ELECTRONIC CONTROL DEVICES & INJURY IMPACT: AN ANALYSIS OF SECONDARY DATA FROM THE ARLINGTON POLICE DEPARTMENT

by

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Abstract

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For law enforcement officers, the necessity to utilize force against a citizen is a powerful aspect of the job. Recent technological advances in force options contribute to the delicate balance of a police officer and using force against a citizen. The Electronic Control Device (ECD) is one such tool of technological advancement. With the introduction of the ECD a fierce argument has emerged challenging the efficacy and safety of the devices.

The Arlington Police Department deploys ECD's to its officers as a part of the daily issued equipment. The purpose of this research project is to analyze the usage of the ECD within the Arlington, Texas Police Department. This project conducts secondary data review of force usage incidents as they relate to ECD injuries upon a subject.

The purpose of this project is to determine if ECD's cause an increase in the rate of injury upon force recipients by the Arlington Police Department. The study will also seek to predict the occurrence of subject injury from a set of controlling variables. The project will test the hypothesis, which suggests ECD usage does not result in a higher rate of injury to force recipients.

Table of Contents

List of Tables

Chapter 1

Introduction

1.1 The Evolution of Policing

Modern policing originated under the direction of Sir Robert Peel in the early 1800's (Miller & Hess, 2002). Since the inception of policing, numerous tasks have been assigned to police officers. While the tasks may evolve, the general function of police officers can be traced back to the London Metropolitan Police (Miller & Hess, 2002). Sir Robert Peel enumerated a list of principles, to which he believed modern policing should adhere:

- The duty of the police is to prevent crime and disorder
- The power of the police to fulfill their duties is dependent upon public approval an on their ability to secure and maintain respect
- Public respect and approval also mean the willing cooperation of the public in the task of securing observance of the law
- The police must seek and preserve public favor not by pandering to public opinion but by constantly demonstrating absolutely impartial service to law
- The police should strive to maintain a relationship with the public that gives reality to the tradition that *the police are the public and the public are the police*
- The test of police efficiently is the absence of crime and disorder, not the visible evidence of police action in dealing with these problems

Miller & Hess, 2002

While the primary principles of policing, whether in the year 1800 or in the year 2014, seem to remain the same, the actual method of policing has evolved, and continues to do so. Historically, policing advanced through

three different eras: political (spoils system), reform (progressive system), and now community policing (Miller & Hess, 2002).

The political era hallmarked the lawlessness of police officers, and vast levels of undisciplined corruption (Miller & Hess, 2002). Officers were hired because they had connections and loyalty to elected officials (Miller & Hess, 2002). These connections were questionable and turned the police into extensions of corrupt politicians (Miller & Hess, 2002). Citizens viewed policing negatively, and relationships were strained (Miller & Hess, 2002).

Following the political era, the reform era shifted policing away from politics and corruption and into a professional system. In the reform era the police became known as “crime fighters” (Miller & Hess, 2002). During the reform era, police distanced themselves from citizens as well because the police believed the citizens were not needed to solve crimes (Miller & Hess, 2002). The reform paradigm created new patrol tactics, such as randomized patrolling, and rapid response to categorized calls for service (Miller & Hess, 2002). The police viewed themselves as experts in the field, and refused or rebuked the help of citizens in doing so (Miller & Hess, 2002). This era strained relationships between the police and the community (Miller & Hess, 2002).

The community era of policing emerged near the end of the 1960’s and beginning of the 1970’s, with the idea of reestablishing a connection to

the community (Miller & Hess, 2002). Under the community era, the police are no longer “crime fighters”, rather now they are viewed as problem solvers (Miller & Hess, 2002). Community era police are expected to partner with the community as stakeholder (Miller & Hess, 2002). These new partnerships looked to solve the problems facing the community with more than police presence and arrests (Miller & Hess, 2002). The community era persists today, and is the closest model to Sir Robert Peel’s statement, “*the police are the public and the public are the police”* (Miller & Hess, 2002).

