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The Effect of COBRA Training on First Responder Self-confidence to Work in a Toxic Chemical or Biological Agent Environment

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The Effect of COBRA Training on First Responder Self-confidence to Work in a Toxic Chemical or Biological Agent Environment

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By

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Abstract

First responders are our nation's front line defense against intentional or accidental releases of toxic chemical or biological agents. Self-confidence which is a building block of self-efficacy is hypothesized to be malleable and increased through training. The purpose of this study was to determine the change if any, which first responders undergo during Chemical, Ordnance, Biological, and Radiological (COBRA) training, in their self-confidence to operate in a toxic chemical or biological agent environment. That is to determine if there is a correlation between increased self-confidence and COBRA training. The methodology of this study was based on quantitative methods of analysis and surveys to collect data from students attending COBRA training at the Center for Domestic Preparedness (CDP), Aniston, Alabama. Collaboration with the CDP ensured the data collected was captured from every student attending COBRA training, thus creating a survey environment wherein there was a 95% plus survey completion rate. The data was collected through a pre and post-training survey, which provided the before and after groups for the study. Descriptive statistics were used to analyze the delta between the groups, and the interrater agreement. Hypothesis testing was through paired sample t-testing, ANOVA, and regression analysis. Analysis of the data collected from students was conducted using SPSS statistical sampling software and a spreadsheet. Confidence was set at 95% with a t-score of 1.984 or greater, and a total case sample of 184 participants. Case sampling is based on standard probability sampling for the entire population of paid first responders in the United States.

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CHAPTER 1 INTRODUCTION

Overview

The intentional use of toxic chemical or biological agents by one group of people against another has been ongoing in armed conflict for over two thousand years (Szinicz, 2005). In the early 1900's however, industrialization provided for large-scale production of toxic chemicals, those which could be weaponized and used as effective weapons of war became weapons of mass destruction (Szinicz, 2005). Unfortunately, weaponized toxic chemical and biological agents are no longer used only on the battlefield between opposing armies. Toxic chemical agents have in fact been used against civilians as recently as the conflict in Syria where both nerve agents and blister agents were used by both sides of the conflict (Pinheiro, AbuZayd, & Ponte, 2017). While the agents used in Syria were most likely, all government manufactured and stored chemical warfare agents, a toxic chemical or biological agent does not necessarily originate from a recognized government source.

Toxic chemical agents need not be released into the environment due to criminal activity, as toxic chemicals are used in many manufacturing processes, agricultural activities, and transported daily on our highways and railroads. Furthermore, many of the same toxic chemicals used in the attacks in Syria are used in a highly diluted form for insecticides, and an inadvertent spill or criminal use can result in the same types of injuries, (O'Malley, 1997) as those caused by purpose made warfare agents. A chilling example of an inadvertent release of toxic chemicals, would be the accidental release of 40 tons of methyl isocyanate from the Union Carbide chemical plant in 1984 in the city of Bhopal, India. Three-thousand people quickly died from exposure and thousands more died from complications (Broughton, 2005). Toxic chemicals are

not the only non-conventional threat we are faced with, as biological agents have been recorded as being used in warfare as far back as 600 BC (Szinicz, 2005).

Biological agents are truly terrifying when used as a weapon, and have been known to devastate entire populations or cause entire cities to flee (Szinicz, 2005). As recently as November 2017, a biological attack was carried out by an American citizen on fellow Americans, where an individual made ricin, and poisoned her neighbors ("Police: Retiree made ricin, tested it on Wake Robin neighbors," 2017). The fact that the individual collected the ingredients locally and manufactured the ricin in their kitchen, underscores the ease by which these toxic agents can be acquired.

Biological agents come in two different forms, one of which is the living form of disease such as plague or smallpox, and the other which is a formulated or manufactured compound like ricin (Szinicz, 2005). An example of a biological agent being used as a weapon would be the anthrax filled letters mailed to several people in 2001 in the United States (Szinicz, 2005). Although ricin is a fairly uncomplicated substance to produce, the production of diseases which can be packaged and maintained in a viable state requires an extensive scientific support capability, as the Japanese discovered before and during World War II (Szinicz, 2005).

The thought of a weaponized disease getting loose into the general population is unacceptable, however that is exactly what the Aum Shinrikyo sect tried to do between 1990 - 1995 (Szinicz, 2005). After World War II, experimentation in the United States continued with chemical and biological agents until the 1960's, when President Nixon shut down biological weapons development research and focused biological weapons research to defensive uses only (Tucker & Mahan, 2009). President Nixon's decision to shut down biological warfare agent development and stockpiling had no impact on chemical weapons development and stockpiling

(Tucker & Mahan, 2009).

Chemical weapons production in the United States continued until 1990, when President George H. W. Bush pushed to have all chemical weapons manufacturing stopped and all stockpiles destroyed. This action ensured that the United States would be in compliance with the implementation of the Chemical Weapons Convention of 1993, which was ratified by congress in 1997 (Tucker & Mahan, 2009). The preemptive push by then President Bush, allowed the U.S. Army to prepare and plan for the beginning of the end of chemical weapons use by the United States.

The destruction of all our country's chemical weapons though was not a light undertaking. It was estimated by the Centers for Disease Control and Prevention that the United States had 31,500 tons of chemical warfare agents, stockpiled at eight different sites in the United States and one territory (CDC, 2016). The U.S. Army, which has the responsibility for the destruction of these stockpiled chemical agents, chose to destroy them in place, rather than transport them to a central site for disposal (Hinton, 1997). I refer to these sites and the chemical weapons in the past and present tense because the disposal of the United States stockpiled chemical weapons is still an ongoing process, with the last of the chemical weapons to hopefully be destroyed in 2023 (PEO, 2018). One of these sites was the former U.S. Army base, Fort McClellan, located near Anniston, Alabama.

Fort McClellan was also the location of the U.S. Army Chemical School, Chemical Decontamination Training Facility (CDTF). The CDTF began operations in March of 1987, training soldiers in the tactics, techniques, and practices (TTP's) necessary to detect and identify chemical warfare agents. Training in the methods for neutralization or destruction of chemical and biological agents, as well as methods for decontamination of people or equipment affected

by chemical or biological agents was also taught at the CDTF (Healy, Coughlin, Smith, Kierzewski, & Smith, 1992). This facility was used to train members of the U.S. Army Chemical Corps, members of the other U.S. armed services and even other nations chemical corps personnel (Healy et al., 1992).

Training by the U.S. Army continued at Fort McClellan until June of 1998, when the Fort McClellan Army Chemical School was renamed, the Center for Domestic Preparedness, and the U.S. Department of Justice began to train our nation's civilian first responders (*Training first responders into the next century*, 1999). The U.S. Army Chemical School course was revamped and became the Advanced Operations Course, and in May of 1999 was renamed the Chemical Ordnance Biological Radiological (COBRA) course. Renaming the course, underscored it's unique nature of being the only course to instruct civilian first responders to work in an actual toxic chemical, biological, or radiological environment (Arledge, 2013).

A first responder is defined as (Blanchard, 2007, pp. 116-117):

> ***First Responder:*** *"The term "first responder" refers to those individuals who in the early stages of an incident are responsible for the protection and preservation of life, property, evidence, and the environment, including emergency response providers as defined in section 2 of the Homeland Security Act of 2002 (6 U.S.C. 101), as well as emergency management, public health, clinical care, public works, and other skilled support personnel (such as equipment operators) that provide immediate support services during prevention, response, and recovery operations." (**White House**, HSPD 8 National Preparedness, December 17, 2003)*

Of the nine definitions of first responder as annotated in the dictionary by (Blanchard, 2007), the above definition most closely fits the requirements of a first responder, and the possible positions and the requirements that they may face with respect to a toxic chemical or biological agent release. The CDP is mandated by congress to provide training for America's first responders,

(*Training first responders into the next century*, 1999) in part, due to the permissive environment of chemical and biological weapons proliferation (Szinicz, 2005). The CDP provides training in more than just chemical and biological response. Training for hospital incident command, instructor training, radiological response, pandemic planning and response, and many other courses, (FEMA, 2018a) are provided free of charge to our nation's first responders. Furthermore, the CDP COBRA Training Facility (COBRATF) exists to instruct first responders in those actions or tasks they must undertake while working in a toxic chemical or biological agent environment (FEMA, 2018c).

Statement of the Problem

The recent use of chemical and biological agents as weapons of mass destruction, have underscored the need for first responders to be able to confidently respond to an incident involving toxic chemical or biological agents (Skryabina, Reedy, Amlôt, Jaye, & Riley, 2017) (DHHS, 2017). Confidence is termed an emotive feeling, of the ability of self, to perform a specific task or action otherwise known as, the Feeling of Knowing (FOK) paradigm (Stankov, Lee, Luo, & Hogan, 2012) (Pajares & Miller, 1994). The self-confidence of first responders has a direct impact on the preparedness of our nation. First responders are this nation's first line of defense against a criminal, accidental, or natural hazards caused release of toxic chemical or biological agents (FEMA, 2018c).

Understanding whether COBRA training increases a first responder's self-confidence, is critical to knowing that our nation's first responders have the confidence, to respond to and operate in a toxic chemical or biological agent environment. Unfortunately, there is no conclusive evidence of this effect as it pertains to civilian first responders, and it is recommended

that this recognizable gap in knowledge be addressed.

Self-confidence has been conclusively shown in well-structured research studies, to increase for military personnel who attended the U.S. Army Chemical School's, CDTF courses before 1998 (Healy et al., 1992) (Stokes & Banderet, 1989). However only one pilot study has attempted to demonstrate this same effect as applied to civilian first responders (Fenn, 2015). Without knowing that civilian first responders have increased their self-confidence due to COBRA training, the efficacy of the COBRA training program, could be held in doubt. Determining if a civilian first responder's self-confidence increases as a result of attending COBRA training, may be critical to determining if the COBRA training program is performing to its full potential.

Purpose of the Study

Studies have been conducted in the past, as it relates to self-confidence and performance by the U.S. Army Chemical School. The CDTF located at Fort McClellan, Alabama, was the physical location of these studies, as the U.S. Army Chemical School was based there (Tyler, Manning, & Oleshansky, 1989) (Healy et al., 1992) (Fatkin & Hudgens, 1994). The CDTF, was the only location where toxic chemical agents were used in training those members of the armed services, who were tasked to deal with weaponized toxic chemical agents. The studies were indicative of increased self-confidence as a result of the training, and were used to validate the need to continue using the CDTF to train members of the armed services to perform chemical decontamination (Healy et al., 1992). The reasoning behind using actual toxic chemical agents to train with, was that the U.S. Army felt training with toxic chemical agents provided a more lifelike training environment for the service members (Healy et al., 1992). This more realistic

training environment was felt to increase soldier self-confidence more effectively than simulants would.

In 1998 the CDTF was absorbed by the Department of Justice (DOJ) and became part of the CDP (FEMA, 2018c). The CDP then opened its doors to the nation's civilian first responders, providing first responder courses at little or no expense to any first responder or other certified applicant (FEMA, 2018d). Over forty-five thousand civilian first responders now attend courses at the CDP yearly, among which the COBRATF is included. Two thousand – Two thousand five hundred students are trained in the COBRATF each year, increasing our nation's response capability to incidents which may use toxic chemical or biological agents (FEMA, 2018b). Ensuring that these civilian first responders have the self-confidence to perform these extremely hazardous missions is a top priority for the faculty and staff of the CDP (FEMA, 2018c).

The purpose of this study is to determine the change if any, which first responders undergo during the COBRA training, in their self-confidence to operate in a toxic chemical or biological agent environment, to in fact determine if there is a correlation between increased self-confidence and COBRA training.

Significance of the Study

Ensuring that first responders have the confidence to respond to, operate in, and recover from, an incident involving toxic chemical or biological agents increases our nation's preparedness. Self-confidence is considered to be a malleable trait that training can increase or decrease, depending on the methodology used in the application of the training regimen (Stankov et al., 2012) (Pajares & Miller, 1994). COBRA training which is provided free of charge to first responders who attend the CDP, is not inexpensive and although the CDP received a budget in

excess of $63 million for FY 2018 (DHS, 2017) it was a reduction from the previous two fiscal years. Demonstrating that the training provided at the COBRATF by the CDP is not only a cost effective preparedness action, but one which could have a profound effect on our nation's readiness, if it were to be reduced or curtailed, is critical to maintaining readiness.

Definition of Terms

Terms and acronyms that are used within this research project include the following:

Achievement Goal Theory (AGT): Achievement goals are competence-based achievements that people focus on in evaluative settings. Originally, two distinctive achievement goals were identified based on the definition of personal competence: mastery and performance goals (Carol S. Dweck, 1986) (Dweck & Leggett 1988).

Achievement Goal Theory (Mastery) (AGT (M)): Abbreviated format

Aum Shinrikyo sect: Sixteen years ago, a Japanese apocalyptic cult, Aum Shinrikyo, dispersed sarin, a chemical weapon, in the Tokyo subway system, killing 13 people and prompting 6,000 others to seek hospital treatment (Danzig et al., 2012).

Center for Domestic Preparedness (CDP): The Center for Domestic Preparedness is one of eight members of the National Domestic Preparedness Consortium. It is located at the site of the decommissioned Fort McClellan, located near Anniston, Alabama. The CDP provides training for first responders in all aspects of first response activities (FEMA, 2018c).

Chemical Decontamination Training Facility (CDTF): The Chemical Decontamination Training Facility which has been refurbished and renamed the Chemical Ordnance Biological and Radiological Training Facility is located at the site of the decommissioned Fort McClellan, located near Anniston, Alabama. This facility was used from 1987 to 1998 to train armed service

personnel in weaponized chemical identification, neutralization, and destruction, as well as decontamination procedures (Tyler et al., 1989).

Chemical, Ordnance, Biological, and Radiological (COBRA): COBRA is the acronym used to identify the type of training which is performed at the training facility after which it is named. It means and underscores the types of hazards which first responders are trained to recognize and defeat (FEMA, 2018c).

Chemical, Ordnance, Biological, and Radiological Training Facility (COBRATF): The name of the facility which is used to train first responders in the methods for working in a toxic chemical or biological agent environment (FEMA, 2018c).

Department of Labor (DOL): The Department of Labor administers federal labor laws to guarantee workers' rights to fair, safe, and healthy working conditions, including minimum hourly wage and overtime pay, protection against employment discrimination, and unemployment insurance (USDOL, 2018).

Discipline: A branch of knowledge, typically one studied in higher education (University, 2017).

Experiential Learning: Experiential learning is a process through which students develop knowledge, skills, and values from direct experiences outside a traditional academic setting (UCD, 2018).

Federal Emergency Management Agency (FEMA): FEMA was formed in 1979 by executive order of the president, combining federal programs that deal with all phases of emergency management, for disasters of all types, into a single agency (Blanchard, 2007, p. 107).

First Responder: An individual who is trained in some aspect of responding to an emergency to save lives and protect property. (See definition on page 7)

Homeland Security Presidential Directive – 8 (HSPD – 8): A group of twenty-two directives

published by the president of the United States dedicated to homeland security originally published by President George W. Bush, of which HSPD-8 is dedicated to “Preparedness” (GW, 2003).

Knowledge, Skills and Abilities (KSAs): Specific KSAs are needed in performing certain jobs. Individual KSAs are demonstrated through qualifying experience, education, or training (VA, 2009).

Levels of Personal Protective Equipment: There are four levels of protection as designated by the Occupational Safety and Health Administration (OSHA) for hazardous materials workers. The levels are Level A, Level B, Level C, and Level D. The hierarchy of protection levels ranges from the most protective level (Level A) to the least protective level (Level D).

Mission Oriented Protective Posture (MOPP) level 4: A level of Personal Protective Equipment usage in the United States Armed Services similar to, the A, B, C, D, levels of Personal Protective Equipment used by civilian first responders when responding to a hazardous materials incident. MOPP4 is the highest level of personal protective equipment used by the U.S. Armed Services.

principal investigator (PI): The principal investigator has primary responsibility for achieving the technical success of the project, while also complying with the financial and administrative policies and regulations associated with the award (OSP, 2017).

Preparedness: refers to the existence of plans, procedures, policies, training, and equipment necessary at the federal, state, and local level to maximize the ability to prevent, respond to, and recover from major events. The term "readiness" is used interchangeably with preparedness. (GW, 2003)

Profession: A paid occupation, especially one that involves prolonged training and a formal

qualification (University, 2017).

Readiness: See preparedness

Self-confidence: Self-confidence is defined as "*A feeling of trust in one's abilities, qualities, and judgment*." (University, 2017).

Self-efficacy: Self-efficacy is defined as "*Peoples' judgments of their capabilities to organize and execute courses of action required to attain designated types of performances*." (Bandura, 1986).

Tactics, Techniques, and Procedures (TTP's): A military term which blends three separate words with their meanings together to describe a single term holding all three meanings but interpreted by most operators as the "methods used to perform tasks" (JCS, 2017, pp. 188, 227, 231). Broken down they mean the following:

> Tactics "the art or skill of employing available means to accomplish an end."
> Techniques "Non-prescriptive ways or methods used to perform missions, functions, or tasks."
> Procedures "Standard, detailed steps that prescribe how to perform specific tasks."

Organization of the Study

This study is composed of five chapters and supporting appendices. Chapter 1 provided an understanding of the history behind the study, the problem which it addresses, and the purpose of the research. Included in Chapter 1 are the definitions of terms used, the research questions driving the study, and a chapter summary.

Chapter 2 is a literature review of the relevant information surrounding the research and speaks extensively to the need for self-confidence in responders in all walks of life. Chapter 2 reviews aspects of self-confidence, how it is achieved, how it impacts self-efficacy, and the

manner in which training affects self-confidence. Three specific aspects of training are reviewed at length to demonstrate the manner in which they should support the independent variable (COBRA training) and may impact the dependent variable (self-confidence). Those specific aspects of training are used as the constructs, which support the theoretical framework, as derived from the relevant literature. The back bone of the type of training which is provided at the CDP is based on Achievement Goal Theory, which is introduced in Chapter 2. Within Chapter 2, the theoretical framework takes shape and is modeled at the end of the chapter. The research issues are introduced in Chapter 2 along with the research hypotheses. Chapter 2 concludes with a discussion of the differences between self-confidence and self-efficacy, and a summary.

Chapter 3 introduces the survey instrument, and population sample. The design of the study is laid out with the independent and dependent variables being clearly defined, along with a precise methodology for data collection and analysis. A pre-survey/post survey comparison using descriptive statistics provides a big picture look at the data, with hypothesis testing being conducted using paired sample t-tests and regression analysis as a means to determine if the hypotheses test true. Calculation of an Interrater Correlation Coefficient (ICC) (r_{WG}) is used to demonstrate the level of agreement between the individual participants, and as a means of displaying the capability of the survey instrument to measure the psychological variables. Chapters 4 and 5 discuss the results of the study, the data analysis methodology, the implications of the results, limitations of the study and recommendations for future studies.

Summary

First responders are on the frontline of safety and security in the United States and risk

their lives on a daily basis to protect others. They deal with hazardous incidents regularly but when the incident involves toxic chemical or biological agents, they need special training. Ensuring that civilian first responders can walk through the hazards of deadly chemicals, and poisonous or infectious diseases, in a confident manner, is the responsibility of the CDP's COBRA Training Facility. This study is focused on research which should demonstrate that self-confidence, as a malleable trait, can be positively increased through the application of targeted training such as that provided by the COBRATF.

CHAPTER 2: LITERATURE REVIEW

Introduction

The literature review shows that the research on self-confidence is grounded in several fields of study. Research conducted thus far, as it relates to confidence gains while training in a toxic agent environment, has only been performed in a limited manner. These studies were performed at the behest of the U.S. Army, at the CDTF in the 1980's and 1990's (Tyler et al., 1989) (Fatkin & Hudgens, 1994).

