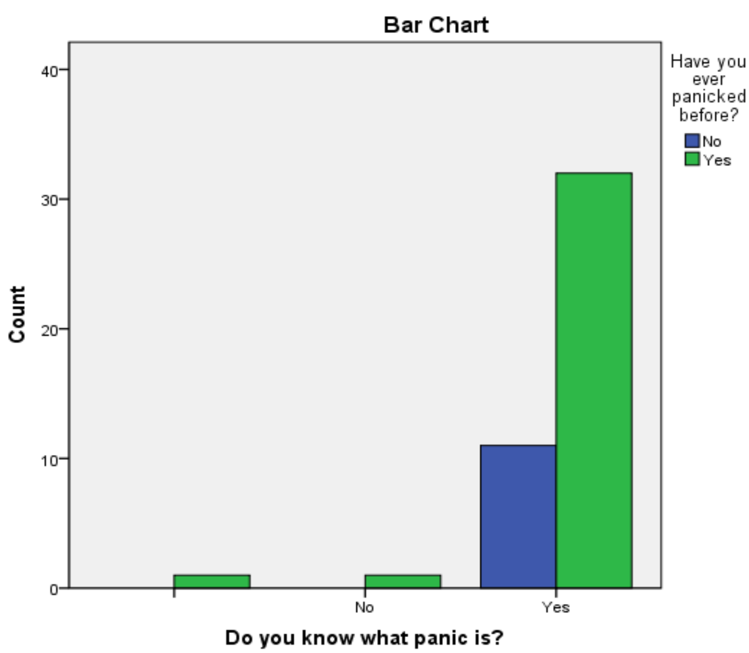


Figure C-25. Have you ever panicked before? vs If yes, were you able to control your panic? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	39.740[a]	2	.000
Likelihood Ratio	40.972	2	.000
N of Valid Cases	45		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is .49.

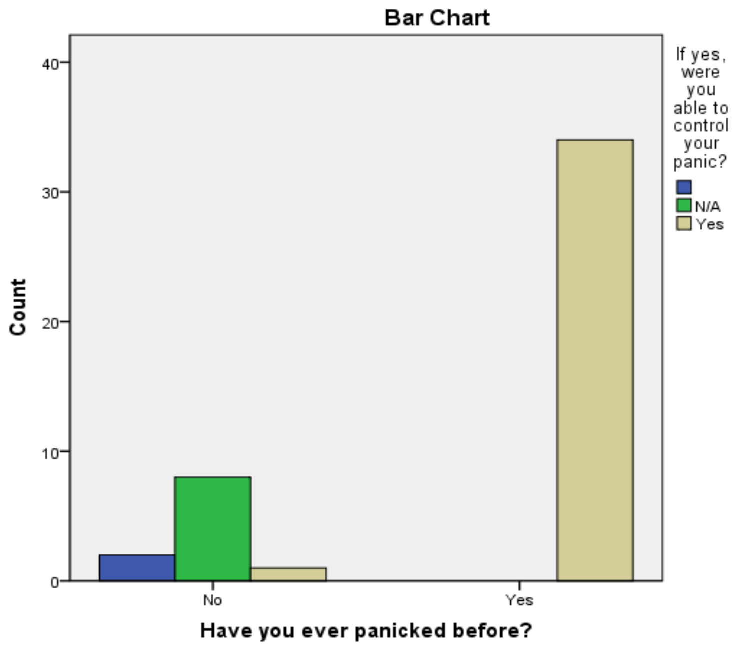


Figure C-26. Have you had any previous realistic scenario/hands-on training (military or civilian)? vs Were any exercises you participated in realistic enough to simulate real life scenarios? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.826[a]	2	.012
Likelihood Ratio	8.216	2	.016
N of Valid Cases	45		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is .36.

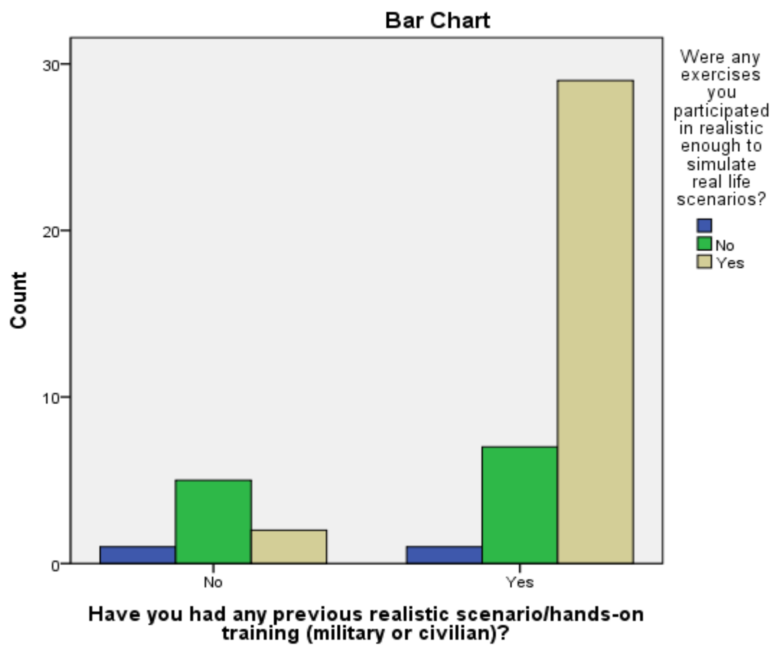


Figure C-27. Were any exercises you participated in realistic enough to simulate real life scenarios? vs Did you feel stressed at any point during the realistic scenario/hands-on exercise portion? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	35.083[a]	4	.000
Likelihood Ratio	19.264	4	.001
N of Valid Cases	45		

a. 6 cells (66.7%) have expected count less than 5. The minimum expected count is .04.

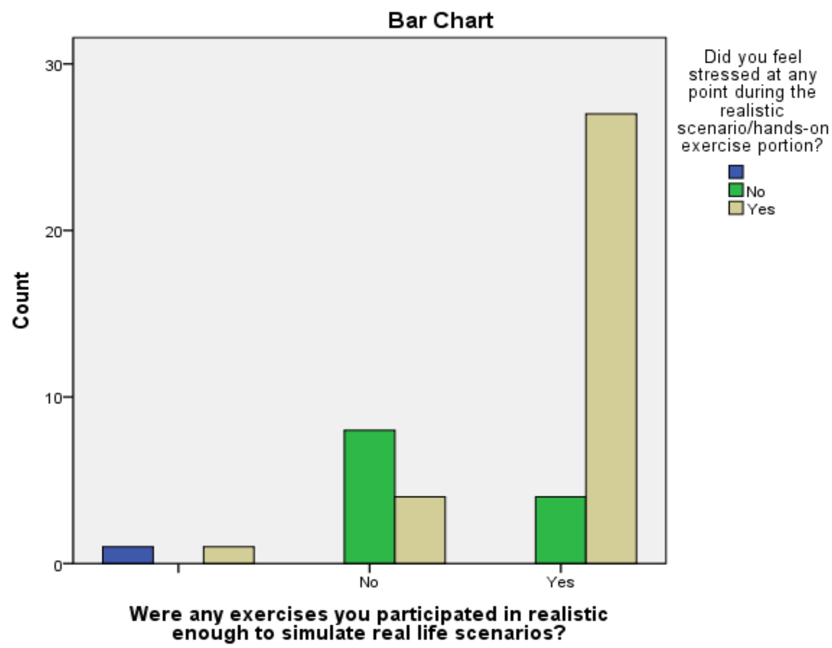


Figure C-28. Were any exercises you participated in realistic enough to simulate real life scenarios? vs Did you feel panic at any point during the realistic scenario/hands-on exercise portion? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	29.634[a]	4	.000
Likelihood Ratio	18.850	4	.001
N of Valid Cases	45		

a. 6 cells (66.7%) have expected count less than 5. The minimum expected count is .04.