With the evolution of the policing paradigm to the community era, there was expansion of resources and equipment (Langworthy & Travis, 2003). Evolution of policing approaches and services are evident even today (Langworthy & Travis, 2003). The equipment utilized by officers improved over time, and continues to advance as fast as technology will allow (Langworthy & Travis, 2003). Today the police are provided an array of tools with which to carry out their job (Langworthy & Travis, 2003).

According to Schultz, technology in policing advances faster than the industry can keep up (2008). New systems from red light enforcement cameras to thermal imaging to in-car video systems for officers now populate the field of police technology (Schultz, 2008). Schultz explains the multitude of advancements in less-lethal technology to include chemical agents, projectile systems, and even electro-muscular disruption technology (2008).

Responsible agency executives must evaluate any new piece of technology for their officers from the auspices of cost-effectiveness, training, service and maintenance requirements, and operational need (Schultz, 2008). In other words, agencies should ensure the equipment serves a purposeful need, such as safety, efficiency, or decreased job task difficulty (Schultz, 2008). The introduction of Electronic Control Devices into law enforcement is no exception to the recommendations by Schultz. Today, over 18,000 law enforcement agencies in the United States of America, and worldwide, deploy a form of ECD (TASER International, 2013).

1.2 Police Use of Force & The Electronic Control Device

> Hereby it is manifest, that during the time men live without a common power to keep them all in awe, they are in that condition which is called war…where every man is enemy to every man…In such condition, there is no place for industry: because the fruit thereof is uncertain: and consequently no agriculture…no society: and which is worst of all, continual fear, and danger or violent death; and the life of man, solitary, poor, nasty, brutish, and short.
>
> Thomas Hobbes, Leviathan

Some would suggest the Government is not needed to police its citizenry. As quoted above from his renowned paper, *Leviathan*, Thomas Hobbes provides his opinion as to what a society without Government would be like. Dunham and Alpert agree, and propose the community needs the police to keep order, prevent harm, and avert anarchy (2001). Dunham and Alpert also suggest the people *need* the state (2001). It is critical that the

people maintain knowledge of policing legislation and rules, which apply to the manner of policing to the citizens (Dunham & Alpert, 2001).

Above enforcing law, police officers are also permitted to use physical force, when reasonable and necessary, to conduct their duty (Dunham & Alpert, 2001). This authority to use force is granted from the polis of the municipality, county, state or federal government from where they possess their sworn authority (Dunham & Alpert, 2001). With the authorization of force, a dilemma is created: how can police be permitted to use physical force against citizens while carefully balancing the potential for illegitimate use of force (Dunham & Alpert, 2001)?

Electronic Control Devices (ECD's) are less-lethal force usage devices, and were implemented into law enforcement in the 1990's (TASER International, 2013). Less-lethal force is a type of force that is not designed to cause death or serious bodily injury (i.e. ECD, bean-bag round, pepper spray). Lethal force is specifically designed to cause death or serious bodily injury (i.e. firearms). Since the introduction of the ECD, there exists a discussion regarding the safety and efficacy of the devices. Several citizen watch groups suggest the ECD should not be classified as a less-lethal weapon, but rather a lethal weapon (Amnesty International, 2004). There is demand by Amnesty International to institute a moratorium on ECD usage until an empirical study can be conducted to fully test the safety of the device

(2004). This debate becomes important to law enforcement agencies that issue an ECD to its officers.

This debate of ECD safety occurs locally as well. The Arlington Texas Police Department issues ECD's to all its officers as daily issued gear (Arlington Police Department, 2013). Thus, the Arlington Police Department must be able to articulate the ECD is a safe less-lethal force option for its officers. The process of ECD implementation for the Arlington Police Department began in 2004 by testing a small number of ECD's with officers for program evaluation (Arlington Police Department, 2013). In 2010, the Arlington Police Department concluded the evaluation phase and rolled ECD's out to all sworn officers (Arlington Police Department, 2013).

As the safety of the ECD is challenged across the nation, the purpose of this study is to determine if there is a relationship between ECD usage and subject injury at the Arlington Police Department. This objective is achieved by reviewing use of force data from the Arlington Police Department. Usage and incidence of injury upon the subject is compared using several independent variables.