Other studies, which have been conducted in relation to increasing self-confidence, have been under the auspices of disciplines in the fields of psychology, education, health sciences, and emergency management. Unfortunately, only one pilot study thus far has been concerned with civilian first responders performing tasks while in a toxic chemical or biological agent environment (Fenn, 2015). This pilot study, on which this research study is based, did not have a large enough sample to ensure the results were conclusive.

The lack of research on the relationship between self-confidence and performance of first responders operating in a toxic chemical or biological agent environment suggests that there may be a gap of knowledge in knowing if first responders can and will respond to a toxic agent incident in a confident and competent manner. Knowing if a first responder's self-confidence improves with training in a toxic agent environment is important to ensuring increased readiness of our nation's civilian first responders (Healy et al., 1992). If as studies by the U.S. Army seem to indicate (Fatkin & Hudgens, 1994) soldiers' self-confidence increased with training at the CDTF while in a toxic chemical agent environment, then it is hypothesized that COBRA training has the same effect on civilian first responders. This recognizable gap in knowledge is indicative of a need to study these phenomena in order to determine if there is indeed a positive effect of

COBRA training on civilian first responder self-confidence.

Purpose of the Study

The purpose of this study is to determine the change if any, which first responders undergo during COBRA training, in their self-confidence to operate in a toxic chemical or biological agent environment, and to ascertain if there is a correlation between increased self-confidence and COBRA training. Furthermore, this study seeks to discover if the participant's self-confidence in their equipment improves as a result of COBRA training.

Research which is similar to the proposed project has been conducted in previous decades, however this research was focused on military personnel for the most part (Healy et al., 1992), (Fatkin & Hudgens, 1994), (Romano & King, 2002). Of the few studies conducted on first responders involved in toxic chemical or biological agent incidents, the focus was on the medical aspects (emergency medicine), police actions, crowd control, emergency planning, and training, vice the self-confidence of civilian first responders (Pangi, 2002) (Okumura et al., 2005) .

The studies that were conducted by the U.S. Army during the 1980's and 1990's, demonstrated that training soldiers to work in a toxic chemical agent environment unhindered, such as could be encountered on the modern battlefield, was beneficial to their ability to perform their missions in combat (Healy et al., 1992). The studies were focused on U.S. soldiers, who were training in an environment contaminated with toxic chemical agents, in order to determine the effects training had on stress, confidence, and performance experienced by those soldiers (Tyler et al., 1989). The studies also looked at the impact the training had on the combat readiness of the soldiers (Healy et al., 1992), and perceived stress associated with the training (Fatkin & Hudgens, 1994). These referenced studies demonstrated a positive difference in the

self-confidence of the individual soldiers' pre-training and post-training. The noted positive difference is assumed to be due to having trained in the CDTF toxic chemical agent environment (Healy et al., 1992).

Military personnel adhere to fundamentally different cultural norms, (Pease, Billera, & Gerard, 2016) that translate into all aspects of the military, including training. In the armed services, the culture of the military is in general, authoritarian, and training is frequently conducted from the perspective of that particular viewpoint (Cole, 2014). These norms may not be acceptable in the world of civilian first responders, and thus the attitudes and emotions expressed by military personnel who are a very small subset of society, may not represent the true impact that civilian style training has on first responders. Determining if the current COBRA training has continued in the vein of the past CDTF to increase self-confidence in civilian first responders, is one of the drivers of this study. The U.S. military is not the only entity which studies the human characteristic of self-confidence; other disciplines such as psychology have, and do so as well.

Research into confidence and the measurement of confidence has been conducted frequently by psychologists (Shrauger & Schohn, 1995), (Lee & Dry, 2006), (Atherton, 2015), (Burns K. M., Burns N. R., & L., 2016). Research conducted outside the COBRATF, the only facility in the United States which maintains and uses toxic chemical and biological agents for training civilian first responders, by necessity conducts research through the use of simulants. Psychologists often study the effects on self-confidence of students in educational venues such as academia, and have demonstrated that increased self-confidence has led to increased performance (McKenzie & Schweitzer, 2001). Furthermore, increasing a student's self-confidence through training and additional tutoring, has been demonstrated, to increase the

overall performance and retention of students in an academic setting (Atherton, 2015). The concept that self-confidence can be improved through training and education is a recent concept (Stankov et al., 2012) (Pajares & Miller, 1994) (Carol S Dweck, 1986). This would indicate self-confidence is a malleable trait, meaning that training designed to improve self-confidence should be a transferable technique of increasing civilian first responder's self-confidence while training with toxic chemical or biological agents. The concept of malleability is in line with Achievement Goal Theory (Mastery) AGT (M), in that training based on the construct of AGT (M), supports increasing ability (efficacy) as a means to an end. Finally, studies seem to indicate that self-confidence is a higher predictor of success than self-efficacy, (Stankov et al., 2012) which if true, would indicate that improving the self-confidence of first responders would in parallel increase self-efficacy, and therefore readiness.

Theoretical Framework

Self-confidence is a character trait which according to the literature, may be a malleable or adjustable trait, and accordingly may be increased through training in knowledge, skills and abilities (Stankov et al., 2012). If the task that the individual is attempting to complete is one requiring specialized equipment, it may be critical that the individual also has confidence in the reliability and capability of the required equipment (Healy et al., 1992). If the individual does not have confidence in themselves and or the reliability and capability of their equipment, their self-confidence may be negatively affected. Stress caused by anxiety of worrying about equipment failure could create a negative feedback loop, increasing mental stress, which would be further exacerbated while working in the stressful toxic chemical or biological agent environment of the COBRATF. Additional stress may lead the individual to make poor judgement calls and/or

mistakes, with disastrous results, or have such a negative impact on the responder that they may choose not to perform.

Self-confidence is hypothesized to be modified by the application of COBRA training longitudinally over the course of the training through increasing success of training experiences (Bandura, 1977). There are three legs on which the construct of COBRA training stands; training style which positively impacts the psychology of the student mastery accomplishments (Senko, Hulleman Chris S., & Harackiewicz, 2010) (Bandura, 1977); realistic training which increases and internalizes their knowledge, skills, and abilities (KSAs) (FEMA, 2018c); and successful hands on use of their equipment in a toxic chemical and or biological agent environment. These three legs, which constitute the methodology of COBRA training, are purposefully designed to develop and internalize a thought process of task oriented success, which is a key characteristic of AGT (M).

COBRA Training

The psychology of COBRA training, the Knowledge, Skills and Abilities (KSAs) gained, and the equipment used, are the foundation on which COBRA training stands. The experiential learning process, provided by the CDP at the COBRATF, creates an environment conducive to the mastery of the KSAs and equipment used, in toxic chemical or biological agent environments. Each of these three constructs provides part of the whole which is COBRA training, and in supporting COBRA training, they are also believed to be positively increasing the self-confidence of the civilian first responder (Ursano, 1989) (Healy et al., 1992) (Fatkin & Hudgens, 1994) (Fenn, 2015).

As noted in the pilot study (Fenn, 2015), the means of measuring the differences between

the pre-training and post-training self-confidence of the students was done using a five point Likert type scale. The neutral point was however discarded to allow for two groups to be created. This method allowed for the ability to conduct bivariate analysis (yes or no) using descriptive statistics to demonstrate the delta between pre-training and post-training survey responses. Furthermore, a Paired-Sample Wilcoxon Signed Rank Test was used for hypothesis testing, wherein inferential analysis determined if the hypothesis was accepted or rejected with a 95% confidence level. The pilot study (Fenn, 2015) was limited by the number of participants (twenty-three), which this study intends to overcome by using a larger sample size (one hundred and eighty-four), determined by using the confidence interval equation with the confidence level set at 95% (Sullivan, 2017). The use of a larger population sample and inclusion of the neutral variable in the statistical analysis, increases the validity of the study by allowing the use of sensitive hypothesis testing (Allen & Seaman, 2007). Accordingly, the use of a probability sample, determined by the population of employed civilian first responders in United States, increases the reliability of the study (Mitchell & Jolley, 2013) as long as the 95% confidence level, based on a standard t-score table, is = to or exceeds, t = 1.984.

Psychological Impact of COBRA Training

The students of COBRA training undergo intense and focused training designed to increase their KSAs (FEMA, 2018c). The idea behind this intense and focused training is to develop civilian first responders nationwide who have all trained to the same standard for working in a toxic chemical and or biological agent environment successfully. One of the focal points of this training is to increase the student's view of themselves positively through tutoring, teamwork (Bandura, 1999), successful task achievement (Bandura, 1977), classroom instruction

and assessment. Each of the aforementioned attributes, is designed to reduce stress and support positive self-perception, by ensuring the student has internalized the knowledge, skills, and abilities necessary to work in a hazardous chemical or biological agent environment (Fatkin & Hudgens, 1994). The training methodology which is used by the CDP is that of mastery vice performance, wherein the students receive instruction in a non-competitive and non-threatening classroom and in a practical application environment. The goal of mastery training is to achieve the ability to perform a task to a standard as an individual, and a group. This method of instruction, training, and learning is all a part of Achievement Goal Theory (Mastery), (Carol S Dweck, 1986). The training provided at the CDTF, which later became the COBRATF, has been demonstrated as having reduced stress and increased self-confidence through successful completion of the training for military personnel (Fatkin & Hudgens, 1994).

It should be noted here that the thought processes behind the training are to design it so that it supports the increase in self-confidence that is necessary to bolster the self-efficacy of the individual. Although training is mentioned multiple times in this sub-section, the focus of this construct is on the psychology behind the training, guiding the impact of the training to increase the ability of the students to succeed. Success is a critical factor in ensuring that the self-confidence of the student increases such that when the student perceives their success, then the perception of further success is possible (Bandura, 1999) (Fatkin & Hudgens, 1994). The theory that this is based on is Achievement Goal Theory (Mastery) (AGT (M)), wherein the student is encouraged to continue to learn until success is achieved (Carol S Dweck, 1986).

Knowledge, Skills and Abilities

Knowledge, Skills and Abilities (KSAs) are part and parcel of every individual, and

whether they can perform a specific set of tasks, is heavily reliant on whether or not they have received training and internalized the skill sets and knowledge that enables them to perform those tasks. COBRA training, provides intense and focused training on working, surviving, and successfully accomplishing tasks in a toxic chemical or biological agent environment. AGT (M) is the theory supporting this intensive training, and the theory suggests that it is the goal to learn, vice the goal to perform that this type of training benefits from (Senko et al., 2010). Studies indicate that individuals with increased experience are more confident and undergo less stress than those who are not as seasoned with working in a toxic chemical and or biological agent environment (Fatkin & Hudgens, 1994). Previously acquired KSAs, such as those gained by armed services personnel returning from the first Gulf War, where many military units wore chemical protective over-garments with masks for days on end, have been noted as being essential to positive performance in a toxic chemical agent environment (Fatkin & Hudgens, 1994).

After the first Gulf War, the United States Army supported a study entitled "*The Impact of Toxic Agent Training on Combat Readiness*", wherein KSAs were clearly noted as being [essential] to the credibility of the chemical warfare soldier (Healy et al., 1992). Noted within the previous reference is the dissertation by (Smith) page 8 of dissertation summation, the training provided by the CDTF was successful in transferring the KSAs necessary to increase the self-confidence of the soldiers (Healy et al., 1992). COBRA training is designed to provide instruction to civilian first responders in the KSAs necessary to perform tasks reliably in a toxic chemical and or biological agent environment. Students internalize these KSAs longitudinally over the course of instruction through repetition, practice, assessment, and increased usage of KSAs and equipment. It was found that when students perform these tasks successfully using the

KSAs taught at the CDP their self-confidence increases (Fatkin & Hudgens, 1994).

Equipment

Working in a toxic agent environment requires specialized equipment that maintains the health of the individual exposed, while performing tasks in a toxic chemical or biological environment. Individuals who have been trained in the use of their equipment, who know and understand the capabilities and limitations of said equipment, have more confidence in their ability to perform tasks while working in a toxic agent environment (Fatkin & Hudgens, 1994). COBRA training provides the focused training necessary for the civilian first responder to internalize the capabilities of their equipment, gain hands-on use of their equipment, and then use the equipment in a toxic chemical or biological agent environment. Studies seem to demonstrate that individuals who train with their equipment in an environment contaminated with real, vice simulated, toxic agents are more confident and suffer from less stress (Healy et al., 1992).

Barriers to Increasing Self-Confidence through COBRA Training

Using toxic chemical and or biological agents is expensive and there is an element of danger involved in using them. Protests have been lodged requesting that the use of these agents be curtailed because of the possibility of an accidental release (*Training first responders into the next century*, 1999), and the ever present possibility that a student could be injured as a result of the training exists. In fact the CDP had to stop using real toxic chemical and biological agents for a period of time, as a result of the possibility that a biological agent had been improperly used (FEMA, 2018b), although no injuries or releases were found to have occurred. As a result of these issues the specter of simulant use is always ready to raise its head as a cheaper and safer alternative to real toxic chemical or biological agents. Our nation's first responders are not

necessarily lazy or less than intelligent, but if an individual knows that they are dealing with a simulant vice a true toxic agent, the possibility arises that the individual may not put forth a true effort of internalizing the TTPs necessary to perform their job to the required standard during a toxic chemical or biological agent incident.

The results of this study should provide indicators as to the efficacy of using actual toxic chemical or biological agents, vice simulants, in training civilian first responders to work and achieve success in a toxic chemical or biological agent environment.

Achievement Goal Theory

Achievement Goal Theory is often discussed as a dual theory in that the theory proposes two paths that individuals follow as they learn (C. S. Dweck & Leggett, 1988). The first path which is followed is "goal mastery" and the second is "goal performance", both of which focus on specific goals and seek to reach or surpass those goals. Goal mastery is focused on meeting a task based standard or specific self-defined criterion (Cook & Artino, 2016). Goal performance is focused on being the best at performing the goal and thus competing against all of one's peers (Cook & Artino, 2016). Although there has been much contentious discussion between which of the two is a better form of learning (Cook & Artino, 2016), it is important to understand that the form which is used at the CDP is "mastery" vice "performance" (Mann, 2014). The apparent reasoning behind a focus on mastery goal achievement, is that first responders are team focused individuals. Working together in order to complete tasks and missions is an absolute necessity for first responders, whether training at the COBRATF or responding to a real world incident. In situations such as that, competing against each other defeats the purpose of teamwork and may result in unnecessary accidents and injuries.

Achievement goal theory (mastery) states that the individual tends to consider ability as a malleable attribute that can be increased or made better through trying harder or repeatedly until mastery is achieved (Senko et al., 2010)

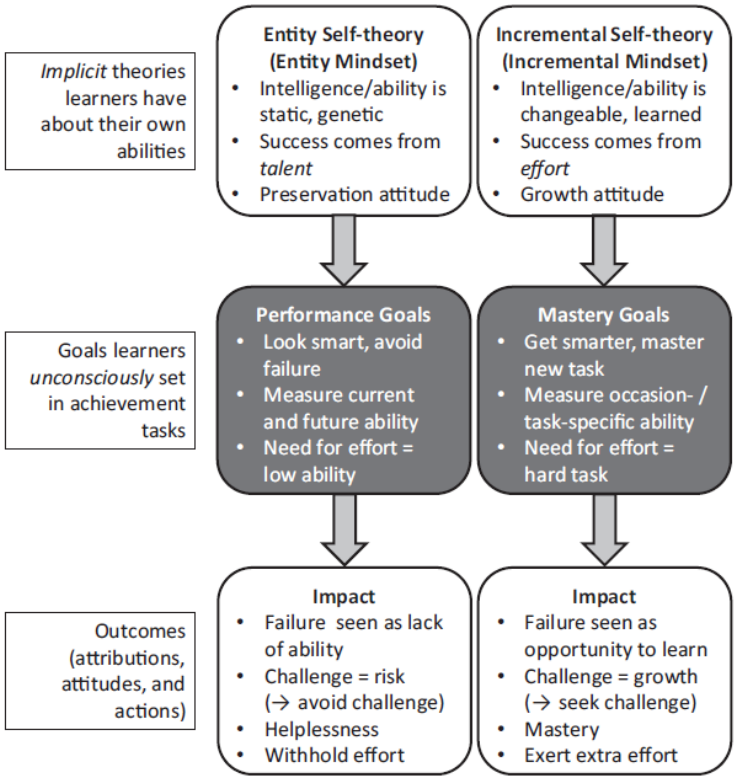

Figure 1. Simplified version of Dweck's goal oriented theory (Senko et al., 2010, p. 1008)

Ability like confidence, is also considered to be malleable, (Pajares & Miller, 1994), (Senko et al., 2010). Following the logic espoused by the AGT (M) theory, COBRA training which increases the KSAs of the civilian first responder, should also then increase the civilian first responder's self-confidence.

The purpose of this study is to determine if increases in self-confidence can be correlated with COBRA training. Self-confidence can be changed through any type of psychological treatment, (Bandura, 1977) a form of which COBRA training is considered to be. Determining if

self-confidence is increased through the application of COBRA training should demonstrate the malleable nature of self-confidence.

Theoretical Model

The theoretical model using the constructs as defined above, demonstrates the method of increasing self-confidence, which is a major foundation of Achievement Goal Theory (Mastery). Modeling the manner in which this process flows, inputs from the independent variable (COBRA training) are applied longitudinally to the dependent variable (civilian first responder self-confidence), using lecture methods, practical application, tutoring, structured assessments for success, teamwork, and hands-on equipment training.

Increasing Civilian First Responder Self-confidence through COBRA Training

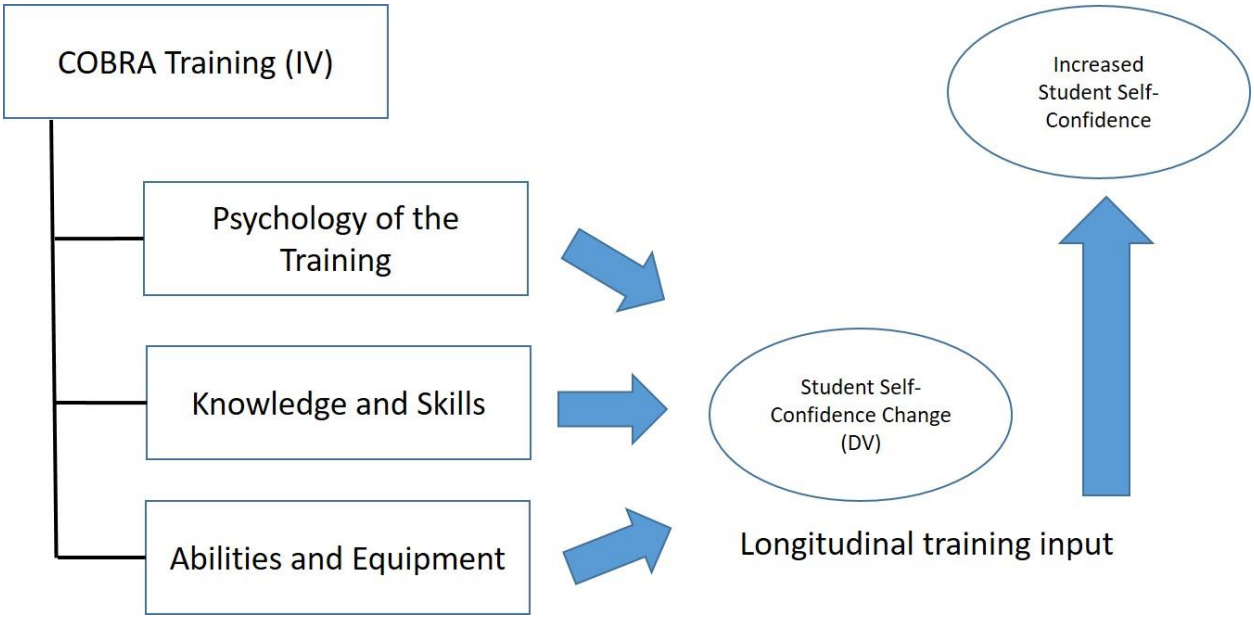

Figure 2. Theoretical model for increasing civilian first responder self-confidence through COBRA training to work in a toxic chemical or biological agent environment.