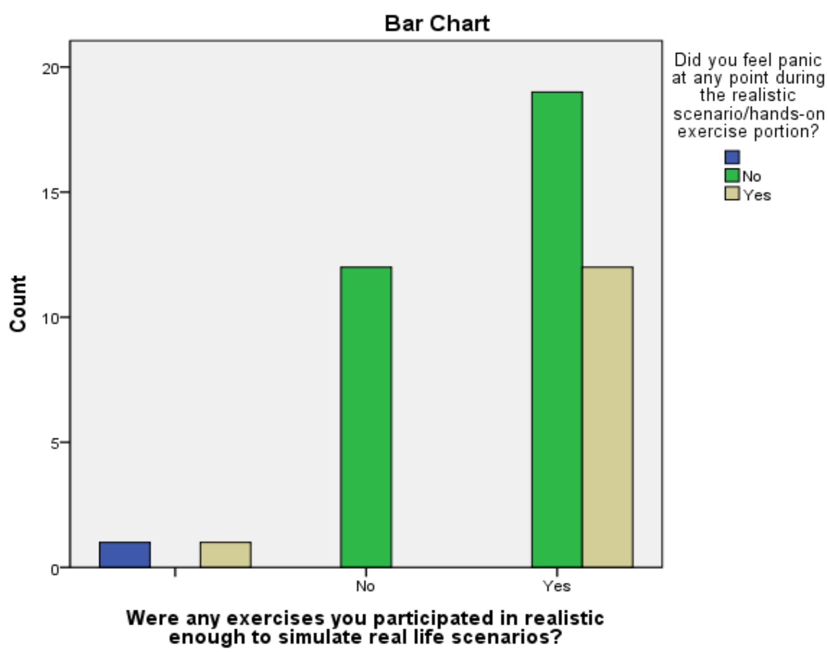


Figure C-29. Were any exercises you participated in realistic enough to simulate real life scenarios? vs If yes, do you feel that stress contributed to your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	29.684[a]	6	.000
Likelihood Ratio	18.892	6	.004
N of Valid Cases	45		

a. 9 cells (75.0%) have expected count less than 5. The minimum expected count is .04.

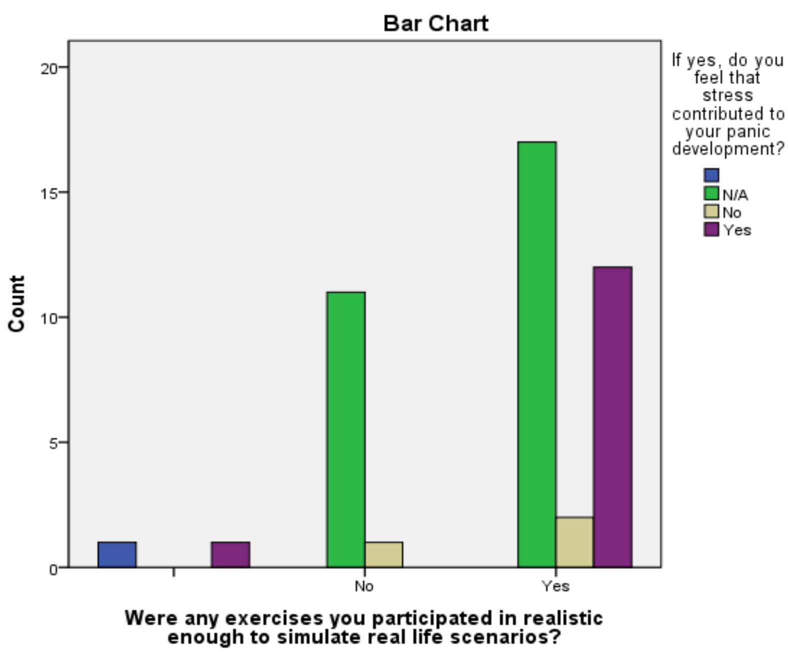


Figure C-30. Were any exercises you participated in realistic enough to simulate real life scenarios? vs If yes, do you feel realistic scenario/hands-on exercise portion played a key role in your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.998[a]	6	.014
Likelihood Ratio	12.038	6	.061
N of Valid Cases	45		

a. 9 cells (75.0%) have expected count less than 5. The minimum expected count is .09.

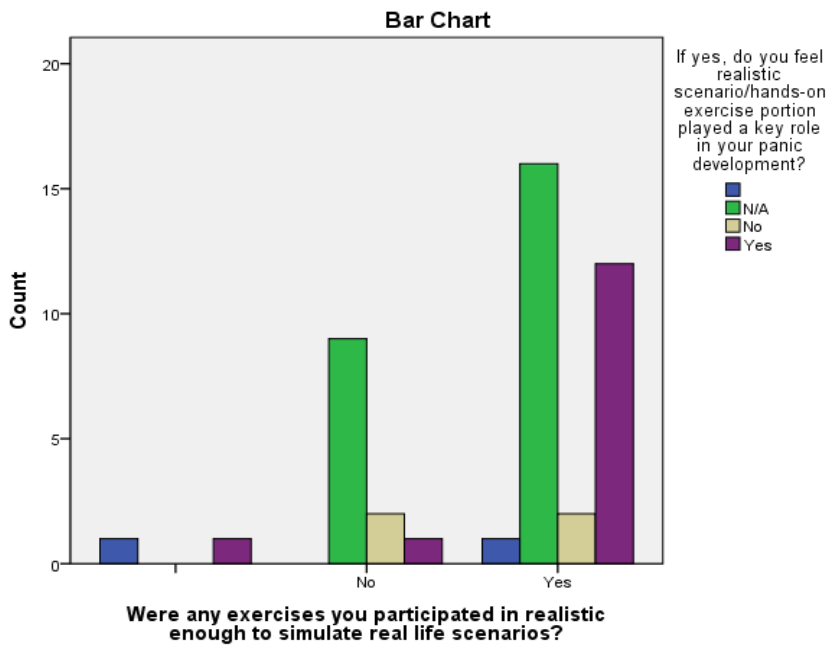


Figure C-31. Have you had any previous realistic scenario/hands-on training (military or civilian)? vs If yes, do you feel that stress contributed to your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.434[a]	3	.092
Likelihood Ratio	5.973	3	.113
N of Valid Cases	45		

a. 6 cells (75.0%) have expected count less than 5. The minimum expected count is .18.