1.3 Organization of Presentation

Chapter two of this presentation is devoted to a robust review of the relevant empirical literature related to the ECD in law enforcement. The researcher begins by discussing the ECD in terms of general function and

nomenclature. This discussion will also include a brief overview of electrical physiology so the reader may better understand the fundamental operation of the ECD and its impact upon a human subject.

Next, the study will review demographic ECD studies looking for similarities amongst national and single-agency ECD policies and responses. Within the demographic studies, the author will also look for training, policy, and program management similarities amongst the various studies. There will then be a discussion of the oppositional and supportive literature. The study will also cover current industry standards surrounding ECD deployment in law enforcement. These standards will look to include policy creation as well as use of force continuum related to ECD placement. Finally, local policies of the Arlington Police Department will be consulted to provide the reader with a framework for this study.

Chapter three is dedicated to the methods of this research study. The data was obtained from the Administrative Investigations Management (AIM) system at the Arlington Police Department, and is considered secondary data. Also included is an explanation of the data characteristics with respect to sample size, requirements for selection and de-selection. The researcher used the Statistical Package for the Social Sciences (SPSS) to conduct various calculations of the data to try and determine if a relationship between the ECD and subject injury exists.

Chapter four of this study focuses upon the findings of the SPSS calculations. These results explain the impact of the findings as they relate to the research questions. A presentation of the findings of the regression analysis is also included.

Chapter five is dedicated to the discussion and conclusions, which can be derived from the findings in chapter four. There will also be an evaluation of the shortcomings or limitations of this study. Because the findings could represent the potential for future research by outside law enforcement agencies, there will be a discussion of policy implications as well. Finally, there will be an explanation of future research, which may be undertaken by other law enforcement agencies with similar research questions. Finally, local policies of the Arlington Police Department will be consulted to provide the reader with a framework for this study.

1.4 Definitions

The term Electronic Control Device (ECD) has many interchangeable definitions that refer to the same device. In this report, the reader will see the following analogous terms:

- Conducted Energy Device (CED)
- Electronic Control Weapon (ECW)
- Conducted Electrical Weapon (CEW)
- Electro-muscular Disruption (EMD)
- Stun Gun
- TASER (TASER International, 2013)

Chapter 2

Literature Review

2.1 Electronic Control Devices

2.1.1 ECD Overview

2.1.1.1 General TASER Overview

The TASER was designed to be similar to a handgun making training and effectiveness more successful (Weiss & Davis, 2003). The TASER contains a power source called a digital power magazine, which is composed of two, 3-volt lithium batteries (Weiss & Davis, 2003). The digital power magazine generates 19 pulses per second when the device is activated (Kroll, 2009). The TASER is loaded with an expendable air cartridge, which is loaded onto the front of the TASER (Weiss & Davis, 2003). The TASER probes are housed within this air cartridge (Weiss & Davis, 2003). The front of each air cartridge is covered by plastic “blast doors”, which fall away when the TASER is fired (Weiss & Davis, 2003). The air cartridges can have an available range of 15’ to 21’, depending on the air cartridge utilized (Weiss & Davis, 2003).

The TASER is activated with an “on/off” toggle switch near the back and above the handle (Weiss & Davis, 2003). When turned on, the TASER activates a laser aiming light and low power white light to illuminate the suspect in front of the device (Weiss & Davis, 2003). When activated, the

officer will see the status of the TASER (battery status) in a central information display at the rear of the TASER device (TASER International, 2013). This central information display also counts down the remaining seconds of each TASER usage when the trigger is activated (TASER International, 2013).

There are two methods of discharging the TASER against a subject: air cartridge, or drive stun mode (Weiss & Davis, 2003). In air cartridge mode, the officer pulls the trigger, which signals a release of compressed nitrogen within the air cartridge (Weiss & Davis, 2003). The nitrogen forces the TASER blast doors to detach, while also propelling the probes towards the subject (Davis & Weiss, 2003). The probes travel towards the subject while vertically spreading apart one foot for each seven linear feet traveled (TASER International, 2013). In other words, at 21 feet the probes will end up spread apart from each other by three vertical feet (TASER International, 2013). The probe spread is critical as the electrical waves affect the subject only between the probe contact points, so the wider the spread of the probes, the more effective the incapacitation of the muscles in between the probes (TASER International, 2013).