Research Issues

The following issues were examined during this study:

Research Issue 1. Does COBRA training at the CDP cause an increase in civilian first responder self-confidence in the use of personal protective equipment (PPE), in a toxic chemical or biological agent contaminated environment?

Research Issue 2. Does COBRA training at the CDP cause an increase in civilian first responder self-confidence with respect to the individual's ability to perform duties in a toxic chemical or biological agent contaminated environment?

Research Issue 3. What do students perceive emotionally, knowledge wise, skill wise and in abilities required before attending COBRA training?

Research Issue 4. What differences will the psychological attribute groups experience between, before, and after COBRA training?

Research Issue 5. What variables will affect the student's satisfaction with COBRA training?

Research Hypotheses

H_1 –The positive emotions of the students operating in a toxic chemical agent environment will be significantly changed between before COBRA training and after COBRA training.

H_2 –The negative emotions of the students operating in a toxic chemical agent environment will be significantly changed between before COBRA training and after COBRA training.

H_3 - The knowledge of the students operating in a toxic chemical agent environment will be significantly changed between before COBRA training and after COBRA training.

H_4 –The skills of the students operating in a toxic chemical agent environment will be significantly changed between before COBRA training and after COBRA training.

H_5 - The perception of the students concerning their abilities for operating in a toxic chemical agent environment will be significantly changed between before COBRA training and after COBRA training.

H_6 - The effects of the participants' satisfaction as it concerns their training will show that positive emotions are highly correlated with training satisfaction.

H_7 - The effects of the participants' satisfaction as it concerns their training will show that negative emotions are highly correlated with training satisfaction.

H_8 - The effects of the participants' satisfaction as it concerns their training will show that confidence in their knowledge are highly correlated with training satisfaction.

H_9 - The effects of the participants' satisfaction as it concerns their training will show that confidence in their skills are highly correlated with training satisfaction.

H_{10} - The effects of the participants' satisfaction as it concerns their training will show that Confidence in their abilities are highly correlated with training satisfaction.

H_{11} – When demographic variables are controlled, the psychological attribute variables "positive emotion", "negative emotions", "knowledge", "skills", and "abilities" changes, will be significant predictors of the effectiveness of the training in producing positive self-confidence changes.

Summary

The literature review has revealed that there is research into training activities that increase self-confidence that have been conducted previously, but there is a knowledge gap in establishing if the same effects achievable for military personnel can also be duplicated for civilian first responders. While other disciplines have recorded successful improvements in the self-confidence of civilian individuals, most notably in educational settings (Senko et al., 2010), through intensive education, tutoring, and training, this was not under circumstances where failure could be life threatening. COBRA training incorporates aspects of Achievement Goal Theory (Mastery) (Carol S Dweck, 1986) and performance accomplishment, which supports the Self-Efficacy Theory espoused by (Bandura, 1977), (McKenzie & Schweitzer, 2001), and (Pajares & Miller, 1994), where success breeds success and negates student failure by providing the student a path to success.

COBRA training uses three constructs to support its impact on students. These are: psychology of the training, increasing KSAs, and hands-on use of equipment. These constructs are applied through the carrier of COBRA training, longitudinally over the period of instruction (4-5 days), with a final application of training in an actual toxic chemical or biological agent environment. Successful completion of this training is expected to increase the civilian first responders' self-confidence, with a parallel increase in their preparedness. The increases in self-confidence are in line with the methodology of learning, which the AGT (M) indicates is a function of learners being focused on ensuring that they master the goals (learning objective) of COBRA training (C. S. Dweck & Leggett, 1988).

Observing and recording this phenomenon should be possible by conducting a before and after survey of first responders undergoing training, at the COBRATF at the CDP. The

methodology as described in Chapter 3 will be applied to civilian first responders in order to collect quantitative data. The data will be analyzed, using proven statistical methodology, and tabled in order to be clearly read and absorb the results. The results should demonstrate a correlation between COBRA training and increases in civilian first responder self-confidence.

The use of Likert type scales in the survey instrument is the means of measuring the students pre and post-training responses, with descriptive statistics used to demonstrate the hypothesized delta between those pre and post-training survey responses (Croasmun & Ostrom, 2011), (Mitchell & Jolley, 2013). Hypothesis testing will be conducted in addition to the descriptive statistics analysis, through the use of paired sample t-tests and regression analysis as described in (Mitchell & Jolley, 2013).

The pre-training survey was pre-tested by two student volunteers and was completed in less than 10 minutes by both. The National Business Research Institute recommends that surveys be no longer than 30 questions (NBRI, 2018), and that they be clear and concise.

An additional test will be used to demonstrate that the civilian first responders participating in this study are answering the questions cognitively, vice through rote checking of the center answer on the Likert type scales, to ensure the participants understand the questions. In other words, the test for pseudo attitudes should demonstrate that the students are not checking random answers or checking only the neutral block on the Likert type scales. Pseudo attitudes are further addressed in Chapter 3 methods and limitations (Huang, 2018).

CHAPTER 3 METHODOLOGY

Introduction

There have been several studies on the effects of training in a toxic chemical environment with personnel of the armed services of the United States and increases in self-confidence (Tyler et al., 1989) (Healy et al., 1992) (Fatkin & Hudgens, 1994). A review of the literature indicated there is a gap in studies relating to self-confidence increases and civilian first responders undergoing training in a toxic chemical or biological agent environment.

Purpose of the Study

The purpose of this study was to determine if there is a correlation between COBRA training and first-responder self-confidence increases. Self-assessment questions using Likert type measurement scales were used to measure students' self-confidence before and after training. The data collected has been used to analyze variances between groups of responders and within groups of responders. Although similar research has been conducted (Tyler et al., 1989) (Ursano, 1989) (Healy et al., 1992) (Fatkin & Hudgens, 1994), a gap exists in examining the relationship between civilian first responder self-confidence increases and COBRA training at the CDP.

The measures used for determining the self-confidence levels of the first responders in a toxic chemical or biological agent environment are self-assessment questions, designed to be answered using Likert type scales and averaging along the mean. The treatment was administered before training began during the administrative phase of coursework required for every course taught at the CDP and immediately after participants finished the final exercise

performed in a toxic chemical or biological agent environment.

The CDP provides course instruction for several courses which train civilian first responders in the COBRATF facility. A list of some of the courses taught at the CDP COBRATF can be seen in Table 1 (FEMA, 2018a).

Table 1.

Example of Courses Taught Using the COBRATF

Course Name	Course Abbreviation	Course Hours
Technical Emergency Response Training for CBRNE Incidents	TERT	32
Hazardous Materials Sampling, Monitoring, and Detection	HT	40
Hands-On Training for CBRNE Incidents	HOT/HOT-I	16/8
Hands-On Training for CBRNE Incidents – Intermediate – Law Enforcement	HOT-LE	8
Hazardous Materials Operations	HAZMAT OPS	40

The fact that several courses provided by the CDP are designed for specific professions and taught using the COBRATF, indicates that many different professions are involved in toxic chemical and biological agent response.

Different professions react to toxic agent or biological incidents using different protocols, and in some cases substantially different equipment. This perspective is offered in order to demonstrate the need to collect more than generalized demographic data. When conducting comparisons between groups it is necessary to ensure that the groups are definitively coded in reference to their differences in order to demonstrate the delta which may occur due to the

professions the groups represent. This is not to say that the self-confidence levels of these groups would not change between the pre-training treatment and the post-training treatment. The comparison was conducted to ensure that a realistic assessment of the changes in self-confidence are measured by profession as well as by the total population sample. The ability to see these changes by profession may have indicated a need for different training regimens for any specific profession. Furthermore, the ability to analyze the data within groups may point to specific training needs of like individuals. An example of this would be different age groups or different positions.

The pilot study conducted by John Fenn (Fenn, 2015) provides the basis for this study. In order to add to the previous work, the data analysis methods used in this study are including additional rigor in order to support the validity of the study. This study applied a full five point Likert scale when measuring the psychological variables, in order to average along the mean (Allen & Seaman, 2007) which provided a more sensitive scale, while being not overly onerous for the students to answer. Additionally, as the survey was incorporated into the pre and post administrative phases of the courses, the students, as part of their participation in COBRA training, were required to complete the surveys in full. The possible bias this may produce is discussed later.

Design of the Study

This study is a pre-training and post-training comparison research design, using descriptive statistics to demonstrate changes in the self-confidence of the participants, before and after COBRA training at the CDP. The population for this study is the employed first responders in the United States as defined by the Department of Labor, Standard Occupational Classification

Dictionary (DOL, 2010 Rev 2013), and annotated by the DOL Chief Evaluation Officer. The sample of the first responders population is those students attending COBRA training at the CDP during 2018. The responses of the students to the self-assessment questions were analyzed using descriptive statistics to verify the participants understand the questions. Descriptive statistics were also used to determine if the survey questions when answered are measuring the psychological variables as expected. Furthermore, a paired sample t-test was conducted for each set of the thirty paired psychological variables, in order to hypothesis test. Finally, a regression analysis was conducted to test for predictor variables of increases in self-confidence, and to ensure the surveys were efficient in their design and performance.

Data Collection

Data for this study were collected from the students attending courses at the CDP during 2018, who are members of the population of civilian first responders employed in the United States, undergoing training involving toxic chemical and biological agents. The data has been collected through the use of pre-training surveys, administered by the CDP during the administrative phase of each course, and post-training surveys administered immediately after the students had completed the final exercise involving toxic chemical or biological agents. The data were collected through the use of the iPads assigned to each student with the information being tracked by the use of the individual student's identification number (SID).

The data collected is non-personal demographic data, and Likert type data derived from self-assessment questions concerning the students' perceptions of their self-confidence before and after COBRA training. The following questions provided the basis for the survey questions answered by the students. The students' answers provided the data points to operationalize

measurement of the student's self-confidence, by subtracting the pre-training survey mean from the post-training survey mean from the Likert type scale responses.

The survey questions were aggregated into the pre-training and post-training surveys in four psychological variable groups. Emotions, confidence in knowledge and skills, confidence in abilities, and satisfaction. Knowledge and skills were in the same group in order to facilitate participant survey completion, however factor analysis indicated they should be broken out during the regression analysis. The following are the items incorporated into the surveys:

To what extent would you feel each of the following emotions if you were assigned to operate in a toxic chemical or biological agent environment?

- Optimistic
- Depressed
- Stressed
- Annoyed
- Nervous
- Fearful
- Relaxed
- Confident
- Energetic
- Alert

To what extent do you agree with each of the following descriptions regarding your understanding of a toxic chemical or biological agent incident?

- I clearly understand the characteristics of a toxic chemical or biological agent incident.

- I clearly understand the exposure paths of toxic chemical or biological agents.
- I clearly understand the hazards of toxic chemical or biological agents.
- I clearly understand the results of exposure to toxic chemical or biological agents
- I know how to operate in a toxic chemical or biological agent environment
- I know the measures to decontaminate myself or others in a toxic chemical or biological agent environment.
- I know how to use personal protective equipment (PPE) in a toxic chemical or biological agent environment
- I know how to work with others during a toxic chemical or biological agent incident.

To what extent do you agree with each of the following descriptions regarding your ability to work in a toxic chemical or biological agent environment?

- I am confident in my ability to operate in a toxic chemical or biological agent environment.
- I am confident in my ability to perform measures to decontaminate myself or others in a toxic chemical or biological agent environment.
- I am confident in my ability to operate personal protective equipment (PPE).
- I am confident in my ability to work with others during a toxic chemical or biological agent incident.
- I believe my personal protective equipment (PPE) will protect me in a toxic chemical or biological agent environment.
- I believe the equipment will detect and correctly identify toxic chemical or biological agents.

- I trust the decontamination equipment used in a toxic chemical or biological agent environment.

To what extent are your expectations of each of the following descriptions on the training to be provided in the COBRATF?

- The training will help to reduce stress while operating in a toxic chemical or biological agent environment.
- The training will increase my self-confidence in my ability to operate in a toxic chemical or biological agent environment.
- The training will provide me with the knowledge to operate in a toxic chemical or biological agent environment.
- The training will prepare me to use the proper equipment in a toxic chemical or biological agent environment.
- The training will prepare me to operate in toxic chemical or biological agent environment correctly.

The pre-training surveys with demographic and self-assessment questions are located in Appendix C. The post-training surveys do not collect demographic data and are located in Appendix D.

Independent Variable

The COBRA training is considered to be the independent variable in this study. COBRA training is a highly regimented training evolution which receives oversight from multiple organizations, and is required to adhere to exacting standards (FEMA, 2018b). As a result of the standards the COBRATF adheres to, the training does not arbitrarily change nor is it adjusted, without due consideration by all parties involved in the course makeup. COBRA training acts as

the independent variable, by being applied to the civilian first responders of the CDP, in an effort to increase trust in their equipment and internalize knowledge, skills, and abilities (KSAs). The expectation was that the research would demonstrate that application of the independent variable, (COBRA training) increases civilian first responder self-confidence.

Dependent Variable

Civilian first responder self-confidence was considered to be the dependent variable in this study, with changes in that variable occurring through the application of COBRA training. The variance of the dependent variable was measured through statistical analysis of the delta between the pre-training self-assessment taken during the onboarding administrative process, and a post-training self-assessment delivered immediately after the final exercise in which a toxic chemical or biological agent was used.

Methodology Appropriateness

The methodology used in this study was appropriate as noted by David McNabb, (McNabb, 2015) in that descriptive studies "provide a description of an event or define a set of attitudes, opinions, or behaviors that are observed or measured at a given time and environment". The quantitative methods used to analyze the Likert type data are appropriate for describing the delta between the pre-training and post-training survey's which are hypothesized as indicating a correlation between COBRA training and self-confidence changes (Mitchell & Jolley, 2013) (Sirkin, 2005). Hypothesis testing conducted using paired sample t-testing and regression analysis was postulated with $p <= .05$ as rejecting the null-hypothesis (Sirkin, 2005). The report of Cronbach's alpha coefficient, which demonstrates if the internal consistency of the data is

reliable, was not conducted for each data set as it relates to each question. Scale analysis was used to validate internal consistency and reliability of the data. The use of this report increased the reliability of the study by demonstrating the consistency of the data within the study (Croasmun & Ostrom, 2011).

Instrumentation (Survey Questionnaire)

The study took place at the CDP where first responders from all walks of life receive training year round. The CDP has a very organized approach in providing instruction to over forty-five thousand students per year, of which approximately two thousand five hundred are trained in the COBRATF. One of the ways in which the CDP manages this many students is through the use of computer technology and a unique number provided to all students termed the Student ID (SID). At the start of each course, during what is termed the administrative phase of the course, each student is issued an iPad linked to their SID that contains their study materials, as well as other information. The CDP added a pre-training survey and a post-training survey to the applications available through the student iPad that linked the pre and post-training survey to their SID. The administration of the surveys was by the federal instructors, who were trained by the principal investigator prior to the study commencing, during the administrative phase, and at the conclusion of the final training exercise for each class attending the CDP for COBRA training.

The pre-training survey is a two-part survey, consisting of demographics collection and self-confidence analysis questions composed of Likert type questions. The post-training survey consists of only the self-confidence analysis questions (See Appendix D).

Each of the variables was measured using Likert type questions consisting of scales using

the following answers:

Question 10:

- Not at all 1
- Small Extent 2
- Neutral 3
- Great Extent 4
- Very Great Extent 5

Questions 11 – 13:

- Strongly Disagree 1
- Disagree 2
- Neither Agree nor Disagree 3
- Agree 4
- Strongly Agree 5

Each answer was assigned a numeric value from 1 – 5, thus "Not at all" or "Strongly Disagree" are assigned a numeric value of 1 while "Very Great Extent" or "Strongly Agree" would receive a value of 5. The surveys are maintained by the CDP student database and the raw data was collected by the principal investigator and input into SPSS-24 Social Sciences statistics analysis software to be analyzed.

Data Analysis

The type of data collected is demographic and Likert type data, and was analyzed as interval data. The Likert type responses were assigned a number 1 – 5 for each survey question, correlating with strongly disagree through strongly agree. This method of data aggregation allowed the principal investigator to use the mean as the method of analyzing the delta between the pre-training survey and the post-training survey. The results of the analysis of the Likert type responses in the pre and post COBRA training surveys were reported through the use of the following outputs:

- A test for pseudo attitudes (Huang, 2018): This test looks at all of the data for each question both pre and post-training and validates that the data is not composed of random or falsely marked answers.
- Descriptive statistics of the pre and post assessments of each question on the confidence survey with their corresponding (r_{WG}) were used to demonstrate overall participant agreement of their understanding of the survey questions.
- A paired sample t-test between the pre-training survey and the post-training-survey of each self-confidence question, to be used to determine if there are significant increases in civilian first responder self-confidence.
- A regression analysis to identify predictors of successful increases in self-confidence of the participants of COBRA training, and to test the efficiency of the surveys.

Hypothesis Testing

Testing for significance to determine if changes in the dependent variable are related to the application of the independent variable was the purpose of hypothesis testing and increases the validity of the research through the demonstration of a relationship between the dependent variable and independent variable. If the paired sample t-test demonstrated significance then the correlation was inferred and resulted in the hypothesis being accepted (Sirkin, 2005). The pilot study (Fenn, 2015), which used a Paired-Sample Wilcoxon Signed Rank Test to determine significance, provided substantial evidence of significance. This study added rigor and validity to the research through the application of paired samples t-testing and regression analysis to determine significance. The change in significance testing was predicated on the size of the sample population and changes in the manner the Likert type scales were being coded.

Significance is established to be p <= .05 (95% confidence) for a sample size of 184 (Sullivan, 2017).

The population sample consisted of those students that attended COBRA training From April through July of 2018, who came from a population base which is between 1.2 and 3.5 million first responders, composed of law enforcement, firefighters, emergency medical technicians/paramedics, and healthcare workers involved in first responder activities (Schafer, Sutter, & Gibbons, 2015).

Limitations of the Study

The population sample of students who are attending COBRA training is not random and as such this is not a true experimental research study. Students who attend COBRA training are often volunteers and in some cases individuals who are required to attend the training, the upshot of which is non-random groupings of students. As such this culminates in the study being conducted as a quasi-experimental study.

Of greater concern was the possibility that the pre-training survey may bias the results of the post-training survey through the students being affected by participant bias (Mitchell & Jolley, 2013). This possible participant bias was normalized due to the size of the sample and as a result of the survey being incorporated into the administrative phases, it became part of the onboarding and outgoing course attendance process.

Another possibility of bias is that the CDP COBRATF is the only toxic chemical or biological agent training facility in the United States, which provides civilian first responders with training using toxic chemical or biological agents. As the CDP is the only facility in the United States which trains civilian first responders with toxic chemical or biological agents, there

is no other population that can be sampled in order to cross check reliability of this study, nor is there any way in which a true experiment can be conducted using a control group and a treatment group. Finally, this study was designed as a pre and post-training comparison quantitative study, intended to use descriptive statistics and hypothesis testing. Descriptive statistics and inferential statistics were used to demonstrate the possibility of a correlation between COBRA training and changes in first responder self-confidence. As the study is quantitative in nature, it is unable to answer why self-confidence should change because of the COBRA training. In order to determine why first responder confidence may or may not change with COBRA training, future qualitative studies would need to be conducted.