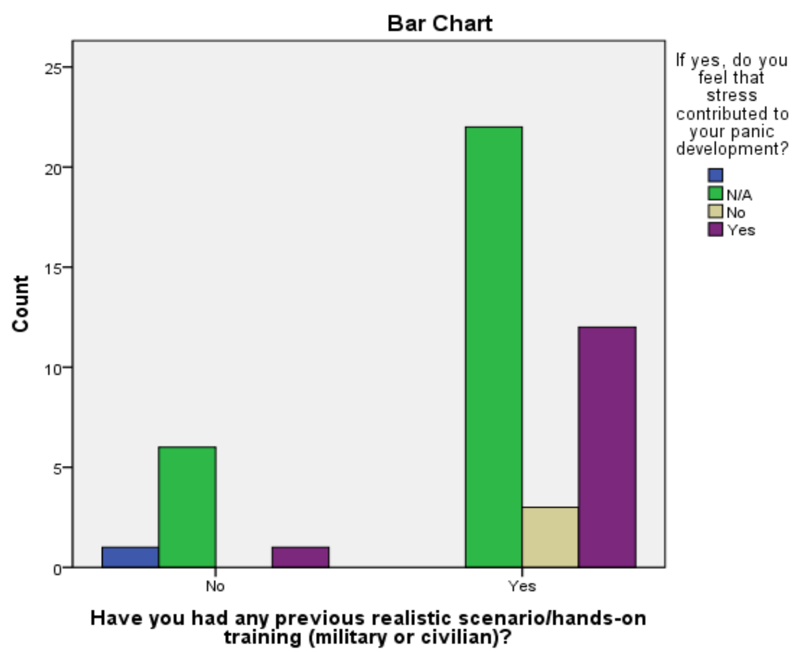
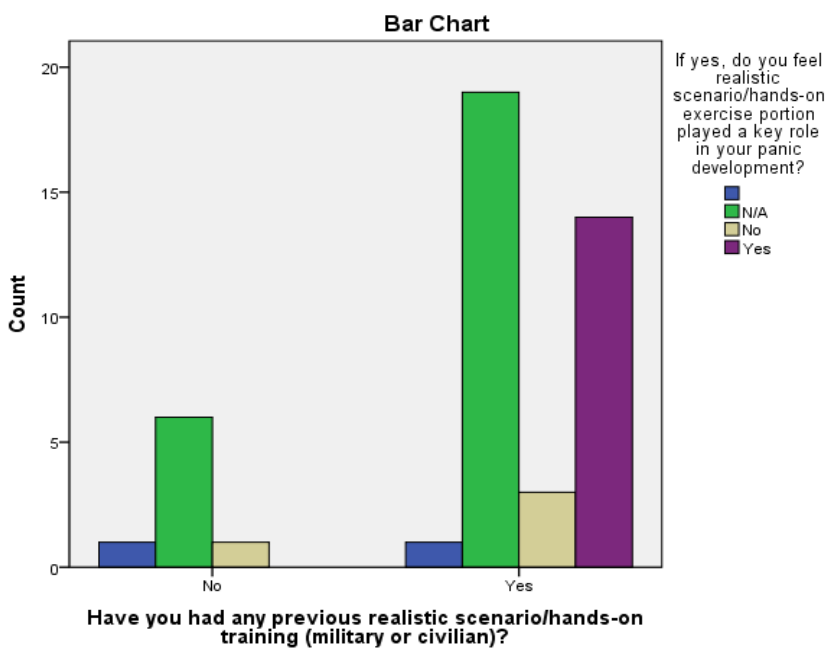


Figure C-32. Have you had any previous realistic scenario/hands-on training (military or civilian)? vs If yes, do you feel realistic scenario/hands-on exercise portion played a key role in your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.253[a]	3	.154
Likelihood Ratio	7.295	3	.063
N of Valid Cases	45		

a. 6 cells (75.0%) have expected count less than 5. The minimum expected count is .36.



Realistic Training Scenarios and Panic

Figure C-33. Do you know what panic is? vs Do you feel that realistic scenario/hands-on portion during the exercise made you aware of your panic development and control? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.279[a]	6	.773
Likelihood Ratio	3.484	6	.746
N of Valid Cases	45		

a. 10 cells (83.3%) have expected count less than 5. The minimum expected count is .02.

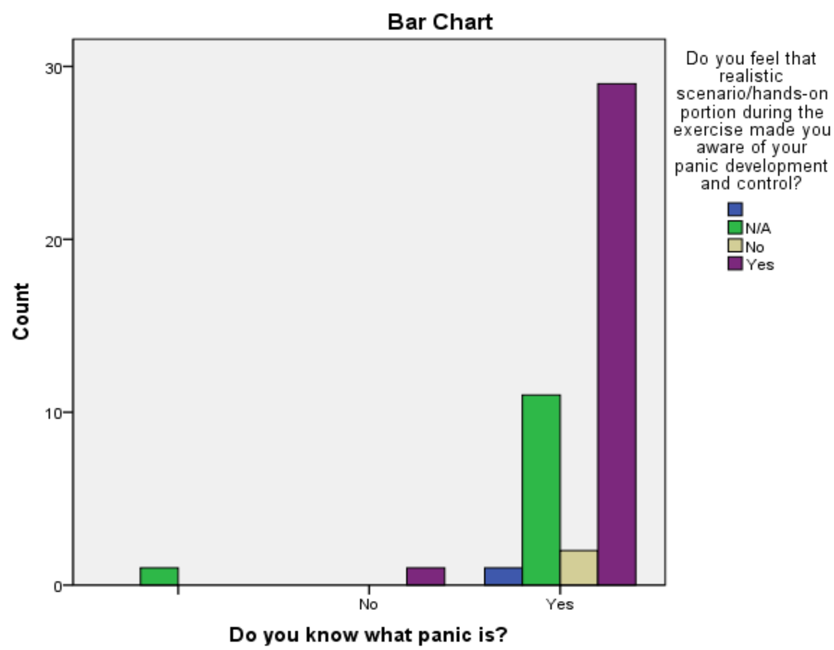


Figure C-34. Do you know what panic is? vs Do you feel that realistic scenario/hands-on training will help you in future situations to control your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.977[a]	4	.137
Likelihood Ratio	4.767	4	.312
N of Valid Cases	45		

a. 6 cells (66.7%) have expected count less than 5. The minimum expected count is .13.