The probes, which are similar to straightened fishhooks, implant into the skin or clothing of the subject (Weiss & Davis, 2003). The probes remain tethered to the TASER via thin electric wire (Weiss & Davis, 2003). The

TASER then conducts the electrical signal through the tethered wires, and into the suspect, creating muscular and sensory overload (Weiss & Davis, 2003). This entire process occurs in less than one second.

In drive stun mode, an officer can remove the air cartridge and apply the TASER to a subject by "driving" or placing the front of it against the body of a subject (Weiss & Davis, 2003). In drive stun mode the TASER will produce only sensory pain since there is no "spread" between the electrical output contact points on the front of the TASER (Weiss & Davis, 2003). In both air cartridge and drive stun mode, the TASER will cycle for 5 seconds with each individual trigger pull (Weiss & Davis, 2003).

Each TASER ECD has an internal memory, which records the date, time, temperature, and duration of each usage (TASER International, 2013). The end user can download this data from an onboard data port to an external computer (TASER International, 2013). The TASER is capable of storing thousands of individual usages in the central memory (TASER International, 2013). The end user is unable to manipulate any of the stored memory system data, which protects the integrity of the ECD (TASER International, 2013).

2.1.1.2 TASER International

Founded in 1993, TASER International is the leading vendor for ECD's in law enforcement. The TASER is named for its inventor, and the

title is actually an acronym: Thomas A. Swift Electric Rifle (TASER International, 2013). TASER International manufactures the most popular model of ECD; the TASER X-26 (TASER International, 2013). The TASER X-26 is the issued ECD for the Arlington Police Department. In their 2012 Annual Report, TASER International indicates the usage of a TASER ECD at 17,000 law enforcement agencies nationwide (TASER International, 2013). TASER International claims to have saved the usage of deadly force in 5.4% of all force usage situations reported to TASER (2013). The company maintains data to show suspect injury rates are reduced 60% when a TASER ECD is utilized (TASER International, 2013).

TASER International produces accessory products and systems for their TASER ECD platform. There are body worn camera systems, which can upload video and audio from a TASER deployment (TASER International, 2013). The company manufactures and sells data storage systems whereby an agency can upload each officer's ECD data for evidentiary safekeeping (TASER International, 2013). TASER International also sells its training and instruction services so that agencies may certify officers to instruct new users of the TASER ECD (TASER International, 2013).

2.1.1.3 Electrical Physiology

The TASER ECD produces an initial charge of 50,000 volts of electricity, which is designed to push or “arc” the electrical signal through the clothing and/or skin of the subject (Weiss & Davis, 2003). Once the arc phase is complete, the TASER lowers the electrical voltage to approximately 1,200 volts (Weiss & Davis, 2003). TASER electrical waves cause immobilization upon the skeletal muscles and the feeling of pain upon the sensory nerves (Weiss & Davis, 2003). The supplied voltage and reduced amperage of 19 pulses per second cause physical immobilization of the subject (Kroll, 2009).

According to Kroll, in order to cause adverse medical reactions (electrocution) the conducted amperes across the chest must be 0.3 or greater (2009). While the TASER operates at a high voltage, it delivers this voltage at a greatly reduced ampere level (Weiss & Davis, 2003). In fact, the TASER ampere rate is only 0.168 amps at 26 watts, which is far below the level of injurious electrocution (Weiss & Davis, 2003). Davis and Weiss conclude the TASER is safe to use the on human subjects since the electrical waves do not adversely affect the subject’s heart, lungs or brain (2003).

2.2 Agency Studies

2.2.1 National Agency Studies

2.2.1.1 Alpert and Dunham

In a study of ECD characteristics, Alpert and Dunham surveyed 12 police agencies using ECD, and suggested policy and training recommendations. In conjunction with the survey, Alpert and Dunham also researched ECD statistics amongst law enforcement agencies across the nation. According to the research, there were 15,000 law enforcement agencies in 40 countries using ECD's (Alpert & Dunham, 2010). Within those agencies, 448,000 officers used the TASER brand ECD and had documented 843,000 deployments of the ECD (Alpert & Dunham, 2010).