Institutional Review Board

The Jacksonville State University Institutional Review Board (IRB) is involved in all aspects of this study, and it reviewed and approved of the methodology and security aspects of the data collection before granting approval of the research study. No personal data of any sort was collected. Each participant's data was tracked via their Student Identification Number (SID). The SID is specific to each student, however the principal investigator does not have access to the CDP SID database and cannot in any way relate any SID back to any specific student. The SID would only be used to ensure that the results of the research can be validated if necessary. As no personal information was collected, the security of the data has been reliant on an encrypted and password protected external hard drive maintained by the principal investigator and used on a similarly encrypted and password protected computer system which is backed up nightly.

Summary

The methodology employed in the collection and analysis of data for this study was chosen for the recognized reliability and validity that is provided by, what for lack of a better term may be considered, an industry standard within the realm of social sciences research. As such, its use is well understood, and the results that it demonstrates when the data is analyzed are easily interpreted. This is indicative that the critical aspects of this study are reliant on the capture of true and accurate data, by the principal investigator and the subsequent entry of that data into the data analysis program. Oversight provided by the CDP ensured that the data was captured correctly in accordance with this proposal, and oversight by the principal investigator's dissertation committee ensured that the data was correctly entered into the database, analyzed, and interpreted.

The purpose of this research is to determine if the application of COBRA training to civilian first responder trained by the CDP, results in changes in self-confidence in the civilian first responder to work in a toxic chemical and or biological agent environment. Furthermore, this research seeks to determine if there are also changes in the civilian first responder's confidence in their equipment to work in a toxic chemical or biological agent environment. Analyzing the data as described demonstrated the delta between the perceptions of the civilian first responder's pre-training self-confidence and post-training self-confidence. The expected outcome of the research is that there will be a positive change in the self-confidence of the students who attended and successfully completed COBRA training.

CHAPTER 4 - RESULTS

The structure of this study was derived from the tenets of quantitative studies as they are conducted by the social sciences. Chapter 4 is structured in a logical method designed to analyze the data collected to build a structured argument which the results corroborate. To begin with, the participants have been described through the use of the demographic data captured by the nine demographic questions of the pre-training survey. Following a demographic description of the participants, a preliminary test has been conducted that validates the variables used in the pre and post-training surveys. After the surveys have been validated, descriptive statistics extracted from a one-sample t-test were used to calculate an interrater correlation coefficient (ICC) (r_{WG}) to demonstrate the participant's agreement on their understanding of the questions asked by the surveys. After completing the analysis of the interrater correlation coefficient (ICC) (r_{WG}) the data was then analyzed through the application of inferential statistics.

Inferential statistics have been used to analyze the data collected, in order to test the hypotheses, and to develop empirical and or theoretical knowledge. The first test used to analyze the data was a paired sample t-test, used to compare the means of the pre and post-training surveys. The paired sample t-test has been used to test H_1, H_2, H_3, H_4, and H_5. Pre-testing of early data suggested that the variables would need to be weighted in order to test them correctly through regression analysis. In order to ensure the variables were correctly weighted, it was necessary to conduct a scale analysis through factoring to determine which combinations of variables would be best suited for regression analysis.

Correlation analysis was then used to build a correlation matrix to identify those variables which may be closely correlated with participant satisfaction. Participant satisfaction is a created

variable developed from the average of the means of the five post survey questions in section four of the post survey. The variable is named "Post Satisfaction Average", and it is used as the dependent variable in the regression analysis. This independent variable is not the same as the independent variable of the quasi-experiment conducted as part of this study. The regression analysis was used to test for participant satisfaction identifiers and to ensure the surveys were efficient in collecting data. Regression analysis was the last test administered to the data; it was used to test H_{11} and to identify predictors of participant satisfaction with COBRA training.

The pre-training survey (See Appendix 1) was composed of nine demographic information questions. Both the pre-training and post-training survey had thirty Likert scale questions broken down into four groups, which were organized in a logical sequence of emotions, and confidence in knowledge and skills, abilities and participant satisfaction. There was no collection of demographic information on the post-training survey. The Likert type questions on the pre-training survey and post-training survey were identical, saving only present and past tenses as grammatically applicable. The surveys were carefully crafted to ensure the time required to administer the surveys was ten minutes or less for each survey, both pre-training and post-training, while still gathering a significant amount of data. Although the surveys were tested for timeliness before being released to the CDP, the timeliness during administration of the surveys, was tracked by the CDP. All of the participants were able to complete the surveys in less than ten minutes which was benchmarked as appropriate by the CDP for their students.

Participants

There were 184 students who participated in pre and post-training self-assessment surveys held at the CDP COBRA Training Facility between April 20, 2018 and June 30, 2018. Collecting data to measure how the participants perceived their self-confidence to operate in a

toxic chemical or biological agent environment, both before and after participating in COBRA training, was the purpose of administering the self-assessment surveys.

The composition of the demographic information was designed to capture data on the composition of the first responder participants as it related to gender, experience, age, position, and education. The composition of the self-confidence assessment questions was broken down into four specific measurement groups as follows:

- Emotive feelings measured by one question applied to ten separate emotions, of which five are considered positive and five are considered negative.
- Self-confidence in:
    - knowledge and
    - skills
- Self-confidence in abilities
- Satisfaction with COBRA training

The mean age of the group as a whole was thirty-three with a minimum age of eighteen and a maximum age of sixty-five. Graphic representation shows a rapid drop in the number of participants represented past the age of thirty-five. (See Figure 3. Participants Age Histogram)

The male to female ratio was one hundred forty-four male participants to forty female participants, of which the female participants were primarily represented in the occupation of healthcare with 29 out of 40 women in a healthcare job family. Frequency analysis of the demographic data demonstrates that the participants were composed of nine specific job types, with fire services being the most represented type of first responder.

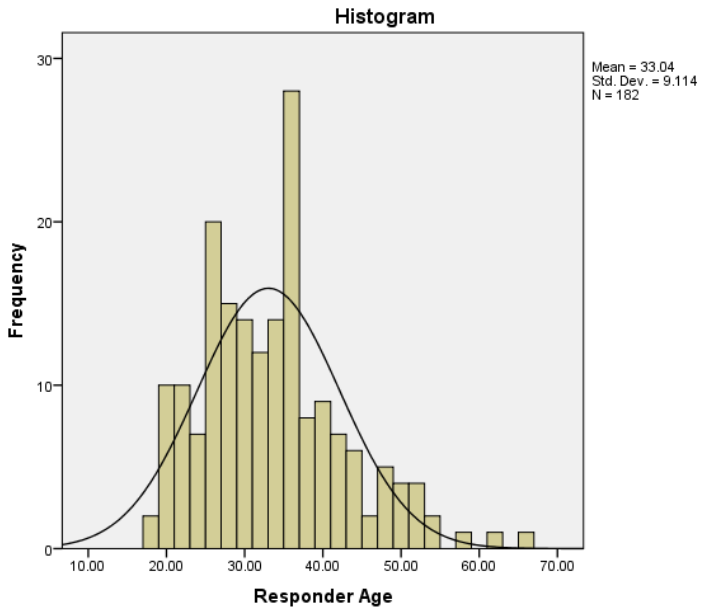

Figure 3. Participants Age Histogram

Table 2 shows the breakdown by group type cross tabulated by gender.

Table 2.

Organizational Types Cross Tabulated by Gender

Responder Organization Type Cross Tabulated by Gender			
	Responder Gender		
Responder Organization Type	**Male**	**Female**	**Total**
Fire Services	59	2	61
Emergency Medical Service (EMS)/Paramedic	13	11	24
Hazardous Materials Response Unit	14	5	19
Law Enforcement	28	2	30
Public Safety Communications	1	0	1
Emergency Management	4	2	6
Public Works	3	0	3
Public Health	2	5	7
Hospital Healthcare	6	5	11
Other Healthcare	14	8	22
Total	144	40	184

The most represented educational level was Associates Degree with higher educational

levels representing only 8.1% of the group. (See Table 3. First Responder Education Level)

Table 3 *First Responder Education Level*

Participants Educational Level in Years

	Years of Education	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	9.00	10	5.4	5.4	5.4
	12.00	53	28.8	28.8	34.2
	14.00	106	57.6	57.6	91.8
	16.00	12	6.5	6.5	98.4
	18.00	1	.5	.5	98.9
	20.00	2	1.1	1.1	100.0
	Total	184	100.0	100.0	

The largest representation for position was “operator” which corresponded with basic fire fighter, patrolman, nurse, emergency medical technician/paramedic, hazardous materials technician, and other entry level job family positions. There were one hundred twenty-nine participants identified as “operator”, with the largest number of individuals in the operator group having high school graduate or equivalent as their educational level. (See Table 4. First Responders Education Level Cross Tabulated with Participants Position)

Table 4.

First Responders Education Level Cross Tabulated with Participants Position

First Responders Education Level Cross Tabulated with Participants Position

Responder Education Level	Operator	Supervisor	Team Leader	Management	Executive Management	Other	Total
Some High School, no Diploma	9	0	0	0	0	1	10
High School Graduate or Equivalent	45	2	3	1	1	1	53
Some College Credit, no Degree	12	2	1	0	0	0	15
Trade/Technical/Vocational Training	25	7	3	3	0	1	39

Associate Degree	31	8	5	6	1	1	52
Bachelor's Degree	7	1	2	1	0	1	12
Master's Degree	0	0	0	1	0	0	1
Professional Degree	0	0	1	0	0	1	2
Total	129	20	15	12	2	6	184

The last two demographic questions requested information as to whether or not the participants had prior COBRA training and whether or not the participants had ever had any previous experience working in a toxic chemical or biological agent environment other than in COBRA training. A cross tabulation between the data collected for these two demographic questions produced the following results:

Table 5.

Previous COBRA Training Cross Tabulated with Previous Experience Operating in a Toxic Chemical Environment

Previous COBRA Training Cross Tabulated with Previous Experience Operating in a Toxic Chemical Environment

		Previous Experience Operating in a Toxic Chemical or Biological Environment		
		No	Yes	Total
Previous COBRA Training	No	119	34	153
	Yes	15	16	31
Total		134	50	184

When the variables in the aforementioned cross tabulation were subjected to a Chi Square analysis for significance, as the following table demonstrates, there is a probability with p <= .05, that the results are indicative of significance concerning COBRA training, and actual operations in a toxic chemical or biological environment. (See Table 6. Chi-Square Tests for

Significance Previous COBRA Training Cross Tabulated with Previous Experience Operating in a Toxic Chemical Environment).

Table 6.

Chi-Square Tests for Significance Previous COBRA Training Cross Tabulated with Previous Experience Operating in a Toxic Chemical Environment

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	11.252[a]	1	0.001		
Continuity Correction [b]	9.815	1	0.002		
Likelihood Ratio	10.240	1	0.001		
Fisher's Exact Test				0.002	0.001
Linear-by-Linear Association	11.190	1	0.001		
N of Valid Cases	184				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.42.

b. Computed only for a 2x2 table

Demographic question number 7 was asked to determine if the participant had requested or been required to attend COBRA training. This demographic question was subjected to further analysis through cross tabulation and correlation analysis. Cross tabulation of demographic questions 7, 8, and 9, indicated that thirty-one participants had previous COBRA training of which sixteen were required to have COBRA training. Furthermore, fifty of the participants had previous experience operating in a toxic chemical or biological agent environment, of which twenty-four were required to have COBRA training. Finally, correlation analysis indicated that there is a significant correlation between previous experience operating in a toxic chemical or biological agent environment and requesting COBRA training.

Preliminary Test for Biased Attitude

There was a total of thirty psychological variables which the self-assessment surveys

presented to the participants. These thirty variables were broken down into four groups, each of which examined a specific facet of the COBRA training as it related to the self-confidence of the participants. The breakdown of the four specific groups is as follows:

- Emotive feelings (emotions) were measured by one question applied to ten separate emotions.
    - five emotions are considered positive and
    - five are considered negative.
- One question assessing self-perceived self-confidence in eight characteristics of chemical or biological agent response knowledge and skills.
- One question assessing self-perceived self-confidence in seven characteristics of chemical or biological agent response abilities.
- One question assessing self-perceived satisfaction with five characteristics of COBRA training.

These thirty psychological variables and nine demographic variables in their respective groups were subjected to several tests to ensure that the surveys, both pre and post-training, were valid:

- Testing to ensure that the questions asked measured what they were meant to measure.
- Testing to ensure that the participants actually understood the questions being asked.
- Testing to determine if the study as applied actually constituted a legitimate quasi-experiment.
- Hypothesis testing.
- Testing to ensure that the participants could actually differentiate the differences between variables.

- Regression analysis to determine whether or not the surveys were efficient, to determine if predictors of the participant's satisfaction could be identified, and to further test the hypotheses.

One Sample t-test to Analyze Validity of Survey Data

Analysis of the surveys was conducted using the following tests respective to the previous bullet list. The first analysis was a one sample t-test of each group of attributes separated by their pre and post-training survey designations. (See Table 7. One-Sample T-Test to Ensure Validity of the Survey Questions)

Table 7

One-Sample T-Test to Ensure Validity of the Survey Questions

One-Sample T-Test to Ensure Validity of Survey Questions

Psychological Variable Attributes	Variables	Pre-Training Survey Results				Post Training Survey Results		
		Test Value = 3				Test Value = 3		
		t	df	Sig (2-tailed)		t	df	Sig. (2-tailed)
Emotions	Optimistic	10.74	182	0.00		11.99	179	0.00
	Depressed	-26.46	182	0.00		-27.00	179	0.00
	Stressed	-5.78	181	0.00		-12.56	179	0.00
	Annoyed	-22.56	181	0.00		-23.79	179	0.00
	Nervous	-5.31	181	0.00		-14.11	179	0.00
	Fearful	-12.18	181	0.00		-15.42	179	0.00
	Relaxed	2.18	181	0.03		6.78	179	0.03
	Confident	10.27	180	0.00		15.80	180	0.00
	Energetic	12.88	182	0.00		14.78	176	0.00
	Alert	25.28	180	0.00		27.09	174	0.00

One-Sample T-Test to Ensure Validity of Survey Questions

Psychological Variable Attributes	Variables	Pre-Training Survey Results			Post Training Survey Results		
		Test Value = 3			Test Value = 3		
		t	df	Sig (2-tailed)	t	df	Sig (2-tailed)
Confidence in Knowledge	Responder Understands Characteristics of Toxic Chemical and Biological Agents	19.34	183	0.00	30.06	180	0.00
	Responder Understands Exposure Paths of Toxic Chemical and Biological Agents	22.00	183	0.00	30.82	180	0.00
	Responder Understands Hazards of Toxic Chemical and Biological Agents	23.19	183	0.00	35.31	180	0.00
	Responder Understands the Results of Exposure to Toxic Chemical and Biological Agents	23.29	183	0.00	31.93	180	0.00
Confidence in Skills	Responder Understands How to Operate in a Toxic Chemical or Biological Agent Environment	17.47	183	0.00	33.89	180	0.00
	Responder Understands How to Perform Personal Decontamination Measures in a Toxic Chemical and Biological Agent Environment	22.83	183	0.00	34.89	180	0.00
	Responder Understands How to use Personal Protective Equipment	27.09	183	0.00	38.18	180	0.00
	Responder Knows How to Work with Others in a Toxic Chemical and Biological Agent Environment	26.46	183	0.00	37.75	180	0.00

One-Sample T-Test to Ensure Validity of Survey Questions

Psychological Variable Attributes	Variables	Pre-Training Survey Results			Post Training Survey Results		
		Test Value = 3			Test Value = 3		
		t	df	Sig (2-tailed)	t	df	Sig (2-tailed)
Confidence in Abilities	Responder is Confident in Their Ability to Operate in a Toxic Chemical and Biological Agent Environment	20.25	183	0.00	20.25	183	0.00
	Responder is Confident in their Ability to Perform Personal Decontamination Procedures	20.78	183	0.00	20.78	183	0.00
	Responder is Confident in their Ability to use Personal Protective Equipment	26.81	183	0.00	26.81	183	0.00
	Responder is Confident in Their Ability to Work with Others in a Toxic Chemical and Biological Agent Environment	25.81	183	0.00	25.81	183	0.00
	Responder Believes in Their PPE to Protect them in a Toxic Chemical and Biological Agent Environment	24.11	183	0.00	24.11	183	0.00
	Responder Believes Their Agent Identification Equipment Will Work in a Toxic Chemical and Biological Agent Environment	21.10	183	0.00	21.10	183	0.00
	Responder Has Trust in Their Decontamination Equipment	20.70	183	0.03	20.70	183	0.03
Satisfaction	Responder Feels Training Will Reduce Stress	22.77	183	0.000	32.84	180	0.000
	Responder Feels Training Will Increase Self-Confidence	29.58	183	0.000	39.29	180	0.000
	Responder Feels Training Will Increase Knowledge to Operate in a Toxic Environment	31.74	183	0.000	36.28	180	0.000
	Responder Feels Training Will Prepare Responder to Use Proper Equipment	29.87	183	0.000	34.98	180	0.000
	Responder Feels Training Will Prepare Them to Work in Toxic Agent Environment	30.27	183	0.000	37.04	179	0.000

The one sample t-test conducted for all of the variables, in both the pre-survey and post survey sets, was conducted in order to determine if the responses provided by the participants, were not equal to three on the Likert scale. If the answers were all equal to three, for any variable, then that may indicate the question was incorrectly worded, or the participant did not understand the question and in seeking to complete the surveys, simply checked the middle box for all of the surveys. The results of the eight separate groups of t-tests wherein df >= 174, t >= 2.175, and p<= .05 indicated that 100% of the variables were significant in both the pre and post-training survey assessments.

Descriptive Statistics

Testing to determine if the participants actually understood the questions that were being asked was carried out by calculating the interclass correlation coefficient (r_{WG}) for each attribute both pre and post survey. (See Table 8. Calculated Interclass Correlation Coefficient (r_{WG})). Using the standard deviation from the previous table (Table 7), the interclass correlation coefficient was calculated with the formula $1-(SD^2/2)$ for each variable in the pre and post survey assessments.

The resulting interclass correlation coefficient interrater agreement score was then posted next to the standard deviation from which it was calculated. Also displayed in the table are the means for each of the eight groups of variables which provides a big picture view of the varying degrees of choices made by the participants with regards to how wide the distribution of values was. As can be clearly seen in both the pre and post-training results, emotions had a much wider variance than the other psychological variables. Scale analysis was determined as needed in order to balance the regression analysis, due to the widely varying distribution of values.

Table 8.