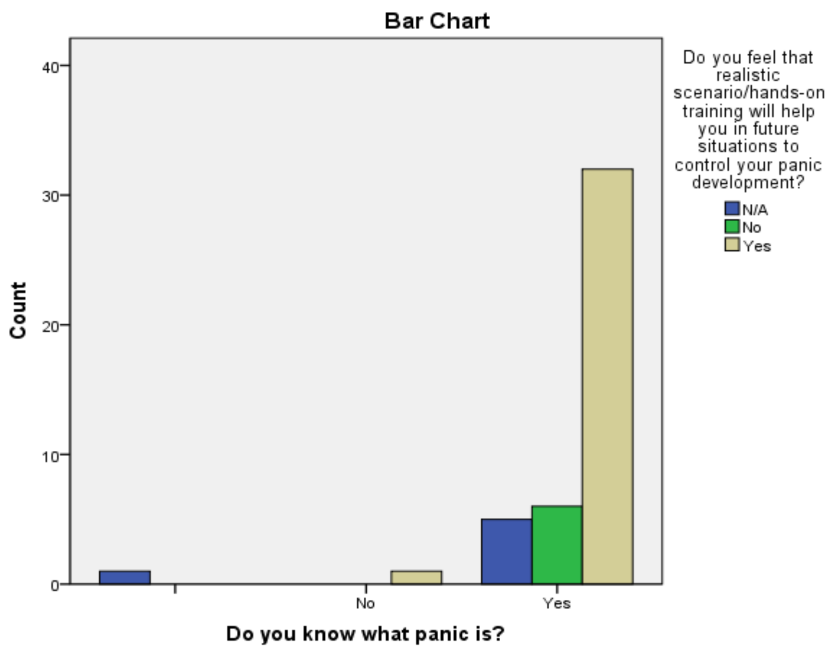


Figure C-35. Have you ever panicked before? vs Do you feel that realistic scenario/hands-on portion during the exercise made you aware of your panic development and control? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.572[a]	3	.206
Likelihood Ratio	4.753	3	.191
N of Valid Cases	45		

a. 5 cells (62.5%) have expected count less than 5. The minimum expected count is .24.

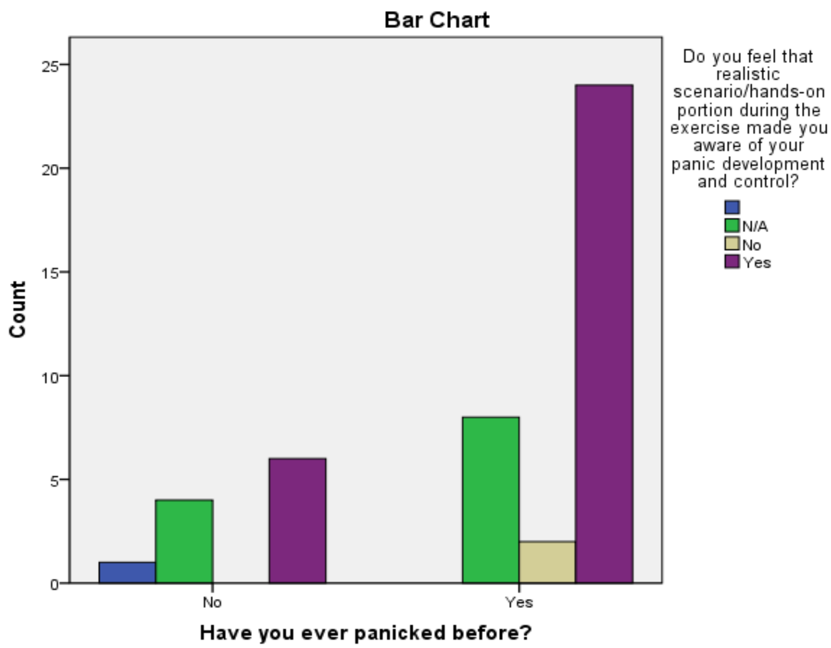


Figure C-36. Have you ever panicked before? vs Do you feel that realistic scenario/hands-on training will help you in future situations to control your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.919[a]	2	.019
Likelihood Ratio	8.310	2	.016
N of Valid Cases	45		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is 1.47.

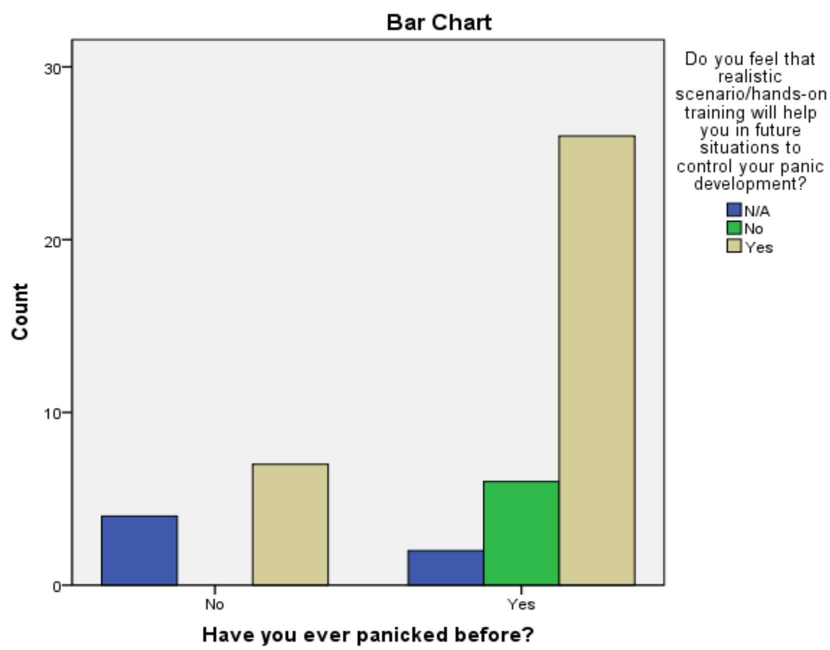


Figure C-37. If yes, were you able to control your panic? vs Do you feel that realistic scenario/hands-on portion during the exercise made you aware of your panic development and control? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.496[a]	6	.000
Likelihood Ratio	10.873	6	.092
N of Valid Cases	45		

a. 9 cells (75.0%) have expected count less than 5. The minimum expected count is .04.