The author researched the etiology of subject injury during force encounters with police and citizens, and related this research specifically to creating an ECD program within a law enforcement agency. Alpert and Dunham found that less than 2% of police and citizen contacts result in a force encounter (Alpert & Dunham, 2010). However, of the force encounters, between 10% and 38% result in an injury to the citizen (Alpert & Dunham, 2010). Most injuries resulted from punching, striking and/or kicking techniques used by the officer (Alpert & Dunham, 2010). These injuries accounted for nearly 70% of the total reported injuries (Alpert & Dunham, 2010). Alpert and Dunham concluded that the use of ECD's could lead to a

reduction of citizen injuries (2010). This reduction varied, depending on the method of collection, from 3% to 90% (Alpert & Dunham, 2010).

The comprehensive study of 12 law enforcement agencies yielded a variation of findings. Alpert and Dunham concluded that ECD are not risk-free, and serious injury or even death may result when an ECD is used against an at-risk population such as a pregnant female, or perhaps an elderly person (2010). However, Alpert and Dunham conclude that ECD's are generally safe given a robust training and implementation program with administrative oversight (2010).

2.2.1.2 National Institute of Justice

The ECD was introduced to the law enforcement community in an effort to prevent injury by reducing the need for officers to use physical force against a combative subject (Alpert et al, 2011). In a report to the National Institute of Justice, Alpert et al documented over 15,000 law enforcement agencies using the ECD as a part of their officer's issued equipment (2011). The researchers in this project found when an officer uses physical force against a citizen; injuries could result from 17% to 64% of the time (Alpert et al, 2011). Of these injuries, "most were minor bruises, strains and abrasions" (Alpert et al, 2011). The ECD probes puncturing the subject accounted for 83% of the reported injuries within this study (Alpert et al, 2011).

The researchers concluded when an officer is physically closer to a suspect, the chances of physical contact and resulting injury also increased (Alpert et al, 2011). When ECD are successfully implemented, agencies in this study reported rates of injuries for suspects and officers fell dramatically (Alpert et al, 2011). Alpert et al ultimately concluded that the ECD is a safe and effective way to prevent injuries (2011).

2.2.1.3 Paoline, Terrill and Ingram

Paoline, Terrill and Ingram conducted a study that compared ECD deployment to hand and weapon-based tactics as they relate to injuries on subjects (2012). At the time of this survey, 11,500 police agencies issued ECD to 260,000 officers across the nation (Paoline et al, 2012). For this study, nearly 80% of the responding 662 agencies issued ECD to its officers (Paoline et al, 2012). Of the responding agencies, eight police agencies were selected for further analysis (Paoline et al, 2012). At issue was whether or not an officer was injured during the force encounter, and also what level of force was the officer using at the time (Paoline et al, 2012).

The findings showed that officer injuries were significantly lower when the ECD was used as compared to other methods of force (i.e. physical personal confrontations) (Paoline et al, 2012). Findings suggest officers from all cases were injured 5% of the time when ECD was used, 14.2% of the time when ECD *and* any other force option was used, and 9.6% of the time when

ECD was not used (Paoline et al, 2012). These findings support the assertion that lower levels of injury occur when an ECD is utilized (Paoline et al, 2012). The conclusion of the research demonstrated the reduction of injury if an officer had the option of an ECD, compared to when other means of physical force is employed (Paoline et al, 2012).

2.2.1.4 Terrill and Paoline

Terrill and Paoline conducted provocative research wherein they attempted to measure the relationship of ECD's and citizen injuries. Prior to this publication, there had been a lack of conclusive ECD studies that controlled for citizen resistance as an explanation for injury (Terrill & Paoline, 2011). Although citing recent medical expert findings of ECD safety presented at a conference hosted by the National Institute of Justice, Terrill and Paoline claimed the results of the conference yielded no conclusive evidence on ECD usage and serious injury or death (Terrill & Paoline, 2011). For this study, Terrill and Paoline relied upon secondary data obtained from the National Institute of Justice's *Assessing Police Use of Force Policies and Outcomes* project (2011). The researcher used a representative sample of 600 agencies and 14,000 uses of force incidents, of which 2,600 involved an ECD (2011). From there, Terrill and Paoline pulled eight comparable agencies with similar policies and reporting guidelines for further detailed evaluation (2011).