Calculated Interclass Correlation Coefficient (r_{WG})

Descriptive Statistics with Interclass Correlation Coefficient (r_{WG})

Psychological Attribute Groups	Variables	Pre-Training Survey Results				Post Training Survey Results			
		N	Mean	Std. Deviation	r_{WG}	N	Mean	Std. Deviation	r_{WG}
Emotions	Optimistic	183	3.77	0.96	0.54	180	3.93	1.04	0.45
	Depressed	183	1.42	0.81	0.67	180	1.38	0.81	0.68
	Stressed	182	2.49	1.19	0.29	180	2.08	0.98	0.52
	Annoyed	182	1.53	0.88	0.62	180	1.47	0.86	0.63
	Nervous	182	2.55	1.14	0.35	180	1.97	0.98	0.52
	Fearful	182	2.03	1.07	0.43	180	1.81	1.03	0.46
	Relaxed	182	3.18	1.12	0.37	180	3.56	1.10	0.40
	Confident	181	3.77	1.01	0.49	181	4.12	0.95	0.55
	Energetic	183	3.86	0.91	0.59	177	3.99	0.90	0.60
	Alert	181	4.43	0.76	0.71	175	4.50	0.73	0.73
	Variables	**Pre-Training Survey Results**				**Post Training Survey Results**			
Confidence in Knowledge	Responder Understands Characteristics of Toxic Chemical and Biological Agents	184	4.02	0.71	0.75	181	4.34	0.60	0.82
	Responder Understands Exposure Paths of Toxic Chemical and Biological Agents	184	4.13	0.70	0.76	181	4.40	0.61	0.81
	Responder Understands Hazards of Toxic Chemical and Biological Agents	184	4.18	0.69	0.76	181	4.45	0.55	0.85
	Responder Understands the Results of Exposure to Toxic Chemical and Biological Agents	184	4.20	0.70	0.76	181	4.41	0.60	0.82
	Variables	**Pre-Training Survey Results**				**Post Training Survey Results**			
Confidence in Skills	Responder Understands How to Operate in a Toxic Chemical or Biological Agent Environment	184	3.99	0.77	0.70	181	4.44	0.57	0.84
	Responder Understands How to Perform Personal Decontamination Measures in a Toxic Chemical and Biological Agent Environment	184	4.15	0.68	0.77	181	4.46	0.56	0.84

	Responder Understands How to use Personal Protective Equipment	184	4.28	0.64	0.80		181	4.51	0.53	0.86
	Responder Knows How to Work With Others in a Toxic Chemical and Biological Agent Environment	184	4.22	0.62	0.81		181	4.50	0.53	0.86
Psychological Attribute Groups	**Variables**	**Pre-Training Survey Results**					**Post Training Survey Results**			
Confidence in Abilities	Responder Confident in Their Ability to Operate in a Toxic Chemical and Biological Agent Environment	184	4.07	0.71	0.75		181	4.44	0.57	0.84
	Responder Confident in Their Ability to Perform Personal Decontamination Procedures	184	4.11	0.72	0.74		181	4.43	0.59	0.83
	Responder Confident in Their Ability to Use Personal Protective Equipment	184	4.29	0.65	0.79		181	4.53	0.54	0.85
	Responder Confident in Their Ability to Work with Others in a Toxic Chemical and Biological Agent Environment	184	4.23	0.65	0.79		181	4.51	0.54	0.85
	Responder Believes in Their PPE to Protect Them in a Toxic Chemical and Biological Agent Environment	184	4.28	0.72	0.74		181	4.53	0.55	0.85
	Responder Believes Their Agent Identification Equipment Will Work in a Toxic Chemical and Biological Agent Environment	184	4.14	0.73	0.73		181	4.44	0.62	0.81
	Responder Has Trust in Their Decontamination Equipment	184	4.14	0.75	0.72		181	4.47	0.59	0.82
	Variables	**Pre-Training Survey Results**					**Post Training Survey Results**			
Satisfaction	Responder Feels Training Will Reduce Stress	184	4.29	0.77	0.71		181	4.51	0.62	0.81
	Responder Feels Training Will Increase Self-Confidence	184	4.43	0.66	0.78		181	4.61	0.55	0.85
	Responder Feels Training Will Increase Knowledge to Operate in a Toxic Environment	184	4.44	0.62	0.81		181	4.56	0.58	0.83
	Responder Feels Training Will Prepare Responder to use Proper Equipment	184	4.43	0.65	0.79		181	4.56	0.60	0.82
	Responder feels Training Will Prepare Them to Work in Toxic Agent Environment	184	4.43	0.64	0.79		180	4.57	0.57	0.84

The results of interclass correlation coefficient (r_{WG}) interrater agreement calculations for

all of the variables in the psychological variable groups “Confidence in Knowledge”, “Confidence in Skills”, “Confidence Abilities”, and “Satisfaction” resulted in a scoring of an interclass correlation coefficient interrater agreement > = .70. Those variables in the psychological variable group “Emotions” achieved an interclass correlation coefficient interrater agreement between .29 and .73, of which only the emotion “Alert” scored greater than .70, wherein it achieved a score of .71 in the pre-training survey and .73 in the post-training survey.

Emotions are difficult to measure as they vary from person to person based on everything that makes up an individual’s life. The .29 ICC (r_{WG}) achieved by the emotion “Stressed” in the pre-training survey demonstrates that the disagreement between the participants was quite large and as such the (r_{WG}) result was very low. The .73 ICC (r_{WG}) achieved by the emotion “Alert” was high because there was close agreement by the participants as to their alertness. When the (r_{WG}) was low the standard deviation was higher resulting in a flatter curve, and when the (r_{WG}) was high the standard deviation was lower, resulting in a narrower curve. What this indicated, was that the results were not evenly distributed across all of the variables, thus they would skew the regression analysis unless they were weighted. It was this effect which required a scale analysis to be conducted in order to more efficiently analyze the regression.

Inferential Statistics

Paired Sample T-test (Hypotheses Test)

In order to determine if the application of the surveys as administered constituted a true quasi-experiment, a paired sample t-test was conducted using each set of variables of the pre-training survey matched to each set of variables of the post-training survey for a total of thirty matched (paired) variables. This particular analysis is also referred to as hypothesis testing,

wherein significance dictated the ability to reject a null hypothesis (See Table 9. Results of Paired Sample t-test (Hypothesis Test)). Significance for this study is set at p <= .05 or at the 95% confidence level. The paired-samples t-test was also conducted in order to compare the participant's self-assessment of self-confidence scores from the pre-training survey to the self-assessment of self-confidence scores of the post-training survey. Significance in this instance would support the hypothesis that there is a correlation between increased self-confidence and COBRA training. In as much as determining if there was indeed a correlation between the participant's self-confidence and COBRA training addresses the research issues of this study, the paired samples t-test was critical to the overall success of the study.

Table 9

Results of Paired Sample t-test (Hypothesis Test)

Paired Sample t-test (Hypothesis Test)

Psychological Attribute Groups	Variables	Mean of the Difference	t	df	Sig. (2-tailed)
Emotions	optimistic	0.18	2.56	179	0.01
	depressed	-0.05	-0.69	179	0.49
	stressed	-0.41	-4.94	178	0.00
	annoyed	-0.07	-0.94	178	0.35
	nervous	-0.58	-6.70	178	0.00
	fearful	-0.22	-2.58	178	0.01
	relaxed	0.37	3.97	178	0.00
	confident	0.36	4.29	177	0.00
	energetic	0.13	2.08	175	0.04
	alert	0.08	1.27	172	0.21
Confidence in Knowledge	Responder Understands Characteristics of Toxic Chemical and Biological Agents	0.33	6.86	180	0.00
	Responder Understands Exposure Paths of Toxic Chemical and Biological Agents	0.28	5.66	180	0.00
	Responder Understands Hazards of Toxic Chemical and Biological Agents	0.28	5.64	180	0.00
	Responder Understands the Results of Exposure to Toxic Chemical and Biological Agents	0.22	4.48	180	0.00

Psychological Attribute Groups	Variables	Mean of the Difference	t	df	Sig. (2-tailed)
Confidence in Skills	Responder Understands How to Operate in a Toxic Chemical or Biological Agent Environment	0.46	8.24	180	0.00
	Responder Understands How to Perform Personal Decontamination Measures in a Toxic Chemical and Biological Agent Environment	0.31	6.48	180	0.00
	Responder Understands How to Use Personal Protective Equipment	0.24	5.20	180	0.00
	Responder Knows How to Work with Others in a Toxic Chemical and Biological Agent Environment	0.29	5.91	180	0.00
Confidence in Abilities	Responder Confident in Their Ability to Operate in a Toxic Chemical and Biological Agent Environment	0.39	7.40	180	0.00
	Responder Confident in Their Ability to Perform Personal Decontamination Procedures	0.34	5.95	180	0.00
	Responder Confident in Their Ability to Use Personal Protective Equipment	0.25	5.47	180	0.00
	Responder Confident in Their Ability to Work with Others in a Toxic Chemical and Biological Agent Environment	0.29	5.99	180	0.00
	Responder Believes in Their PPE to Protect Them in a Toxic Chemical and Biological Agent Environment	0.26	4.87	180	0.00
	Responder Believes Their Agent Identification Equipment Will Work in a Toxic Chemical and Biological Agent Environment	0.31	5.49	180	0.00
	Responder Has Trust in Their Decontamination Equipment	0.34	6.16	180	0.00
	Variables				
Satisfaction	Responder Feels Training Will Reduce Stress	0.23	3.92	180	0.00
	Responder Feels Training Will Increase Self-Confidence	0.19	3.95	180	0.00
	Responder Feels Training Will Increase Knowledge to Operate in a Toxic Environment	0.13	2.77	180	0.01
	Responder Feels Training Will Prepare Responder to use Proper Equipment	0.14	2.61	180	0.01
	Responder feels Training Will Prepare Them to Work in Toxic Agent Environment	0.16	3.05	179	0.00

The paired sample t-test demonstrated that of the 30 paired variables analyzed, only the following three variables are indicated as being non-significant:

- Alert
- Annoyed
- Depressed

All other variables were determined to be significant with the lowest score being $t_{175} = 2.076$, $p <= .05$ and the highest score being $t_{180} = 8.238$, $p <= .05$. Furthermore, the highest t-scores were associated with those psychological variables which were focused on determining if there is a correlation between COBRA training and the participant's self-confidence to work in a toxic chemical or biological environment.

Scale Analysis

Table 10

Scale Analysis

Scale Analysis for

Attributes (Emotions)	Variables	Factor 1	Factor 2	Factor 3	α	r bar
Positive Emotions	optimistic	0.46			0.68	0.34
	relaxed	0.49				
	confident	0.66				
	energetic	0.8				
	alert	0.51				
Negative Emotions (TRNG)	stressed		0.63		0.59	0.51
	nervous		0.71			
	fearful		0.7			
Negative Emotions (DUTY)	depressed			0.64	0.63	0.44
	annoyed			0.62		

Scale Analysis

Attributes (Knowledge and Skills)	Variables	Factor 1	Factor 2	Factor 3	α	r bar
Confidence in Knowledge	Responder Understands Characteristics of Toxic Chemical and Biological Agents	0.64			0.73	0.66
	Responder Understands Exposure Paths of Toxic Chemical and Biological Agents	0.81				
	Responder Understands Hazards of Toxic Chemical and Biological Agents	0.74				
	Responder Understands the Results of Exposure to Toxic Chemical and Biological Agents	0.73				
Confidence in Skills	Responder Understands How to Operate in a Toxic Chemical or Biological Agent Environment		0.62		0.73	0.66
	Responder Understands How to Perform Personal Decontamination Measures in a Toxic Chemical and Biological Agent Environment		0.74			
	Responder Understands How to Use Personal Protective Equipment		0.7			
	Responder Knows How to Work with Others in a Toxic Chemical and Biological Agent Environment		0.84			

Scale Analysis

Attributes (Abilities)	Variables	Factor 1	Factor 2	Factor 3	α	r bar
Confidence in Abilities	Responder Confident in Their Ability to Operate in a Toxic Chemical and Biological Agent Environment	0.83			0.85	0.67
	Responder Confident in Their Ability to Perform Personal Decontamination Procedures	0.82				
	Responder Confident in Their Ability to Use Personal Protective Equipment	0.84				
	Responder Confident in Their Ability to Work with Others in a Toxic Chemical and Biological Agent Environment	0.86				
	Responder Believes in Their PPE to Protect Them in a Toxic Chemical and Biological Agent Environment	0.85				
	Responder Believes Their Agent Identification Equipment Will Work in a Toxic Chemical and Biological Agent Environment	0.85				
	Responder Has Trust in Their Decontamination Equipment	0.87				

The factor analysis results indicated that there should be three “emotion” factors, one “knowledge” factor”, one “skill” factor”, and one “confidence” factor. This resulted in the need to create six new psychological attribute variables. The creation of these six new variables meant that the attribute groups were split into different groups than those which were represented by the survey instruments. These new groups are simply specific variables from the original groups recombined to create more efficient variables. These variables were created in the following manner:

- The means of the differences between the pre and post-training surveys for the five positive emotions were combined and averaged to create the new variable, "*ACM (Average of Combined Means) Positive Emotions*",
- The means of the differences between the pre and post-training surveys for three negative emotions, "*Stressed*", "*Fearful*", and "*Nervous*" were combined and averaged to create the new variable, "*ACM (Average of Combined Means) Negative Emotions Training*",
- The means of the differences between the pre and post-training surveys for two negative emotions, "*Annoyed*", and "D*epressed*" were combined and averaged to create the new variable, "*ACM (Average of Combined Means) Negative Emotions Duty*",
- The means of the differences between the pre and post-training surveys for the first four psychological variables of section two "Confidence in Knowledge and Skills", were combined and averaged to create the new variable, "*ACM (Average of Combined Means) Knowledge*",
- The means of the differences between the pre and post-training surveys for the next four psychological variables of section two "Confidence in Knowledge and Skills", were combined and averaged to create the new variable, "*ACM (Average of Combined Means) Skills*",
- The means of the differences between the pre and post-training surveys for all seven psychological variables of section three "Confidence (Abilities)", were combined and averaged to create the new variable, "*ACM (Average of Combined Means) Confidence*".

Correlation Analysis

Once the new variables had been identified and calculated, a correlational analysis was conducted to determine how closely the demographic variables and the psychological variables correlated. The results of the correlation analysis also answered hypotheses H_6 – H_{10} where it was hypothesized that the participant's satisfaction with training would be highly correlated with the new variables,

Table 11

Correlation Matrix

Correlational Matrix																	
	Responder Gender	Education Level	Time in Responder Occupation	Responder Position	Responder Organization Type	Reason Responder Attended Training	Previous COBRA Trng	Previous Exp Operating in a Toxic Env	Positive Emotions	Negative Emotions Training	Negative Emotions Duty	Confidence in Knowledge	Confidence in Skills	Confidence in Abilities	Post Satisfaction	
Responder Age	-.325**	.297**	.619**	.252**	-.150*	.246**	.192**	0.14	-0.09	0.07	-0.12	0.01	0.03	-0.03	0.11	Responder Age
	0.00	0.00	0.00	0.00	0.04	0.00	0.01	0.07	0.25	0.36	0.12	0.88	0.64	0.74	0.14	
	Responder Gender	0.09	-.272**	0.05	.274**	-0.12	-0.03	0.06	0.15	-.168*	0.09	0.10	0.10	.157*	-0.10	Responder Gender
		0.24	0.00	0.47	0.00	0.10	0.73	0.39	0.05	0.02	0.23	0.19	0.17	0.03	0.18	
		Education Level in Years	0.10	.240**	.191**	0.11	0.08	0.03	-0.02	-0.05	-0.04	0.03	0.05	0.06	0.01	Education Level in Years
			0.16	0.00	0.01	0.14	0.27	0.73	0.81	0.51	0.64	0.71	0.46	0.41	0.84	
			Time in Responder Occupation	0.02	-.285**	.354**	.186*	.231**	-0.09	0.07	-0.04	-.188*	-0.11	-0.11	0.00	Time in Responder Occupation
				0.78	0.00	0.00	0.01	0.00	0.23	0.37	0.59	0.01	0.14	0.15	0.98	
				Responder Position	.214**	0.11	.234**	0.08	-0.03	-0.01	-0.08	0.05	0.05	0.12	0.07	Responder Position
					0.00	0.13	0.00	0.27	0.72	0.92	0.31	0.50	0.53	0.11	0.34	
					Responder Organization Type	-.154*	-0.01	-0.07	-0.04	0.05	0.02	0.05	0.12	0.14	-0.09	Responder Organization Type
						0.04	0.86	0.37	0.63	0.51	0.75	0.51	0.11	0.05	0.21	
						Reason Responder Attended	0.06	0.13	0.06	0.00	0.07	-0.11	-0.07	-0.07	0.09	Reason Responder Attended
							0.38	0.07	0.44	0.97	0.35	0.14	0.38	0.38	0.23	
								.247**	-0.09	0.12	0.08	-.146*	-.149*	-0.14	0.08	

							Previous COBRA Trng	0.00	0.22	0.11	0.27	0.05	0.05	0.07	0.29	Previous COBRA Trng
								Previous Exp Operating in	-0.01	0.09	0.07	-0.05	-0.04	0.00	-0.04	Previous Exp Operating in
									0.86	0.25	0.37	0.54	0.58	0.98	0.63	
									Positive Emotions	-.213**	0.05	.205**	.286**	.317**	.303**	Positive Emotions
										0.01	0.53	0.01	0.00	0.00	0.00	
										Negative Emotions Training	.377**	-0.14	-.161*	-.198**	-0.13	Negative Emotions Training
											0.00	0.07	0.03	0.01	0.08	
											Negative Emotions Duty	-0.09	-0.05	-0.10	-0.06	Negative Emotions Duty
												0.22	0.50	0.19	0.40	
												Confidence in Knowledge	.711**	.605**	.245**	Confidence in Knowledge
													0.00	0.00	0.00	
													Confidence in Skills	.715**	.294**	Confidence in Skills
														0.00	0.00	
														Confidence in Abilities	.306**	Confidence in Abilities
															0.00	

"Positive Emotions", "Negative Emotions (Training)", "Negative Emotions (Duty)", "Confidence in Knowledge", "Confidence in Skills", and "Confidence in Abilities". The majority of these new variables were highly correlated with the participant's satisfaction with training.

- $H_{6,}$ "Positive Emotions", was highly correlated with participant satisfaction with Pearson's r = .30, p<=.05.
- H_8 "Knowledge", was highly correlated with participant satisfaction with Pearson's r = .25, p<=.05.
- H_9 "Skills", was highly correlated with participant satisfaction with Pearson's r = .29, p<=.05.
- H_{10} "Abilities", was highly correlated with participant satisfaction with Pearson's r = .31, p<=.05.

However, hypothesis H_7 which was focused on whether or not the "negative emotions" that had been divided into "Negative Emotions (Training), and "Negative Emotions (Duty) were correlated with participant satisfaction, was in fact not correlated with participant satisfaction.

Regression Analysis

Testing H_{11}.of the study was conducted using regression analysis (forward) to determine if the regression excluded the twelve variables that were highly correlated with participant satisfaction because many of the independent variables are highly correlated to each other. In order to avoid a collinear effect, a forward selection method was used in the regression analysis. The expectation was that demographic variables and the psychological variables, "Positive Emotions", "Confidence in Knowledge", "Confidence in Skills", and "Confidence in Abilities",

would prove to be predictors of the participants satisfaction with COBRA training.

The results of this analysis indicated that $R^2 = .415 < .70$ with an Adjusted R^2 of .173, as the scoring of efficiency of the study, or goodness of fit.

The variables used to calculate the regression were all nine of the demographic variables and the psychological variables, “Positive Emotions”, “Negative Emotions (Training)”, “Negative Emotions (Duty)”, “Confidence in Knowledge”, “Confidence in Skills”, and “Confidence in Abilities”. The means of the five variables of section four “Satisfaction”, of the post-training survey, which were focused on participant satisfaction were added and averaged to create the dependent variable for the regression analysis.

The One-way ANOVA calculated in combination with the regression analysis indicated that F = 11.328, $df_{3,163}$ with F critical at 3.739, thus F > than 3.739, p <= 0.05.

Table 12.

One-way ANOVA through Regression Analysis

One Way ANOVA Through Regression Analysis

	Sum of Squares	df	Mean Square	F	Sig.
Regression	8.981	3	2.994	11.328	.000[d]
Residual	43.073	163	0.264		
Total	52.054	166			

The regression calculation furthermore, generated specific variables which would be considered to be predictors of the participants satisfaction with the training received. The expectation was that one or more demographic variables, the positive emotion variables, the negative emotion variables, and the confidence variables, would prove to be significant indicators of the satisfaction of the participants with COBRA training.

The significant indicators of the participant’s satisfaction with COBRA training were

determined by the regression analysis as the following:

- the responder demographic variable “gender”,
- the positive emotion variables, and
- the confidence variables.

The confidence and positive emotion variables were both positively significant with slopes of .233 and .194 respectively. Furthermore, there was minimal variation on these slopes, with β indicating tight groupings along the slope at .256 and .240 respectively. (See Figure 5. Regression Analysis Scatter Plot). T-scores for confidence variables and positive emotion variables were calculated to be $t_{3,163}$, 3.395 and 3.189 respectively, with $p <= 0.05$. Furthermore, when observed through the perspective of Pearson’s r, the correlation between the averaged consolidated means of the confidence variables and the dependent variable was, $r = 0.306$, $p <= 0.05$, with $N = 180$. Meanwhile the correlation between the mean consolidated averages of the positive emotions and the dependent variable was $r = 0.303$, $p <= 0.05$, with $N = 171$.