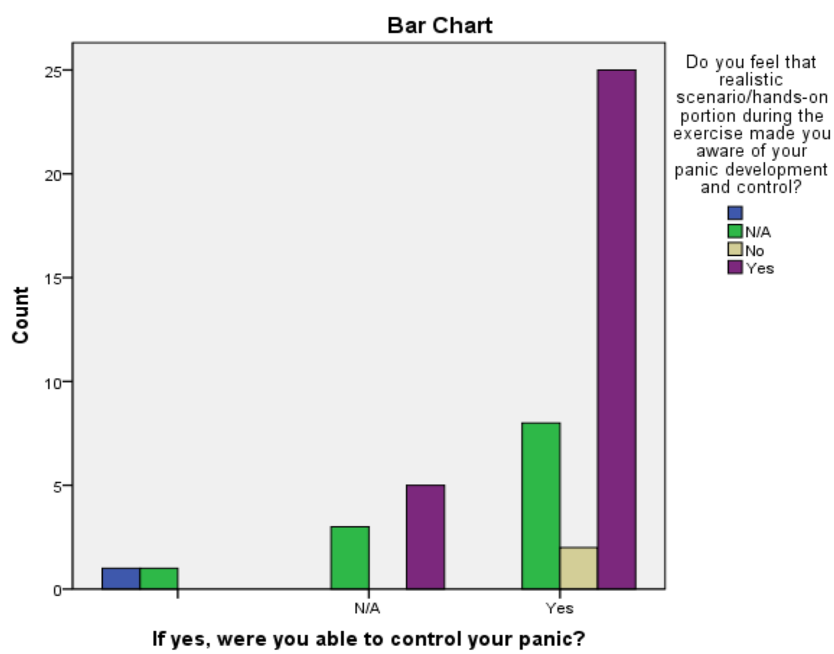
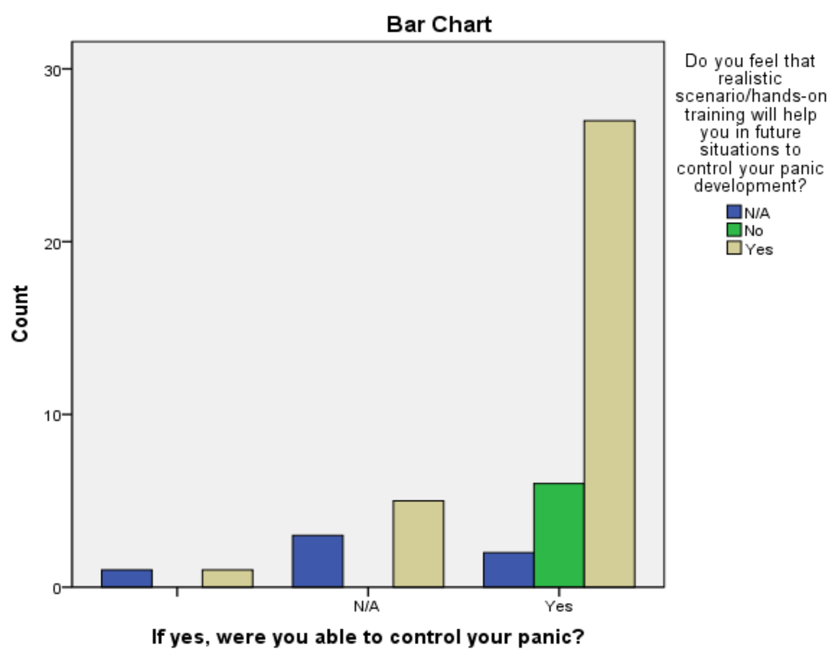


Figure C-38. If yes, were you able to control your panic? vs Do you feel that realistic scenario/hands-on training will help you in future situations to control your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.105[a]	4	.059
Likelihood Ratio	8.845	4	.065
N of Valid Cases	45		

a. 7 cells (77.8%) have expected count less than 5. The minimum expected count is .27.



Realistic Training Benefits

Figure C-39. Have you had any previous realistic scenario/hands-on training (military or civilian)? vs Do you feel that realistic scenario/hands-on portion during the exercise made you aware of your panic development and control? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.863[a]	3	.000
Likelihood Ratio	16.716	3	.001
N of Valid Cases	45		

a. 5 cells (62.5%) have expected count less than 5. The minimum expected count is .18.

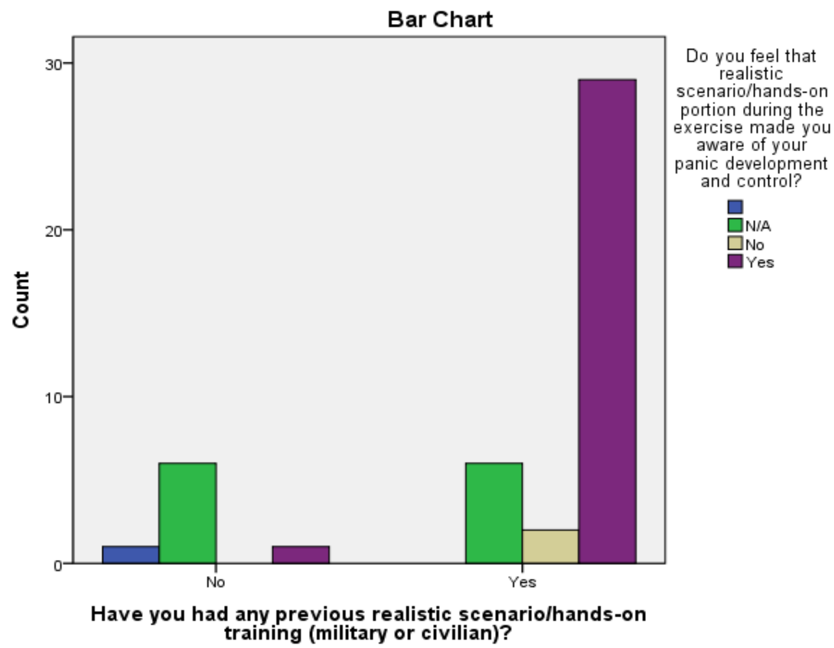


Figure C-40. Have you had any previous realistic scenario/hands-on training (military or civilian)? vs Do you feel that realistic scenario/hands-on training will help you in future situations to control your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.623[a]	2	.003
Likelihood Ratio	10.395	2	.006
N of Valid Cases	45		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is 1.07.

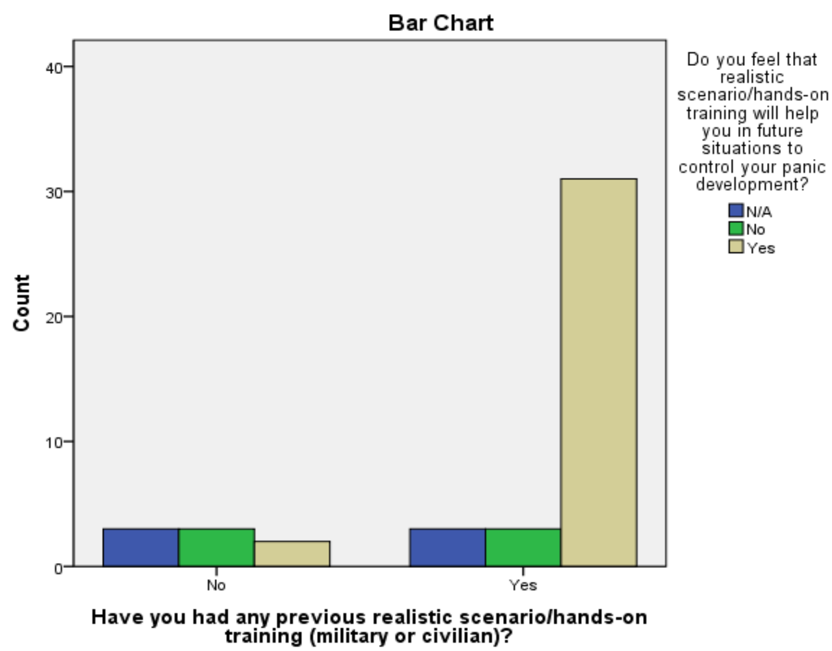


Figure C-41. Were any exercises you participated in realistic enough to simulate real life scenarios? vs Do you feel that realistic scenario/hands-on portion during the exercise made you aware of your panic development and control? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	43.460[a]	6	.000
Likelihood Ratio	28.682	6	.000
N of Valid Cases	45		

a. 9 cells (75.0%) have expected count less than 5. The minimum expected count is .04.