The findings reveal citizens are 68% more likely to be injured by a ECD and 89% more likely to be injured with a ECD and another force option (Terrill & Paoline, 2011). Terrill and Paoline were quick to point out the limitations of their own findings: data was limited to a secondary search of National Institute of Justice data, each agency varied widely on how to classify injuries, and agencies varied on how to report use of force incidents (2011). As such, Terrill and Paoline call for additional research using the multivariate analysis they conducted as an effort to uncover whether or not the ECD is likely to cause citizen injury (2011).

2.2.2 Single Agency Studies

2.2.2.1 White and Ready

ECD's are deployed differently from agency to agency. One study by White and Ready reviewed ECD efficacy in the New York Police Department (NYPD) from 2002 through 2005 (2008). The study sought to discover how suspect resistance correlates to ECD usage and compares officer satisfaction with the force encounter regarding ECD usage (White & Ready, 2008). In the NYPD, the ECD is issued to select units, such as the Emergency Services Unit (similar to SWAT) (White & Ready, 2008). During the three-year period, White and Ready noted 375 total uses of the ECD (2008).

White and Ready found the ECD to be quite effective in multiple circumstances (White & Ready, 2008). For the dependent variable, White and Ready measured effectiveness as it relates to ending suspect resistance (2008). Respondent officers reported a 78% level of efficacy regarding ECD use in the field (White & Ready, 2008). With such a high rating, researchers concluded most officers were generally pleased with the ECD usage against resisting suspects (White & Ready, 2008). White & Ready also evaluated post-deployment concerns, such as preventing escalated levels of force or additional ECD deployments against the same combative subject (2008).

The survey also evaluated the number of seconds the ECD was used and whether or not the suspect was incapacitated at all during the usage (White & Ready, 2008). Finally, officers were asked, in their opinion, if the ECD performed successfully (White & Ready, 2008). The results showed 33% of suspects continued to resist after the ECD was used in the confrontation (White & Ready, 2008). This continued resistance is broken down into two categories: the ECD never successfully contacted the suspect to cause incapacitation, or the ECD initially was in contact with the subject, but due to the dynamic circumstances of physical resistance, became detached during the encounter allowing the suspect to continue resisting (White & Ready, 2008). White and Ready noted that continued resistance is an important subject because it highlights how ECD provides a limited

window of opportunity for officers to safely control a combative subject (2008). Further, officers should not expect a suspect to immediately surrender with an ECD deployment, and alternate methods of control must be employed alongside the ECD (White & Ready, 2008). Also of note was when one probe failed to lodge upon the suspect, the chances of further resistance grew 300%, giving credibility to reliable training to teach proper deployment methods (White & Ready, 2008).

Regarding findings of officer's satisfaction, 78.7% of officers surveyed were satisfied with the ECD deployment (White & Ready, 2008). The NYPD also reported that when a suspect had a weapon (i.e. bat, gun, bottle, etc.), the ECD usage had a higher satisfaction for the officers because in some cases, deadly force was avoided and the confrontation was ended (White & Ready, 2008). White and Ready concluded ECD to be most effective against a subject over 200 pounds, greater than 3 feet away from the officer, under influence of drugs/alcohol, and directing violence towards the officer (2008).

2.2.2.2 Lin and Jones

Lin and Jones reviewed ECD usage and outcomes at the Washington State Patrol (WSP) from 2005-2007 (2009). In this research project, 1,188 ECD uses were analyzed across the sampling time frame (Lin & Jones, 2009). The study sought to discover: what force methods were replaced by ECD, did ECD use reduce higher levels of force, how do officers rate the

effectiveness of ECD, and did the ECD reduce suspect and officer injuries (Lin & Jones, 2009).