Table 13.

Regression Analysis Identified Coefficient Predictors

Identified Predictor Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	4.490	0.049		92.556	0.000
Confidence Variables	0.233	0.069	0.256	3.395	0.001
Positive Emotion Variables	0.194	0.061	0.240	3.189	0.002
Responder Gender	-0.257	0.099	-0.188	-2.597	0.010

The third predictor variable was responder gender $t_{3,163}$ -2.597, $p <= 0.05$. The correlation

for Pearson's r between responder gender and the DV however was somewhat tenuous with r = -0.10, p >= 0.05, which was indicated as non-significant in the correlation matrix.

The plot for the slope of these three variables was plotted next to a standardized chart, in order to demonstrate the goodness of fit graphically. As can be seen with Figure 4 and Figure 5 in comparison, the goodness of fit as predicted by the model seems to be excellent, with minimal variation. Figure 4 is a normalized P-Plot and Figure 5 is this study's regression analysis scatter plot. As noted above, the R for the goodness of fit is R^2 = .415 with Adjusted R^2 = .173.

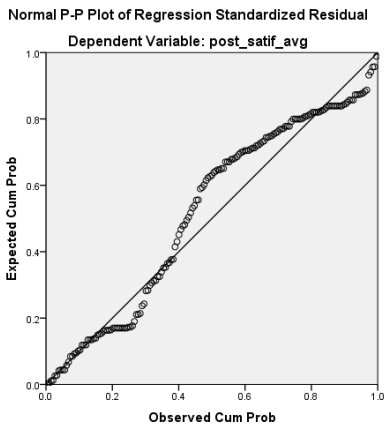

Figure 4. Normalized P-Plot

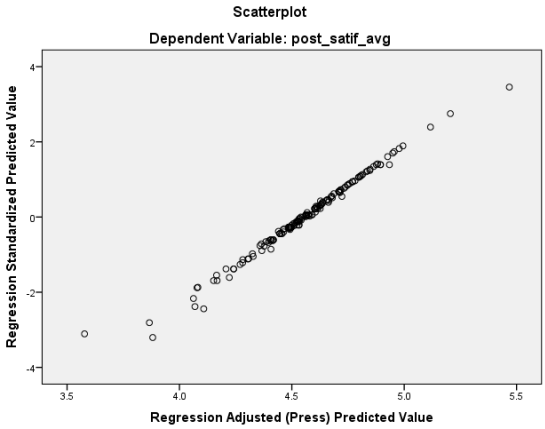

Figure 5. Regression Analysis Scatter Plot

Linear regression analysis was used to test if the psychological and demographic attributes significantly predicted participant's rankings of satisfaction with COBRA training. The regression analysis calculated that there were three predictors among the fourteen psychological and demographic variables used to populate the regression. The results of the regression indicated that the three predictors explained 17.3% of the variance (R^2 = .173, F(3,166)=11.33, p<.05). It was found that psychological attribute "Difference of the Mean of Confidence", significantly predicted satisfaction with COBRA training (β = .26, p<.05), as did psychological attribute "Difference of the Mean of Positive Emotions", (β = .24, p<.05) and demographic

variable "Gender", (β = -.19, $p<.05$). The main effect of "Confidence" was significant $F(1,165)$ = 17.075, MSE = 4.882, $p < .05$, with the main effect of "Positive Emotions" also significant $F(2,164)$ = 13.161, MSE = 3.599, $p < .05$ and "Gender" $F(3,163)$ = 11.328, MSE = 2.994, $p <$ .05.

An additional regression analysis focused on the three largest subgroups of the first responder participants attending COBRA training, was conducted in an effort to ensure the rigor of the study. The three largest sub groups of the study were fire services, law enforcement, and healthcare. (See Table 14. Regression Analysis of Sub-groups).

Linear regression analysis was used to test if the psychological and demographic attributes for the healthcare subgroup significantly predicted participants' feelings of satisfaction with COBRA training. The results of the regression indicated that three predictors explained 25% of the variance (R^2 =.25, $F_{(3,54)}$=7.340, $p<.05$). It was found that psychological attribute "ACM Skills" significantly predicted satisfaction (β = .432, $p<=.05$), as did the demographic variable, "Reason Responder Attended Training" (β = .357, $p<=.05$), and the demographic variable, "Previous COBRA Training" (β = .235, $p<=.05$).

Linear regression analysis was also used to test if the psychological and demographic attributes for the fire services subgroup, significantly predicted participants' rankings of satisfaction with COBRA training. The results of the regression indicated that a single predictor explained 14% of the variance (R^2 =.14, $F_{(1,52)}$=8.408, $p<.05$). It was found that psychological attribute, "Difference of the Mean of Positive Emotions", significantly predicted satisfaction (β = .373, $p<=.05$).

Finally, linear regression analysis was used to determine if the psychological and demographic attributes for the law enforcement subgroup, significantly predicted participants'

rankings of satisfaction with COBRA training. The results of the regression indicated the predictor explained 17% of the variance (R^2 =.20, $F_{(1,24)}$=6.020, p<.05). It was found that psychological attribute, “Difference of the Mean of Positive Emotions”, significantly predicted satisfaction (β = .448, p<=.05).

Analysis of the three major subgroups is tenuous at this time as the number of cases per subgroup do not exceed N=120. However, the regression indicated that the predictors for each individual sub-group were determined as being significant. As the N of participants was below 120 in the individual sub-groups, additional analysis would be required to ensure validity and is currently beyond the scope of this study.

Table 14.

Regression Analysis of Sub-groups

Regression Analysis for Three Largest Job Families

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Job Family
.373	.139	.123	.55435	Fire Services
.488	.201	.167	.42952	Law Enforcement
.538	.290	.250	.46917	Healthcare

Summary

Frequency analysis, descriptive statistics, hypothesis testing, factor analysis, and regression analysis have been applied to the data collected from the 184 participants of this study. No survey took more than 10 minutes to complete, and all of the surveys were completed electronically on iPads maintained by the CDP. The surveys were administered as part and parcel of each participant’s administrative course work, before training began, and after the last active agent exercise, in an effort to reduce bias. The surveys were designed to collect data, which was

analyzed to determine if there is a correlation between COBRA training and increased self-confidence of first responders to work in a toxic chemical or biological agent environment. The results of the analysis allow for several conclusions to be made which will be discussed in Chapter 5.

CHAPTER 5 - FINDINGS AND DISCUSSION

Summary

First responders have been noted as being in the front lines of our nation's defense against the accidental or intentional releases of toxic chemical or biological agents. They are the ones who are trained to enter into hazardous situations, wherein there is a high probability of exposure to these harmful agents, which may result in injury or death. The nature of their jobs requires that they be trained to recognize and respond to these threats with the knowledge, skills, and abilities, which when supported with the appropriate equipment, allows them to effectively neutralize those threats. However, if the individual responder is not confident in themselves and their abilities, then there is the chance that they can falter or hesitate at a critical moment in time.

The CDP trains first responders in the knowledge, skills, and abilities required to work in a toxic chemical or biological agent environment as well as providing instruction on the appropriate equipment to use when doing so (FEMA, 2018c). However, leadership at the CDP needed to know whether the training the first responders were receiving at the COBRATF was positively impacting the first responder's self-confidence. Increases in self-confidence should support the response actions of first responders in real world events.

The army conducted testing during the late 1980's and early 1990's (Tyler et al., 1989) (Ursano, 1989) (Healy et al., 1992) (Fatkin & Hudgens, 1994) to determine if there were increases of self-confidence in individual soldiers of the Army's Chemical Corps who had undergone training at the CDTF, which later became the CDP. Although this testing seemed to demonstrate positive increases in the self-confidence of the individual soldiers to work in a contaminated environment, there are differences in the way the military trains versus the way in

which civilian first responders train (Cole, 2014) (Pease et al., 2016). There has never been extensive testing on the perceived increases of self-confidence of civilian first responders since the Department of Justice (DOJ) took over the CDTF in 1998 and renamed it the Center for Domestic Preparedness (Fenn, 2015). When the DOJ took control of training at the CDP, the department also renamed the CDTF for toxic chemical agent training as the Chemical Ordnance Biological Radiological (COBRA) Training Facility.

The CDP, working with Jacksonville State University, requested research assistance in determining whether or not COBRA training increased the self-confidence of civilian first responders to work in a toxic chemical or biological agent contaminated environment. In 2015 a pilot study was conducted to determine if there was a possible correlation between COBRA training and possible increases in first responders' self-confidence (Fenn, 2015). The results of the pilot study suggested that there may be such a correlation between COBRA training and first responders' self-confidence but could not conclusively state that this was in fact true. The CDP, in working with Jacksonville State University's Emergency Management Institute, felt that the results of the pilot study had merit, and requested a more formal study of this issue.

Findings

The literature review demonstrated that training of civilian first responders in a toxic chemical or biological agent environment had not previously focused on their emotions. Self-confidence is considered to be an emotive feeling about one's self-perceived abilities. Self-confidence is also considered to be malleable, (Pajares & Miller, 1994), (Senko et al., 2010) and it is thought that using toxic chemical or viable biological agents in a carefully constructed training environment can affect self-confidence in a more positive manner than simulants can

(Healy et al., 1992).

The literature review brought into focus the first finding that, while not part of the focus on self-confidence increases, what is critical to the future of COBRA training of first responders. The population of first responders is increasing faster than the COBRA training output of the CDP. As an example, the Department of Labor states that within the healthcare job family, "EMTs and Paramedics are forecast to increase at 15% per year for the foreseeable future (Bureau of Labor Statistics, 2018a). The National Registry of EMTs and Paramedics lists the number of registered EMTs and Paramedics in 2004 as being 120,000 (The National Registry, 2004) and the number in 2017 as being 375,000 (The National Registry, 2017). The CDP currently has a throughput of between two thousand and twenty-five hundred first responders per year and has maintained that output for several years (FEMA, 2018c).

Thirty-one out of one hundred and eighty-four first responders indicated that they were repeat attendees to the COBRA training course, and one hundred and eight participants were required to attend COBRA training. If first responders are required to attend COBRA training, this would indicate that if they do not attend COBRA training they could suffer negative impacts in their jobs. As the increases in first responder populations continue, the ability of any first responder to attend COBRA training at its present output per year is approximately a .04% chance.

Regression analysis indicates that the demographic variable "Gender", demonstrates negative tendencies, which may indicate that females are experiencing a negative training environment while attending COBRA training. Furthermore, correlation analysis indicates a negative correlation between participant satisfaction and gender although not significantly.

The paired sample t-testing indicates significant increases in positive emotions and in self-confidence of knowledge, skills, and abilities. Furthermore, regression analysis indicates that the created variables ACM Positive Emotions and ACM Confidence in abilities are significant predictors of participant satisfaction. The increases in self-confidence are indicated as being significant and the significance seems to be corroborated by all of the tests used to examine the data.

Paired sample t-testing indicates that negative emotions were reduced between before and after COBRA training. Although testing indicates that negative emotions had negative changes between the pre and post-training surveys, factor analysis was necessary to even out the effect of the positive emotions in overshadowing the negative emotions. The paired sample t-testing testing clearly indicates that every variable except negative emotions was increased positively between before and after COBRA training.

The additional regression analysis of job families indicated that there were different predictors of success for different job families, but that the case numbers were too low to conclusively state that they were accurate predictors.

Discussion

This study was conducted at the behest of the Federal Emergency Management Agency's Center for Domestic Preparedness, through collaboration with the Emergency Management Department of the School of Human Services and Social Sciences, Jacksonville State University. The research provides a basis for a better understanding of ways in which civilian first responders may be trained at the COBRA training facility to work in toxic chemical or biological agent environments. Knowing that training, increases the self-confidence of civilian first

responders to willingly work in environments that are contaminated with toxic chemical or biological agents, is important to ensuring the first responders receive the best training possible for their own safety as well as society's (Carol S Dweck, 1986) (C. S. Dweck & Leggett, 1988).

The results of the study further indicate that the participants were generally in agreement on the self-assessments of the psychological variables in section two and section three of the surveys. Their Interclass Correlation Coefficients (ICC) (r_{WG}) were consistent across the fifteen variables which made up these two sections. This agreement would indicate that the participants, regardless of their job family, all understood the questions and could distinguish between them. The strength of the participant agreement which was shown would strongly imply that COBRA training is a good fit for civilian first responders in all walks of life. Regression analysis further confirmed the goodness of fit which is graphically illustrated in Figure 5.

The literature review indicated that the CDP has a yearly throughput of between two thousand and twenty-five hundred first responders from the COBRA training course (FEMA, 2018c). The first responder profession in the United States has been growing rapidly since 2004 when there were only 120,000 registered EMTs and Paramedics according to the National Registry (The National Registry, 2004), and which now has 375,000 registered EMTs and Paramedics (The National Registry, 2017). The fire services and law enforcement populations have been growing as well with an expected 7% increase per year for the next several years (Bureau of Labor Statistics, 2018a), (Bureau of Labor Statistics, 2018b). This may indicate that the CDP is not keeping up with the need for trained civilian first responders capable of responding to a toxic chemical or biological agent incident.

A troubling finding was the predictor "Gender", developed through regression analysis, which was shown to be, $t_{3,163}$ -2.597, $p <= 0.05$, but when subjected to a correlation analysis for

Pearson's r, between "gender" and the dependent variable, the correlation was somewhat tenuous with $r = -0.10$, $p = 0.05$. However, the regression analysis results could indicate that the COBRA training environment for females may be less than holistically applicable to both genders (Emrey-Arras, 2015) (Schermerhorn-Collins, 2017). In other words, the COBRA training is indicated as being a negative experience for females regardless of the increases in self-confidence they may have experienced.

However, this may be a false effect generated by population, evolutionary, or cultural differences that are being limelighted unintentionally. There were nine separate job families included in this study, of which healthcare was one of the most populous. It may be possible that the mindset of the healthcare first responders may be affecting the choice of predictors chosen by the regression analysis. However, if this is a true effect then it would indicate that the CDP possibly has a hostile work environment towards females at the COBRATF. It is recommended that the CDP immediately initiate a process to determine if this is a case of hostile training environment towards females or a simple limelight effect of the female's job families effecting the analysis.

The positive increases in the means of the variables across the board except for negative emotions indicates that self-confidence was indeed influenced in a positive manner by COBRA training. This could have been a false effect generated by first day training enthusiasm and last day training relief at completing COBRA training. However, the analysis took this into account by looking at all of the variables during regression analysis, indicating that COBRA training acted as the IV and self-confidence appears to have increased as a result of the treatment.

The paired sample t-testing indicated that negative emotions were reduced between before and after COBRA training while still maintaining the negative results indicated by the

analysis is interesting. The negative emotions were measured using the same Likert scale as the positive emotions, thus when their means were examined, the differences of the means were the remainders of subtracting the pre-training survey from the post-training survey. Although it seems to be counter indicative, the fact that the negative emotions maintained a negative remainder could be a very good discovery. By maintaining a negative remainder, the negative emotions demonstrated that they in fact decreased their effect on the participants. Thus, the reduction in negative emotion as measured meant that there may have been an additional positive effect on the participants.

The research adds to the idea that emotive feelings, such as self-confidence, are malleable attributes which can be influenced through training that when properly applied can lead to increases in self-efficacy (Cook & Artino, 2016) (Carol S Dweck, 1986) (Stankov et al., 2012). In other words, when an individual feels confident, they have a higher expectation of their abilities to perform, which when linked to actual performance criteria, can demonstrate improved performance (efficacy). When the self-efficacy of an individual is demonstrated as being higher, then the true efficacy of performance can be demonstrated as increased, resulting in an overall efficiency in completed tasks. As other emotive feelings were also measured during this study, data on those feelings was also captured. “Stress” was one such feeling which was measured, and when analyzed showed a remarkable decrease between the pre-training survey and the post-training survey. “Nervous” was another negative emotive feeling which was measured and also demonstrated a distinct positive difference from before training to after training.

The emotive feelings “stressed” and “nervous” are considered to be negative feelings, and when they were measured it was on the same Likert scale as the positive emotions. Thus, when they were analyzed using a paired sample t-test, their means were calculated as being

negative. The negative means which both of these negative emotive feelings demonstrated, indicated that their effect on the participants was reduced substantially from the pre-training time period to the post-training time period;

Stressed mean of the difference = -.40782, df_{178}, t=4.939, p < = .05

Nervous mean of the difference = -.58101, df_{178}, t=6.700, p < = .05

In other words, the COBRA training reduced stress and nervousness while increasing self-confidence. The reduction in negative emotive feelings and the increase in positive emotive feelings are indicated as being directly correlated with COBRA training. The idea that COBRA training not only increases self-confidence but also reduces negative feelings, could indicate that the positive impact of COBRA training on civilian first responders to operate in a toxic chemical or biological agent environment is much greater than originally hypothesized. Determining how much of an impact the reduction of negative emotions may have on the ability of the civilian first responders to respond to, operate in, and recover from, a response to a toxic chemical or biological agent incident needs to be looked at further and will require a significant qualitative and quantitative study to be conducted.

Different job families have different needs, firemen have long been used to wearing bunker gear to enter dangerous environments and perform their jobs. Police have been wearing PPE in the form of ballistic vests and ballistic eye protection for years, and healthcare workers routinely done PPE against biological infections. The individual job family regression analysis chose radically different predictors for healthcare and law enforcement when analyzed separately. This indicates that the CDP should continue to collect data on the separate job families using the current surveys until enough cases for each of the major job families have been gathered to conduct valid and credible analysis of those job families. This could lead to

changes in the way future COBRA training courses are taught in order to better serve the specific job family.

Finally, the analysis when applied to the theoretical framework model postulated in Chapter 3 supports the model through the use of the, (pre-training survey – training period – post-training survey) measurement methodology, indicating that the participants self-confidence was increased longitudinally over the time period the course was taught. Thus, the correlation between COBRA training and increases in the self-confidence appear to be a constant and therefore a measurable characteristic of human emotions.

CHAPTER 6 – CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Civilian first responder organizations who require completion of the COBRA training course to justify job positions are unintentionally using the CDP as a certifying agency to justify specific job competencies. This is a practice which may not be sustainable, as the increases in first responder populations may make it almost impossible for an individual to attend COBRA training more than once over the course of several years. It is recommended that first responders not re-attend COBRA training, as that is a course which needs to be provided to as many first responders as possible. It is recommended that the CDP establish a COBRA training refresher and/or a COBRA training advanced course which more first responders can attend, leaving the COBRA training course open for first time attendee's. Regardless, the increases in first responder populations are making it imperative that a solution be found to ensure higher numbers of civilian first responders can attend some form of COBRA training. This is necessary in order to maintain our ability as a nation to respond to and recover from toxic chemical or biological agent incidents quickly and safely.

Research issue one asked if COBRA training as it is done at the CDP increases a first responder's self-confidence in the use of personal protective equipment (PPE) in a toxic chemical or biological agent contaminated environment. This research question was investigated through the application of descriptive statistics, paired sample t-testing, factor analysis, and regression analysis. Based on the findings of the results of these statistical analysis tests, it is the conclusion of this study that there is a significant correlation between COBRA training as it is applied at the CDP and positive increases in first responder self-confidence in the use of personal protective equipment to work in a toxic chemical or biological agent environment.

Research issue two asks if there is a correlation between COBRA training as it is applied at the CDP and an increase in individual responder self-confidence with respect to the individual's ability to perform duties in a toxic agent contaminated environment. All of the tests applied to research issue one, were also applied to research issue two. Based on the results of those tests, it is the conclusion of this study that there is a significant correlation between COBRA training as it is applied at the CDP and positive increases in first responder self-confidence to perform duties in a toxic chemical or biological agent environment. Furthermore, the tests indicate that this training reliably increases self-confidence of first responders to operate in a toxic chemical or biological agent environment regardless of age, gender, experience, or occupation.