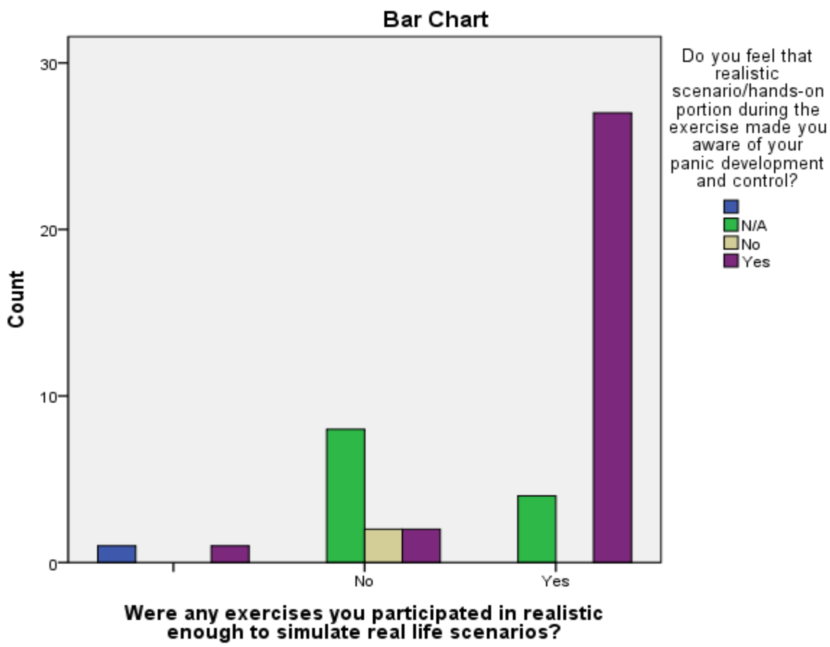


Figure C-42. Were any exercises you participated in realistic enough to simulate real life scenarios? vs Do you feel that realistic scenario/hands-on training will help you in future situations to control your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	23.539[a]	4	.000
Likelihood Ratio	24.163	4	.000
N of Valid Cases	45		

a. 7 cells (77.8%) have expected count less than 5. The minimum expected count is .27.

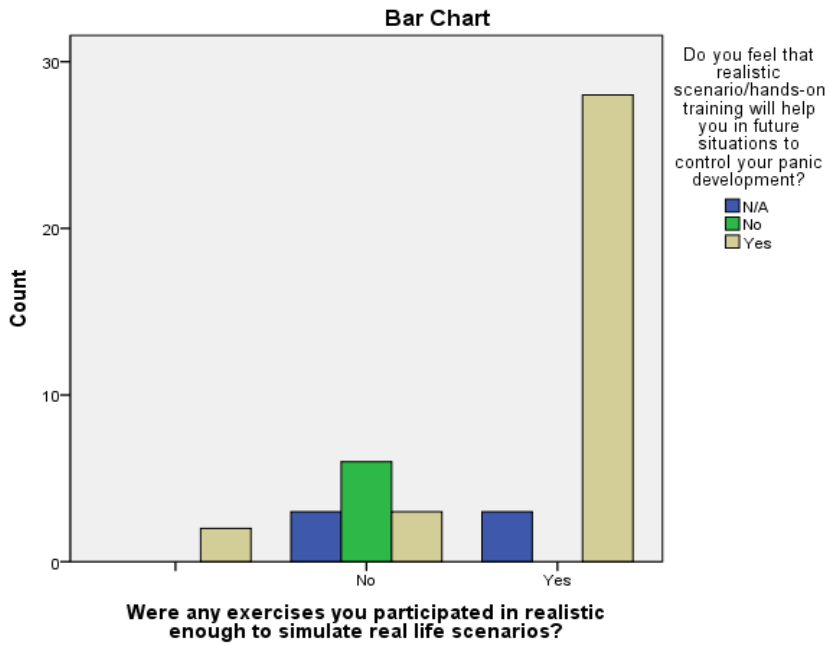


Figure C-43. Did you feel stressed at any point during the realistic scenario/hands-on exercise portion? vs Do you feel that realistic scenario/hands-on portion during the exercise made you aware of your panic development and control? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	66.195[a]	6	.000
Likelihood Ratio	30.190	6	.000
N of Valid Cases	45		

a. 9 cells (75.0%) have expected count less than 5. The minimum expected count is .02.

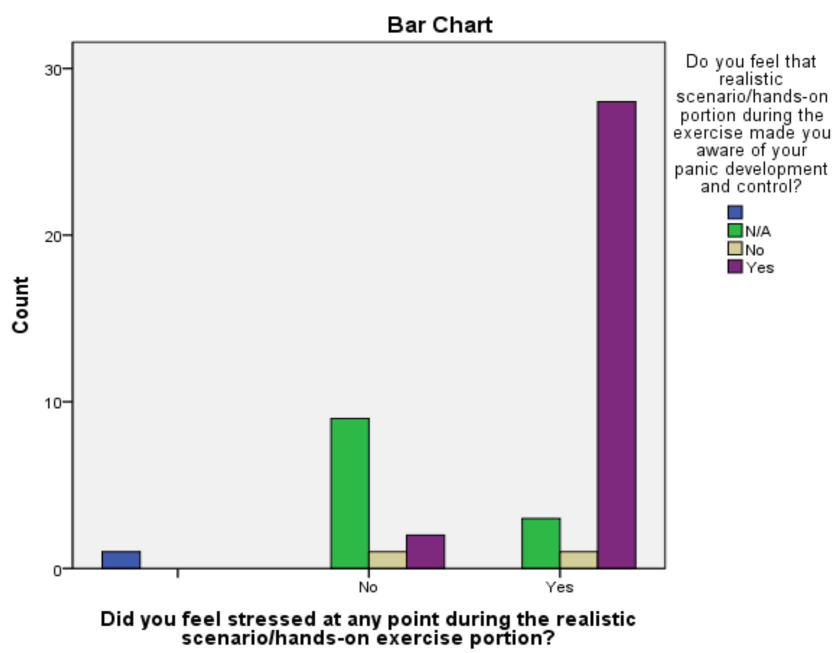


Figure C-44. Did you feel stressed at any point during the realistic scenario/hands-on exercise portion? vs Do you feel that realistic scenario/hands-on training will help you in future situations to control your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.021[a]	4	.000
Likelihood Ratio	19.235	4	.001
N of Valid Cases	45		

a. 7 cells (77.8%) have expected count less than 5. The minimum expected count is .13.