During agency implementation, the WSP issued the ECD in groups each year to its officers (Lin & Jones, 2009). The total number of officers employed during this study remained constant (1,055 officers) (Lin & Jones, 2009). Each year, 250 ECD units were issued to the officers, and also, injury rates declined each year (from 15% at the beginning to 9% at the conclusion) (Lin & Jones, 2009). Most encounters with ECD's, 70.6%, did not result in citizen injury, and if injured, it was reported to be "visible" injury (16.2%) (Lin & Jones, 2009).

Lin and Jones conclude ECD use reduces officer and suspect injuries when used correctly (2009). Lin and Jones also found the force encounter was more likely to end sooner when an ECD was deployed effectively (Lin & Jones, 2009). Lin and Jones recommend agency executives understand that ECD's do not replace lethal force; however, ECD's provide alternatives to non-lethal and less-lethal force options (Lin & Jones, 2009).

2.2.2.3 Sousa, Ready and Ault

Sousa, Ready and Ault studied the Las Vegas Metropolitan Police Department (LVMPD) ECD usage as a force option during simulated force encounters (Sousa et al, 2010). The study involved the sample of 64 randomly selected officers (32 control group and 32 experimental group)

(Sousa et al, 2010). For this project, each officer was presented with three different scenarios and their force response to each scenario was examined (Sousa et al, 2010). The research question tested whether or not the issuance of an ECD affected an officer's response to resistance by producing a higher than necessary level of force (Sousa et al, 2010).

Each test subject was presented the same three incident scenarios: a non-aggressive incident, an aggressive incident, and a deadly force incident (Sousa et al, 2010). The officers were also given the same instructions and force options to select as a response (Sousa et al, 2010). Throughout all 64 cases, the officers were found to respond accordingly to each separate scenario.

During the non-aggressive scenario, officers frequently selected empty-hand control as a response (Sousa et al, 2010). For the aggressive incident, officers used the ECD and impact weapon as their primary response (Sousa et al, 2010). Lastly, most officers responded with deadly force in the deadly force scenario, and a few used the ECD (Sousa et al, 2010). The study concluded officers did not vary their response to the scenario just because they had an ECD available to them (Sousa et al, 2010). Also, the researchers determined the ECD to be an effective tool (Sousa et al, 2010).

2.3 Oppositional ECD Literature

2.3.1 Amnesty International

While there are a number of studies touting the effectiveness of ECD usage, there is also oppositional literature on the subject of ECD deployment by law enforcement. In addition to its intrinsic value, it is vitally important to understand the oppositional ECD literature because it supports the need to further study ECD implementation.

In two separate reports, Amnesty International questions the use of ECD's as a form of torture by foreign countries and misuse by law enforcement. In their 2003 report, the organization states that various manufacturers have increased production of ECD's and purport the devices to be a "less than lethal" method of force (2003). The report suggests the usage of ECD's by foreign countries to evoke confessions from prisoners or provide inhumane treatment of the same should create a moment of pause amongst those considering the implementation of ECD (Amnesty International, 2003).

In 2004, Amnesty International published another report calling for the suspension of all ECD's by law enforcement until an independent research study could be conducted to evaluate whether or not an ECD is truly non-lethal (Amnesty International, 2004). The impetus for this report is centered on the fear that police agencies have become overly reliant upon ECD's and

this leads to the increase of potential misuse of ECD's (Amnesty International, 2004). Although Amnesty International claims to support ECD's and other non-lethal technology to protect officers and suspects, the group states ECD's have not been properly evaluated for human safety (2004). The report poses several anecdotal points in which it attempts to relate the ECD to in-custody suspect death (Amnesty International, 2004).

One particular point raised by Amnesty International claims the ECD is an easy way for US law enforcement to inflict serious pain and incapacitation upon people with a "the flick of a button" (2004). This inflammatory phrase creates a challenge for law enforcement as it may create fear by the general public of law enforcement use of the weapon. The implication of misuse has been important, as it has resulted in a call for an empirical evaluation to prove ECD's as lethal or non-lethal. This call has been answered by a number of researchers as outlined above.