Research issue three inquires as to what participants perceive of COBRA training emotionally, knowledge wise, skills wise, and in abilities before attending the training. Analysis through inferential statistics indicates that the participants are stressed, nervous, and fearful, but still confident and emotionally positive before attending COBRA training. Paired sample t-testing demonstrates increases across the board in all of the tested psychological variables except negative emotions which demonstrated negative changes. The data indicates that the participants arrive with a positive attitude and depart with an increased positive attitude, thus the results seem to indicate their expectations are positive over all.

The results of this study as applied to the researcher's hypotheses are as follows:

H_1 –The positive emotions of the participants as they relate to the individual operating in a toxic chemical agent environment will be significantly changed between before COBRA training and after COBRA training.

H_2 –The negative emotions of the students as they relate to the student operating in a toxic

chemical agent environment will be significantly changed between before COBRA training and after COBRA training.

The results of the study as they relate to the changes in the participants' emotions would at first seem to contraindicate rejection of the null hypothesis for H_1, as three of the ten emotions were determined to be non-significant. The emotions: depressed, annoyed, and alert, were all deemed to be non-significant. However, closer examination of these three emotions when applied to the participants, indicated that it was more than likely as not, that the principal investigator failed to take into account the following effects when assigning these emotions to the surveys:

- Depressed = $t_{179} = -.69$, $p > .05$ (.493) with a marginal mean difference of -.05 which is equal to an average decrease in depression of 1%. Physically fit and motivated first responders are unlikely to be depressed when attending a course that supports their chosen field of endeavor, thus resulting in a very slight decrease in depression on completion of the training, most probably due to the excitement of finishing the course.
- Annoyed = $t_{178} = -.94$, $p > .05$, but a mean difference of -.07 which equates to a very slight decrease in annoyance of approximately 1%. First responders who are preparing to enter into, or finish training, in an intense training environment are unlikely to be annoyed by completing a short survey; thus, there was little change with this emotion.
- Alert = $t_{172} = 1.271$, $p > .05$ (.205) means that this emotion may have been skewed by the timing of the survey and again the difference is approximated a 1% change. The participants are alert on the first day of COBRA training and they are alert when they

finish the training, however at the completion of the training they are also physically exhausted and may equate that exhaustion with less alertness.

All seven of the remaining emotions to include confidence were significantly changed in a positive manner. During analysis of the psychological variables, all of the psychological variables were recoded into psychological attribute groups, which allowed for those variables to provide a consolidated mean average. The consolidated mean average of the emotions along with the other psychological attribute groups were then subjected to regression analysis. The regression analysis ANOVA results, $F = 11.328$, $df_{3,163}$ with F critical at 3.739, thus $F >$ than 3.739, with $p <= 0.05$ conclusively states that the emotions of the participants were significantly increased. Furthermore, the negative emotions were not correlated with satisfaction, therefore, based on the results of this study, the null hypotheses for H_1 and H_2 were rejected.

H_3 - The knowledge of the students as it relates to the student operating in a toxic chemical agent environment will be significantly changed between before COBRA training and after COBRA training.

H_4 –The skills of the students as they relate to the student operating in a toxic chemical agent environment will be significantly changed between before COBRA training and after COBRA training.

H_5 - The perception of the students concerning their abilities for operating in a toxic chemical agent environment will be significantly changed between before COBRA training and after COBRA training.

Section two of the psychological variables was focused on determining whether or not there were significant changes between the pre-training survey and the post-training survey as related to

self-confidence in knowledge and skills. All eight of these variables results, when subjected to individual psychological variable paired sample t-testing, had t-scores $t_{180} >= 4.483$, $p < 0.05$. Furthermore, when the pre-training variables and post-training variables were combined into pre and post-training psychological attribute groups and again subjected to paired sample t-testing, it was found that: $t_{180} >= 6.567$, $p<=0.05$ for self-confidence of knowledge, and $t_{180} >= 7.579$, $p<=0.05$ for self-confidence of skills, self-confidence is significantly indicated as being improved.

Section three of the psychological variables was focused on determining whether there were significant changes between the pre-training survey and the post-training survey as related to self-confidence and the participant's abilities. All seven of these variables results had t-scores t_{180}, $>= 4.866$, $p < .05$. Furthermore, when these seven variables were combined into their pre and post-training psychological attribute groups, t_{178}, $>= 6.967$, $p < .05$, clearly indicating a positive increase in self-confidence. Based on the results of this study the null hypotheses for H_3 – H_5were rejected.

H_6 - The effects of the participants' satisfaction as it concerns their training will show that positive emotions are highly correlated with training satisfaction.

H_8 - The effects of the participants' satisfaction as it concerns their training will show that confidence in their knowledge is highly correlated with training satisfaction.

H_9 - The effects of the participants' satisfaction as it concerns their training will show that confidence in their skills is highly correlated with training satisfaction.

H_{10} - The effects of the participants' satisfaction as it concerns their training will show that confidence in their abilities is highly correlated with training satisfaction.

Correlation analysis indicates clearly that the variables, “Positive Emotions”, “Confidence in Knowledge”, “Confidence in Skills”, and “Confidence in Abilities”, are highly correlated with participant satisfaction of COBRA training. Based on the results of this study, the null hypotheses for H_6, H_8, H_9, and H_{10} were rejected.

H_7 - The effects of the participants’ satisfaction as it concerns their training will show that negative emotions are highly correlated with training satisfaction.

The correlation analysis of participants’ satisfaction for COBRA training and the “Negative Emotions (Training)” and “Negative Emotions (Duty)”, were found to be non-significant and thus the null hypothesis cannot be rejected. Further study needs to be conducted in order to determine why the negative emotions were not correlated with participant satisfaction as it relates to COBRA training. It is possible that because COBRA training is such a positive experience that the negative emotions were overshadowed.

H_{11} – When demographic variables are controlled, the psychological attribute variables “positive emotion”, “negative emotions”, “knowledge”, “skills”, and “abilities” changes, will be significant predictors of the effectiveness of the training in producing positive self-confidence changes.

Regression analysis when applied to the data, developed three predictors focused on determining the effectiveness of COBRA training as it concerned the satisfaction of the participants. These three predictors, which were analyzed in their demographic and psychological attribute groups, were as follows:

- Gender
- Positive Emotions
- Self-Confidence in Abilities

As noted in the analysis results, the variables Positive Emotions and Self-Confidence in Abilities were determined to be significant with $t_{3,163}$, 3.395, $p <= 0.05$ and 3.189, $p <= 0.05$ respectively, both of which significantly indicated positive satisfaction with COBRA training. However, Gender with $t_{3,163}$ -2.597, $p <= 0.05$, clearly indicated significance with dissatisfaction by females with COBRA training. Based on the results of this study the null Hypothesis for H_{11} cannot be rejected. Three variable groups, "negative emotions", "confidence in knowledge", and "confidence in skills" were not selected as significant predictors of participant satisfaction with COBRA training. This may be because there were too many variables assigned to the regression analysis, or that the very high correlation of "self-confidence in abilities", and "positive emotions" with participant satisfaction with COBRA training created a collinearity effect. Future research with additional variables and qualitative input should be able to pinpoint the issue and confirm the output.

Recommendations and Areas for Future Research

The initial demographic variable analysis indicated that there is a sudden drop in the age of first responders attending the COBRA training course at the age of 35. It is recommended that this issue be looked at further as the number of individuals who maintain and use institutional knowledge are critical to the trickle-down effect of training. In theory, the participants who attend training, return to their jobs and pass knowledge on to others if by no other means than being watched by the entry level operators as the more experienced individual performs their duties. If there is a sudden drop of trained COBRA responders after the age of 35, then the CDP may be losing ground on the number of first responders trained to the standard of the CDP for response to toxic chemical or biological agent incidents. It is recommended that an inventory of

civilian first responders who have been trained to COBRA standards be undertaken as soon as possible.

The negative satisfaction felt by female participants who underwent COBRA training as noted, is troubling, as the reasons why it occurred were beyond the scope of this study and in fact were not known until the data had been analyzed. The implications of female first responders undertaking training which they need in order to better support toxic chemical or biological agent incident response, but who may have been negatively affected by the very training that is supposed to prepare them for that response are staggering. Further research is required to determine if this is correct and if so, to determine the cause of the dissatisfaction of female civilian first responders.

It has been noted that there were significant effects on negative as well as positive emotions. This effect requires more study as negative emotions have the ability to severely impact individuals in high stress job families. As the training used by the COBRATF is effective in decreasing negative emotions, then it is entirely possible that the same style of training would work for individuals in other high stress job families, such as flight controllers and emergency call center operators. Research into the manner in which negative emotion reduction increases the efficiency and capability of civilian first responders is suggested in order to identify the impact of this effect and capitalize on it.

Although it has not been mentioned previously, the author of this study attended training at the CDTF in 1997, as a United States Marine Explosive Ordnance Disposal (EOD) technician, shortly before the Department of Justice accepted control of the facility in 1998. This was fortuitous as the author of this study was able to view this research from perspectives other than an individual who had not attended this training.

This information is brought into play in order to demonstrate a significant discovery that the research brought to light. This discovery is based on the paired sample t-scores of the last section of questions on the surveys, which were developed to demonstrate the participants' satisfaction with the COBRA training. In the armed services, the axiom "train the way you will fight", drives home a very important methodology in training and education as it relates to the United States Military.

When the author of this study attended training at the CDTF as a United States Marine EOD technician, he used a form of personal protective equipment (PPE) called Toxicological Agent Protective (TAP) Ensemble and an M-40 Special Purpose Mode mask (USA, 1994, pp. 1-3 - 1-5). This PPE was worn during training in July, even though the butyl rubber overcoat and butyl rubber overalls, with the beeswax impregnated long johns underneath, all taped shut for a complete seal against chemical agents, was brutally hot because that is the gear that would be worn in combat. All other military personnel were wearing what is now referred to by the rank and file as MOPP Gear (Mission Oriented Protective Posture (MOPP)) gear (USA/USMC, 1993), even though this acronym referred to a PPE level of protection such as Level A protection (National Environmental Trainers, 2018) vice the true names of the equipment. Those military personnel were also training to dress the way they would in combat.

Table 15.

Participant's Satisfaction with Training

Participant's Satisfaction with Training

Satisfaction	Responder Feels Training Will Reduce Stress	0.2320	3.918	180	0.000
	Responder Feels Training Will Increase Self-Confidence	0.1878	3.952	180	0.000
	Responder Feels Training Will Increase Knowledge to Operate in a Toxic Environment	0.1326	2.767	180	0.006
	Responder Feels Training Will Prepare Responder to Use Proper Equipment	0.1381	2.606	180	0.010
	Responder Feels Training Will Prepare Them to Work in Toxic Agent Environment	0.1556	3.053	179	0.003

As can be seen in Table 15. Participants Satisfaction with Training, psychological variable number 29 (highlighted) is significant in accordance with the confidence level used in this study. However, it was high enough to raise a question as to why it would be so. The author, as someone who has attended training in an environment where the participant is expected to train in the equipment to be used in real life situations, and who has seen the equipment which is used for training at the CDP, was able to recognize an issue that it is recommended further research be used to examine.

Civilian first responders purchase the PPE from vendors throughout the nation and because of this, there are varying degrees of equipment likeness in comparison to that used by the CDP for COBRA training. It is probable that the slight dissatisfaction demonstrated by variable 29 could indicate that individual civilian first responders using different PPE at their job locations may be uncertain if they can make the correct choices in PPE based on the training PPE which they receive at the CDP. A qualitative study aimed at determining if this is in fact true is recommended to see if the first responders have the same level of self-confidence regardless of the PPE manufacturer.

Civilian first responders also use different types of PPE based on their job family, such as

healthcare using PPE more suitable for mass casualty patient care and hazardous materials response teams using PPE more suited to working in a grossly contaminated incident site.

The final regression analysis conducted on the three largest job family sub-groups indicated that all three had predictors for satisfaction. However, all three of them were also sub-optimal for analysis due to low case numbers. It is suggested that the surveys which this study used continue to be utilized to collect data at the COBRA training facility in order to gather enough case samples to support a credible and valid analysis, based on single job families vice all civilian first responders attending COBRA training. The increased focus on single family job types would ensure that any discrepancies shaded out by larger groups of single family job types over smaller groups, would be eliminated and increase the accuracy of the data. Additionally, a narrower focus and increased accuracy could demonstrate characteristics which are significant due to the job family, which could then lead to a better instructional methodology for that job family.

Finally, the process of developing this study and collaborating with the CDP to apply this study to the participants, which is a representative sample of our nation's first responders, should lead to future joint efforts between the CDP and Jacksonville State University. The cooperation, collaboration, communication, and coordination required to conduct research of this nature is based on the tenets of the emergency management profession. The budding academic discipline of emergency management with the deep grounding of academia, should solidify the research foundation which is being built between these two organizations and can only benefit all of those involved. This is a demonstration of the communication of science from academia to practice. It also exemplifies the value added process, which evaluation research can provide to an organization such as the CDP as it works to improve the training and education of our nation's

first responders.

In closing, this study has produced results which clearly answered the research issues, provided groundwork for future research, and added to the body of knowledge in the academic discipline of emergency management. A qualitative study designed to parse out those aspects of COBRA training which may need to be fine-tuned to better support our nation's first responders in today's world of technological advances, would benefit the CDP. The CDP, as one of the training centers at the forefront of emergency management training and education and the only institution which provides training for civilian first responders in toxic chemical and biological agent environments, is critical to the safety and security of our nation.

References

Allen, I. E., & Seaman, C. A. (2007). Likert scales and data analyses. *Quality Progress, 40*(7), 64-65.

Arledge, S. (2013). CDP updates its technical emergency response training. Retrieved from http://www.firehouse.com/article/10933059/cdp-updates-its-technical-emergency-response-training

Atherton, M. (2015). Measuring confidence levels of male and female students in open access enabling courses. *Issues in Educational Research, 25*(2), 81-98.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.

Bandura, A. (1986). *Social foundations of thought and action: a social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1999). Social Cognitive Theory: An agentic perspective. *Asian Journal of Social Psychology, 2*, 21-41.

Blanchard, B. W. (Ed.) (2007) Dictionary of emergency management and related terms, definitions, legislation and acronyms. Emmitsburg, MD: DHS FEMA EMI.

Broughton, E. (2005). The Bhopal disaster and its aftermath: a review. *Environ Health, 4*(1), 6. doi:10.1186/1476-069X-4-6

Bureau of Labor Statistics. (2018a). Occupational Outlook Handbook, EMTs and Paramedics. Retrieved from https://www.bls.gov/ooh/healthcare/emts-and-paramedics.htm

Bureau of Labor Statistics. (2018b). Occupational Outlook Handbook, Police and Detectives. Retrieved from https://www.bls.gov/ooh/protective-service/police-and-detectives.htm

Burns K. M., Burns N. R., & L., W. (2016). Confidence—more a personality or ability trait? It

depends on how it is measured: A comparison of young and older adults. *Frontiers of Psychology, 7*(518), 1-14. doi:10.3389/fpsyg.2016.00518

CDC, D. (2016). Chemical weapons elimination. Retrieved from https://www.cdc.gov/nceh/demil/history.htm

Cole, R. F. (2014). Understanding military culture: A guide for professional school counselors. *The Professional Counselor, 4*(5), 497-504. doi:10.15241/rfc.4.5.497

Cook, D. A., & Artino, A. R., Jr. (2016). Motivation to learn: an overview of contemporary theories. *Med Educ, 50*(10), 997-1014. doi:10.1111/medu.13074

Croasmun, J. T., & Ostrom, L. (2011). Using Likert-type scales in the social sciences. *Journal of Adult Education, 40*(1), 19-22.

Danzig, R., Sageman, M., Leighton, T., Hough, L., Yuki, H., Rui, K., & M., H. Z. (2012). *Aum Shinrikyo insights into how terrorists develop biological and chemical weapons*. Retrieved from Washington, DC: https://www.files.ethz.ch/isn/156879/CNAS_AumShinrikyo_SecondEdition_English.pdf.

DHHS. (2017). The golden first minutes — initial response to a chemical hazardous materials incident. *Chemical hazards emergency medical management.* Retrieved from https://chemm.nlm.nih.gov/detailedinfo.htm

DHS. (2017). *Budget-in-Brief Fiscal Year 2018 Homeland Security*. Washington, DC: Department of Homeland Security Retrieved from http://freebeacon.com/wp-content/uploads/2017/05/FY18-DHS-BIB.pdf.

DOL. (2010 Rev 2013). *Standard occupational definition manual*. Washington, D.C.: Government Printing Office.

Dweck, C. S. (1986). Motivational processes affecting learning. *American Psychologist, 41*(10),

1040-1048.

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*, 256-273.

Emrey-Arras, M. (2015). *Women in STEM research: Better data and information sharing could improve oversight of federal grant-making and Title IX compliance*. Retrieved from Washington D.C.:

Fatkin, L., & Hudgens, G. (1994). *Stress Perceptions of Soldiers Participating in Training at the Chemical Defense Training Facility: The Mediating Effects of Motivation, Experience, and Confidence Level.* Retrieved from Aberdeen Proving Ground, MD: http://www.dtic.mil/dtic/tr/fulltext/u2/a276961.pdf

FEMA. (2018a). All Training. Retrieved from https://cdp.dhs.gov/find-training/courses

FEMA. (2018b). CDP to resume using nerve agents, biological materials in select courses. Retrieved from https://cdp.dhs.gov/cdp-use-of-ricin

FEMA. (2018c). The Center for Domestic Preparedness: About. Retrieved from https://cdp.dhs.gov/about

FEMA. (2018d). Resident Training. *Center for Domestic Preparedness.* Retrieved from https://cdp.dhs.gov/training/resident

Fenn, J. (2015). *Effect of COBRA training on responder confidence in a contaminated environment*. Pilot Study. Emergency Management Institute. Jacksonville State University. Jacksonville, AL.

GW, B. (2003). *Homeland security presidential directive - 8*. Washington DC: Office of the President of the United States Retrieved from http://media.washingtonpost.com/wp-srv/nation/nationalsecurity/earlywarning/HSPD-8.pdf.

Healy, S., Coughlin, R., Smith, P., Kierzewski, M., & Smith, D. (1992). *The impact of toxic agent training on combat readiness*. Retrieved from Fort McClellan, AL: www.dtic.mil/dtic/tr/fulltext/u2/a248991.pdf

Hinton, J., Henry L. . (1997). *Chemical weapons and materiel: Key factors affecting disposal costs and schedule*. Retrieved from Washington, DC: https://www.gao.gov/products/NSIAD-97-18

Huang, S. K. (2018). Excerpt on psuedo attitudes. In. Jacksonville, AL: Jacksonville State University

Joint Chiefs of Staff. (Ed.) (2017) DOD dictionary of military and associated terms. Washington, DC: CJCS.

Lee, M. D., & Dry, M. J. (2006). Decision making and confidence given uncertain advice. *Cognitive Science, 30,* 1081–1095.

Mann, R. A. (2014). Instructor training course. In. Auburn, AL: Mann, RA.

McKenzie, K., & Schweitzer, R. D. (2001). Who succeeds at university? Factors predicting academic performance in first year Australian university students. *Higher Education Research and Development, 20*(1), 21-33.

McNabb, D. E. (2015). *Research methods in public administration and non-profit management:Qualitative and quantitative approaches* (3 ed.). New York, NY: Routledge.

Mitchell, M. L., & Jolley, J. M. (2013). *Research Design: Explained* (Eighth ed.). Belmont, CA: Wadsworth. pp228, 310.