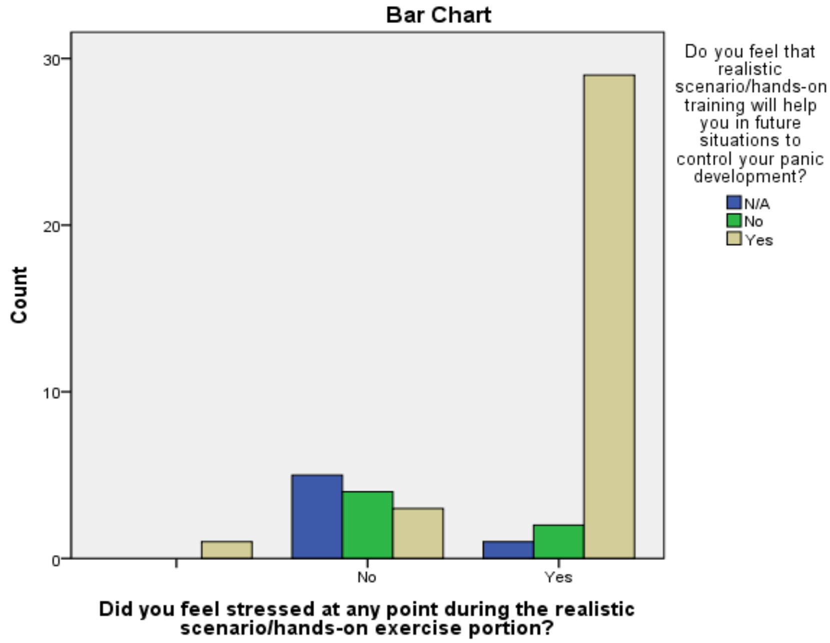


Figure C-45. Did you feel panic at any point during the realistic scenario/hands-on exercise portion? vs Do you feel that realistic scenario/hands-on portion during the exercise made you aware of your panic development and control? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	53.806[a]	6	.000
Likelihood Ratio	21.950	6	.001
N of Valid Cases	45		

a. 9 cells (75.0%) have expected count less than 5. The minimum expected count is .02.

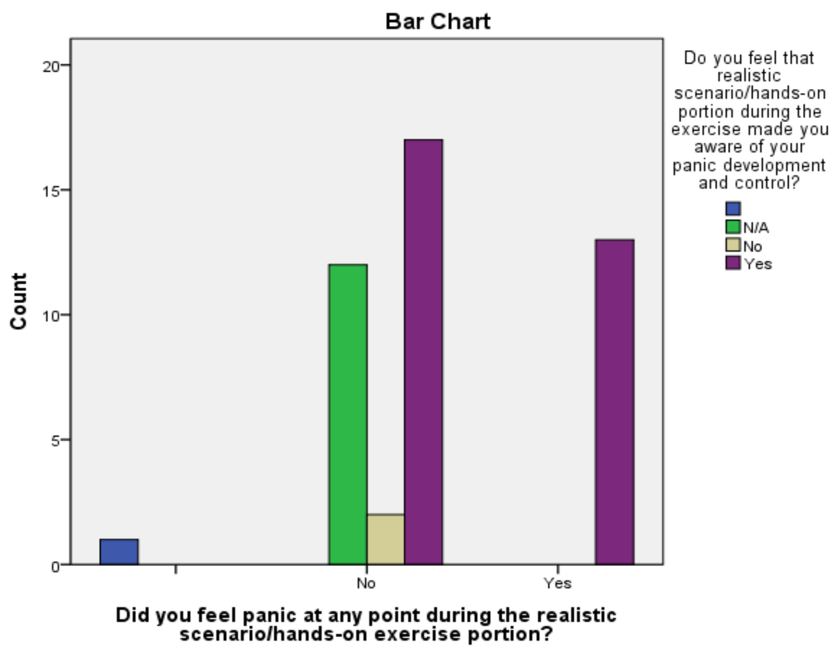


Figure C-46. Did you feel panic at any point during the realistic scenario/hands-on exercise portion? vs Do you feel that realistic scenario/hands-on training will help you in future situations to control your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.390[a]	4	.117
Likelihood Ratio	10.812	4	.029
N of Valid Cases	45		

a. 7 cells (77.8%) have expected count less than 5. The minimum expected count is .13.

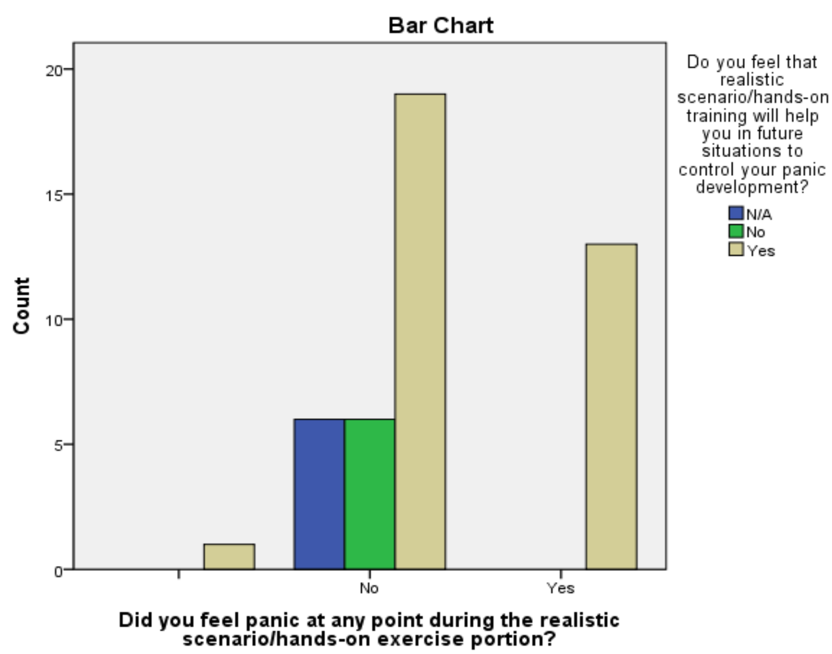


Figure C-47. If yes, do you feel that stress contributed to your panic development? vs Do you feel that realistic scenario/hands-on portion during the exercise made you aware of your panic development and control? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	61.143[a]	9	.000
Likelihood Ratio	26.574	9	.002
N of Valid Cases	45		

a. 13 cells (81.3%) have expected count less than 5. The minimum expected count is .02.

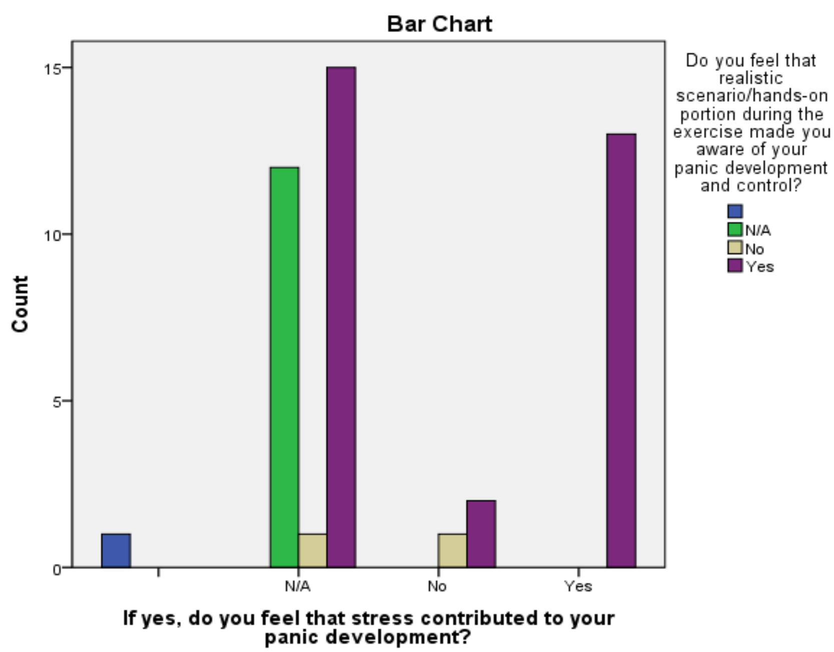


Figure C-48. If yes, do you feel that stress contributed to your panic development? vs Do you feel that realistic scenario/hands-on training will help you in future situations to control your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.823[a]	6	.184
Likelihood Ratio	12.330	6	.055
N of Valid Cases	45		

a. 10 cells (83.3%) have expected count less than 5. The minimum expected count is .13.