National Environmental Trainers, I. (2018). HAZMAT Protection Levels. Retrieved from https://www.natlenvtrainers.com/blog/article/hazmat-protection-levels

NBRI. (2018). How long should the survey be? *How long should the survey be?* Retrieved from https://www.nbrii.com/faqs/survey-design/long-survey/

O'Malley, M. (1997). Clinical evaluation of pesticide exposure and poisonings. *Lancet, 349*(9059).

Okumura, S., Okumura, T., Ishimatsu, S., Miura, K., Maekawa, H., & Naito, T. (2005). Clinical review: Tokyo – protecting the health care worker during a chemical mass casualty event: an important issue of continuing relevance. *Critical Care, 9*(4), 397-400. doi:10.1186/cc3062)

OSP. (2017). Role of the principal investigator. *Office of Sponsored Projects.* Retrieved from http://www.dartmouth.edu/~osp/resources/manual/post-award/pirole.html

Pajares, F., & Miller, M. D. (1994). Role of self-efficacy and self-concept beliefs in mathematical problem solving: A path analysis. *Journal of Educational Psychology, 86*(2), 193-203.

Pangi, R. (2002). *Consequence management in the 1995 sarin attacks on the Japanese subway system*. Retrieved from Cambridge, MA: https://www.belfercenter.org/sites/default/files/legacy/files/consequence_management_in_the_1995_sarin_attacks_on_the_japanese_subway_system.pdf

Pease, J. L., Billera, M., & Gerard, G. (2016). Military culture and the transition to civilian life: Suicide risk and other considerations. *Social Work, 61*(1), 83-86.

PEO, A. (2018). Frequently Asked Questions. *Program Executive Office: Assembled Chemical Weapons Alternatives.* Retrieved from https://www.peoacwa.army.mil/frequently-asked-questions/

Pinheiro, P. S., AbuZayd, K. K., & Ponte, C. D. (2017). *Report of the Independent International*

Commission of Inquiry on the Syrian Arab Republic. Geneva, Switzerland: United Nations Retrieved from http://www.ohchr.org/Documents/HRBodies/HRCouncil/CoISyria/A_HRC_36_55_EN.docx.

Police: Retiree made ricin, tested it on Wake Robin neighbors. (2017). [Press release]. Retrieved from http://www.burlingtonfreepress.com/story/news/2017/12/01/police-retiree-made-ricin-tested-neighbors/913194001/

Romano, J., & King, J. (2002). Chemical warfare and chemical terrorism: Psychological and performance outcomes. *Military Psychology, 14*(2), 83-177.

Schafer, K., Sutter, R., & Gibbons, S. (2015). *Characteristics of individuals and employment among first responders*. Retrieved from Washington DC: https://www.dol.gov/asp/evaluation/analytics-reports/CharacteristicsOfIndividualsAndEmploymentAmongFirstResponders.pdf.

Schermerhorn-Collins, A. L. (2017). *The challenges to gender integration in the career fire services: A comparative case study of men in nursing.* (Master of Arts in Security Studies), Naval Post Graduate School, Monterey, CA. Retrieved from http://hdl.handle.net/10945/53044

Senko, C., Hulleman Chris S., & Harackiewicz, J. M. (2010). Achievement goal theory at the crossroads: Old controversies, current challenges, and new directions. In *Department of Psychology*. SUNY, NY: New Paltz, NY.

Shrauger, J., Sidney , & Schohn, M. (1995). Self-confidence in college students: conceptualization, measurement, and behavioral implications. *Assessment, 2*(3), 255-278. doi:https://doi.org/10.1177/1073191195002003006

Sirkin, R. M. (2005). *Statistics for the social sciences* (3 ed.). Thousand Oaks, CA: Sage Publishing.

Skryabina, E., Reedy, G., Amlôt, R., Jaye, P., & Riley, P. (2017). What is the value of health emergency preparedness exercises? A scoping review study. *International Journal of Disaster Risk Reduction, 21*, 274-283. doi:10.1016/j.ijdrr.2016.12.010

Stankov, L., Lee, J., Luo, W., & Hogan, D. J. (2012). Confidence: A better predictor of academic achievement than self-efficacy, self-concept and anxiety? *Learning and Individual Differences, 22*(6), 747-758. doi:10.1016/j.lindif.2012.05.013

Stokes, W., & Banderet, L. (1989). Psychological aspects of chemical defense and warfare. *Military Psychology, 9*(4), 395-415.

Sullivan, L. (2017). Confidence intervals. Retrieved from http://sphweb.bumc.bu.edu/otlt/MPH-Modules/BS/BS704_Confidence_Intervals/BS704_Confidence_Intervals_print.html

Szinicz, L. (2005). History of chemical and biological warfare agents. *Toxicology, 214*(3), 167-181. doi:10.1016/j.tox.2005.06.011

The National Registry. (2004). *2004_Annual_Report*. Retrieved from Columbus, OH:

The National Registry. (2017). The National Registry Data Dashboard. Retrieved from https://www.nremt.org/rwd/public/data/maps

Training first responders into the next century, Senate, First Sess. 1-55 (1999).

Tucker, J. B., & Mahan, E. R. (2009). *President Nixon's decision to renounce the U.S. offensive biological weapons program*. Retrieved from Washington, D.C.:

Tyler, F., Manning, F., & Oleshansky, M. (1989). *Stress, Confidence, Performance, and Credibility Produced by Toxic Agent Training at the Chemical Decontamination Training Facility: Final Report for the U.S. Army Chemical School*. Retrieved from Washington,

DC:

UCD. (2018). What is experiential learning. *Experiential learning center.* Retrieved from http://www.ucdenver.edu/life/services/ExperientialLearning/about/Pages/WhatisExperientialLearning.aspx

Oxford University. (Ed.) (2017) New Oxford Living Dictionaries. Oxford, UK: Oxford University Press.

Ursano, R. (1989). *Psychological and Behavioral Responses to a Chemical and Biological Warfare Environment: Final Recommendations*. Retrieved from Bethesda, MA:

USA. (1994). *Technical manual operator's, unit and direct support maintenance manual including repair parts and special tools list or the toxicological agent protective (TAP) ensemble*. Washington D.C.: Headquarters Department of the Army.

USA/USMC. (1993). *US ARMY TM 10-8415-209-10 Operator's manual for individual chemical protective clothing*. Washington D.C.: Headquarters Departments of the Army and Marine Corps.

USDOL. (2018). US Department of Labor. Retrieved from https://www.usa.gov/federal-agencies/u-s-department-of-labor

VA. (2009). What are KSAs. Retrieved from https://www.va.gov/jobs/hiring/apply/ksa.asp

APPENDIX 1

SELF-CONFIDENCE PRE-TRAINING SURVEY

Appendix 1

Responder Confidence Questionnaire (PRE-Training)

This survey is designed to evaluate the perception of how COBRA Training affects first responders working in a toxic chemical or biological agent environment. No personal identifying information will be collected and individual responses will be kept confidential. General demographic information will be solicited. All data will be stored on a secure server. You must be at least 18 years old to participate in this survey. There are no known risks to taking this survey. All responses are anonymous. However, results in the aggregate may be published in scholarly papers.

☐ Checking this box signifies that the student has read, understood, and consents to the previous statement.

PLEASE ENTER THE MOST APPROPRIATE ANSWER FOR EACH QUESTION.

1. What is your age? _____ years old.

2. What is your gender?

☐ Male
☐ Female

3. What is the highest level of academic education you have attained? *If currently enrolled, highest degree received.*

☐ Some high school, no diploma
☐ High school graduate or the equivalent (for example: GED)
☐ Some college credit, no degree
☐ Trade/technical/vocational training
☐ Associate degree
☐ Bachelor's degree
☐ Master's degree
☐ Professional degree
☐ Doctorate

4. How long have you been involved in first response or emergency services?
_____ years.

5. Which of the following best describes your position?

- ☐ Operator
- ☐ Supervisor
- ☐ Team Leader
- ☐ Management
- ☐ Executive Management
- ☐ Other _____ (please specify)

6. Which of the following best describes your organization?

- ☐ Fire Services
- ☐ Emergency Medical Services (EMS)
- ☐ Hazardous Materials Unit
- ☐ Law Enforcement
- ☐ Public Safety Communications
- ☐ Emergency Management
- ☐ Public Works
- ☐ Public Health
- ☐ Hospital Healthcare
- ☐ Other Healthcare _____ (please specify)

7. Which of the following best describes the reason for your attendance of this course?

- ☐ I am required to attend COBRA Training
- ☐ I requested to attend COBRA Training

8. Have you ever participated in COBRA Training before?

- ☐ Yes
- ☐ No

(9.) Do you have previous experience (other than COBRA Training) operating in a toxic chemical or biological agent environment?

- ☐ Yes
- ☐ No

SCENARIO:

As a first responder it may be necessary to respond to an incident scene that is known to be a toxic chemical or biological agent event. Assume the appropriate equipment to perform the assigned tasks is available and that all logistics necessary to support an operation of this nature are available. Please answer each of the following questions by checking the appropriate box.

PLEASE ENTER THE MOST APPROPRIATE ANSWER FOR EACH QUESTION.

(10.) To what extent would you feel each of the following emotions, if you were assigned to operate in a toxic chemical or biological agent environment?	Not at all	Small extent	Neutral	Great extent	Very great extent
a. Optimistic	☐	☐	☐	☐	☐
b. Depressed	☐	☐	☐	☐	☐
c. Stressed	☐	☐	☐	☐	☐
d. Annoyed	☐	☐	☐	☐	☐
e. Nervous	☐	☐	☐	☐	☐
f. Fearful	☐	☐	☐	☐	☐
g. Relaxed	☐	☐	☐	☐	☐
h. Confident	☐	☐	☐	☐	☐
i. Energetic	☐	☐	☐	☐	☐
j. Alert	☐	☐	☐	☐	☐

(11.) To what extent do you agree with each of the following descriptions regarding your understanding of a toxic chemical or biological agent incident?	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a. I clearly understand the characteristics of a toxic chemical or biological agent incident.	☐	☐	☐	☐	☐
b. I clearly understand the exposure paths of toxic chemical or biological agents.	☐	☐	☐	☐	☐
c. I clearly understand the hazards of toxic chemical or biological agents.	☐	☐	☐	☐	☐
d. I clearly understand the results of exposure to toxic chemical or biological agents	☐	☐	☐	☐	☐
e. I know how to operate in a toxic chemical or biological agent environment	☐	☐	☐	☐	☐
f. I know the measures to decontaminate myself or others in a toxic chemical or biological agent environment.	☐	☐	☐	☐	☐
g. I know how to use personal protective equipment (PPE) in a toxic chemical or biological agent environment	☐	☐	☐	☐	☐
h. I know how to work with others during a toxic chemical or biological agent incident.	☐	☐	☐	☐	☐

(12.) To what extent do you agree with each of the following descriptions regarding your ability to work in a toxic chemical or biological agent environment?	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a. I am confident in my ability to operate in a toxic chemical or biological agent environment.	☐	☐	☐	☐	☐
b. I am confident in my ability to perform measures to decontaminate myself or others in a toxic chemical or biological agent environment.	☐	☐	☐	☐	☐
c. I am confident in my ability to operate personal protective equipment (PPE).	☐	☐	☐	☐	☐
d. I am confident in my ability to work with others during a toxic chemical or biological agent incident.	☐	☐	☐	☐	☐
e. I believe my personal protective equipment (PPE) will protect me in a toxic chemical or biological agent environment.	☐	☐	☐	☐	☐
f. I believe the agent identification equipment will detect and correctly identify toxic chemical or biological agents.	☐	☐	☐	☐	☐
g. I trust the decontamination equipment used in a toxic chemical or biological agent environment.	☐	☐	☐	☐	☐

(13.) To what extent are your expectations of each of the following descriptions on the training to be provided in the COBRATF?	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a. The training will help to reduce stress while operating in a toxic chemical or biological agent environment	☐	☐	☐	☐	☐
b. The training will increase my self-confidence in my ability to operate in a toxic chemical or biological agent environment	☐	☐	☐	☐	☐
c. The training will provide me with the knowledge to operate in a toxic chemical or biological agent environment	☐	☐	☐	☐	☐
d. The training will prepare me to use the proper equipment in a toxic chemical or biological agent environment	☐	☐	☐	☐	☐
e. The training will prepare me to operate in toxic chemical or biological agent environment correctly	☐	☐	☐	☐	☐

APPENDIX 2

SELF-CONFIDENCE POST-TRAINING SURVEY

Appendix 2

Responder Confidence Questionnaire (POST Training)

This survey is designed to evaluate the perception of how COBRA Training affects first responders working in a toxic chemical or biological agent environment. No personal identifying information will be collected and individual responses will be kept confidential. General demographic information will be solicited. All data will be stored on a secure server. You must be at least 18 years old to participate in this survey. There are no known risks to taking this survey. All responses are anonymous. However, results in the aggregate may be published in scholarly papers.

☐ Checking this box signifies that the student has read, understood, and consents to the previous statement.

SCENARIO:

As a first responder it may be necessary to respond to an incident scene that is known to be a toxic chemical or biological agent event. Assume the appropriate equipment to perform the assigned tasks is available and that all logistics necessary to support an operation of this nature are available. Please answer each of the following questions by checking the appropriate box.

PLEASE CHECK THE MOST APPROPRIATE ANSWER FOR EACH QUESTION.

(1.) To what extent would you feel each of the following emotions, if you were assigned to operate in a toxic chemical or biological agent environment?	Not at all	Small extent	Neutral	Great extent	Very great extent
k. Optimistic	☐	☐	☐	☐	☐
l. Depressed	☐	☐	☐	☐	☐
m. Stressed	☐	☐	☐	☐	☐
n. Annoyed	☐	☐	☐	☐	☐
o. Nervous	☐	☐	☐	☐	☐
p. Fearful	☐	☐	☐	☐	☐
q. Relaxed	☐	☐	☐	☐	☐
r. Confident	☐	☐	☐	☐	☐
s. Energetic	☐	☐	☐	☐	☐
t. Alert	☐	☐	☐	☐	☐

(2.) To what extent do you agree with each of the following descriptions regarding your understanding of a toxic chemical or biological agent incident?	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
i. I clearly understand the characteristics of a toxic chemical or biological agent incident.	☐	☐	☐	☐	☐
j. I clearly understand the exposure paths of toxic chemical or biological agents.	☐	☐	☐	☐	☐
k. I clearly understand the hazards of toxic chemical or biological agents.	☐	☐	☐	☐	☐
l. I clearly understand the results of exposure to toxic chemical or biological agents	☐	☐	☐	☐	☐
m. I know how to operate in a toxic chemical or biological agent environment	☐	☐	☐	☐	☐
n. I know the measures to decontaminate myself or others in a toxic chemical or biological agent environment.	☐	☐	☐	☐	☐
o. I know how to use personal protective equipment (PPE) in a toxic chemical or biological agent environment	☐	☐	☐	☐	☐
p. I know how to work with others during a toxic chemical or biological agent incident.	☐	☐	☐	☐	☐

(3.) To what extent do you agree with each of the following descriptions regarding your ability to work in a toxic chemical or biological agent environment?	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
h. I am confident in my ability to operate in a toxic chemical or biological agent environment.	☐	☐	☐	☐	☐
i. I am confident in my ability to perform measures to decontaminate myself or others in a toxic chemical or biological agent environment.	☐	☐	☐	☐	☐
j. I am confident in my ability to operate personal protective equipment (PPE).	☐	☐	☐	☐	☐
k. I am confident in my ability to work with others during a toxic chemical or biological agent incident.	☐	☐	☐	☐	☐
l. I believe my personal protective equipment (PPE) will protect me in a toxic chemical or biological agent environment.	☐	☐	☐	☐	☐
m. I believe the agent identification equipment will detect and correctly identify toxic chemical or biological agents.	☐	☐	☐	☐	☐
n. I trust the decontamination equipment used in a toxic chemical or biological agent environment.	☐	☐	☐	☐	☐

(4.) To what extent are your expectations of each of the following descriptions on the training received in the COBRATF?	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
f. The training helped to reduce stress while operating in a toxic chemical or biological agent environment	☐	☐	☐	☐	☐
g. The training increased my self-confidence in my ability to operate in a toxic chemical or biological agent environment	☐	☐	☐	☐	☐
h. The training provided me with the knowledge to operate in a toxic chemical or biological agent environment	☐	☐	☐	☐	☐
i. The training prepared me to use the proper equipment in a toxic chemical or biological agent environment	☐	☐	☐	☐	☐
j. The training prepared me to operate in toxic chemical or biological agent environment correctly	☐	☐	☐	☐	☐

APPENDIX 3

PERMISSION TO CONDUCT RESEARCH

JSU | OFFICE OF THE VICE PROVOST
JACKSONVILLE STATE UNIVERSITY

March 8, 2018

Dear Robert Mann:

Your proposal submitted for review by the Human Participants Review Protocol for the project titled: "The Effect of COBRA Training on Responder Self-Confidence to work in a Toxic Chemical or Biological Agent Environment" has been approved as exempt. If the project is still in process one year from now, you are asked to provide the IRB with a renewal application and a report on the progress of the research project.

Sincerely,

Joe Walsh
Executive Secretary, IRB

JW/dh

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P. 800.231.5291
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APPENDIX 4

REQUEST TO AMEND DISSERTATION WITH COMMITTEE CHAIR APPROVAL

Robert A. Mann
1817 Roanoke
Lane
Auburn, AL 36830
Rmann1@stu.jsu.edu
334-332-4020

Dr. Shaw,

Good afternoon, I am writing to you to formally request a change to my dissertation proposal dated 8 Mar, 2018, "*The effects of training in a toxic chemical or biological agent environment on first responders' self-confidence".*

I have been working diligently with the data that has thus far been collected and met with Dr. Huang on the 17 June, 2018 at the JSU McClellan Campus to discuss the analysis results of the information collected. Currently, 184 case samples have been collected and analyzed, with the results having been deemed credible by Dr. Huang.

Dr. Huang has stated that it is unnecessary to continue to collect data for the dissertation at this point and that I should complete writing my dissertation and submit it for review.

Based off of Dr. Huang's expertise in statistical analysis and my own experience I am asking that I be allowed to change the number of cases to collect (384+) to the number of cases collected (184).

R/S

Robert A Mann Digitally signed by Robert A Mann
Date: 2018.07.03 12:02:11
-05'00'

Robert A. Mann

Re: Request for change

Gregory Shaw

Wed 7/4/2018 12:40 AM

To:Paige McKerchar <pmckerchar@jsu.edu>; Robert Mann <rmann1@stu.jsu.edu>;

Cc:Jeff Ryan <jryan@jsu.edu>; Shih-Kai Huang <shuang@jsu.edu>;

From Italy I

approve this

---

change. Greg

Shaw

From: Paige McKerchar
Sent: Tuesday, July 3, 2018 4:01:14 PM
To: Robert Mann; Gregory Shaw **Cc:** Jeff Ryan; Shih-Kai Huang **Subject:** Re: Request for change

Hi Bob,

I approve of the change in the number of participants from 384 to 184. I'm so glad the data were interpretable at the lower number. If you need anything else from me documenting my approval, just let me know.

Best,
Dr. McKerchar

--
Paige McKerchar, Ph.D., BCBA-D Department Head, Psychology Jacksonville State University
700 Pelham Road North
Jacksonville, AL 36265
Office: 256-782-5808
Fax: 256-782-5637
Email: pmckerchar@jsu.edu

From: Robert Mann
Sent: Tuesday, July 3, 2018 12:08:24 PM
To: Gregory Shaw
Cc: Jeff Ryan; Shih-Kai Huang; Paige McKerchar
Subject: Request for change

Dr. Shaw,

Please find attached a formal letter requesting to change the number of cases to collect for my dissertation from 384 to the number collected which is 184. I digitally signed it and when convenient please respond to the letter so that I may forward it on to the IRB. Thank you, R/S

Bob