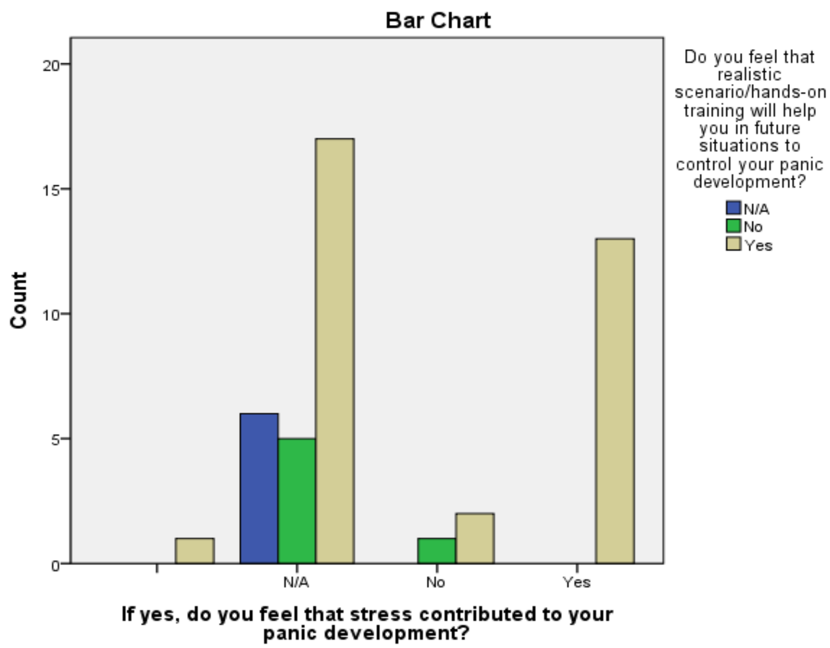


Figure C-49. If yes, do you feel realistic scenario/hands-on exercise portion played a key role in your panic development? vs Do you feel that realistic scenario/hands-on portion during the exercise made you aware of your panic development and control? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	36.503[a]	9	.000
Likelihood Ratio	23.526	9	.005
N of Valid Cases	45		

a. 13 cells (81.3%) have expected count less than 5. The minimum expected count is .04.

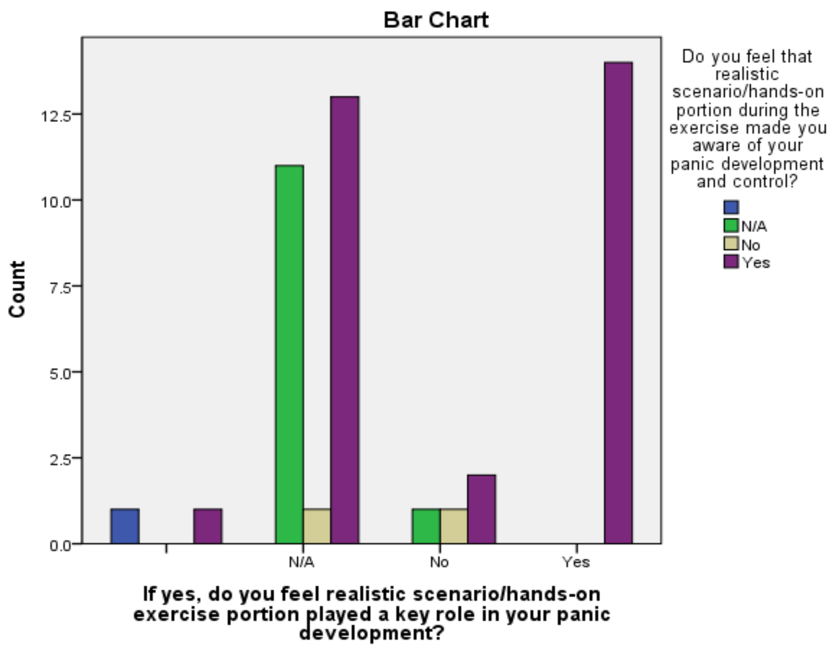
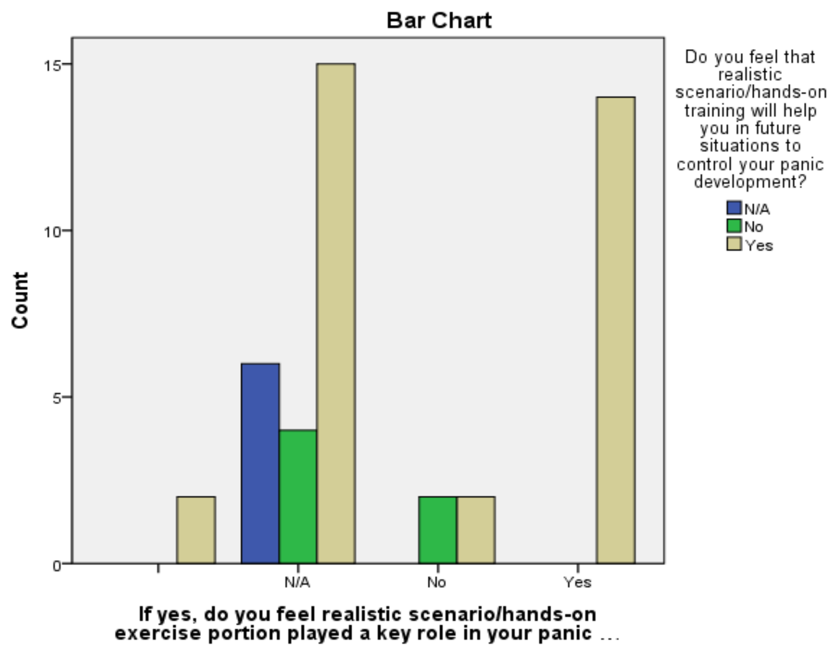


Figure C-50. If yes, do you feel realistic scenario/hands-on exercise portion played a key role in your panic development? vs Do you feel that realistic scenario/hands-on training will help you in future situations to control your panic development? Crosstabulation.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.555[a]	6	.035
Likelihood Ratio	16.172	6	.013
N of Valid Cases	45		

a. 10 cells (83.3%) have expected count less than 5. The minimum expected count is .27.



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