2.3.2 American Civil Liberties Union

In an article from the American Civil Liberties Union, McRay and Andersson give their opinion as to why the TASER cannot be referred to as a non-lethal weapon (2012). This article suggests that TASER is responsible for the death of 500 people since 2001 (McCray & Andersson, 2012). The basis for this argument comes at a recommendation of the American Heart Association, suggesting misuse of the TASER can lead to cardiac arrest

(McCray & Andersson, 2012). The article does not provide empirical support for this claim of ECD related deaths, it simply references that ECD has been used in incidents where a subject later died (McCray & Andersson, 2012).

McCray and Andersson also raise questions about TASER International being a "for profit" company and one of the most commercially prolific ECD companies on the market (2012). According to the authors, officers deploy the TASER haphazardly, regardless of the subject's conditions, and do not consider the "at-risk" populations (i.e. pregnant, mentally unstable, drug induced) (McRay & Andersson, 2012). The authors of the article request law enforcement agencies consider the potential misuse of TASER by officers as a reason to discontinue the use of the TASER (2012).

2.4 Pro ECD Literature

2.4.1 Industry Standards

2.4.1.1 Police Executive Research Forum

The Police Executive Research Forum is a non-profit authority on policy implementation for law enforcement agencies. The Police Executive Research Forum releases many publications regarding law enforcement issues. The audience for most publications is police executives or law enforcement agency heads (i.e. Chief's, Sheriff's, etc.). In the law enforcement community, the Police Executive Research Forum is held in

high regard for its opinion on policing issues. In response to the report from Amnesty International in 2004, the Police Executive Research Forum conducted a study in 2005 centered on the safe usage of ECD's by law enforcement.

The primary focus of this study is ECD guidelines and policy implementation strategies for law enforcement agencies (Police Executive Research Forum, 2011). The Police Executive Research Forum identified multiple suggestions for safe and effective ECD implementation within a law enforcement agency. In 2011, The Police Executive Research Forum revisited the 2005 report and amendments were made to the suggested policy implementations. The Police Executive Research Forum maintains in the 2005 and 2011 reports that ECD's are to be considered non-lethal and an effective law enforcement tool (2011). The purpose of the 2005 and 2011 reports is to aid law enforcement agencies with implementing ECD's within their agencies in a responsible manner.

In the 2011 report, The Police Executive Research Forum outline several aspects of importance. The recent report indicates that while the ECD is a less-lethal weapon and a valuable tool to officers, it is not an option of convenience (Police Executive Research Forum, 2011). The Police Executive Research Forum breaks down ECD guidelines into 6 segments: policy creation, training, using the ECW, medical protocols, reporting

procedures, and public information (2011). The report stresses attention to policy and training for the ECD within an agency. The Police Executive Research Forum discusses the need for agencies to evaluate all ECD usage using a totality of circumstances approach (2011). ECD's are not risk free and require careful scrutiny in each deployment situation (2011).

The Police Executive Research Forum outlines several key points for agencies to consider in policy and training: weak side wear (worn opposite hip side from the firearm), bright colored (yellow) ECD's to discern it from a firearm, issuing warnings to suspects (if able) before ECD use, limiting number of activations or total use time per suspect, avoiding those who would be 'at risk' to an ECD deployment (i.e. pregnant, small children, elevated positions) (2011). The Police Executive Research Forum also suggests training should include both written knowledge exams and scenario based qualifications to ensure practical application tests (2011).

The Police Executive Research Forum emphasizes medical intervention and observation of the subject as soon as practical after ECD usage (2011). Police field supervisors should physically respond to and review each ECD deployment by an officer (Police Executive Research Forum, 2011). This policy is hoped to help reduce the potential misuse and/or overuse of the ECD (Police Executive Research Forum, 2011).

The Police Executive Research Forum stresses the need for community involvement in ECD implementation by partnering with local community stakeholders as ECD's are introduced within each agency (2011). This community awareness helps reduce public misunderstanding as the local agency adopts the ECD (Police Executive Research Forum, 2011). The report produced by the Police Executive Research Forum is a critical in setting the tone for careful policy creation and oversight surrounding an agency's ECD program.

2.4.1.2 The International Association of Chiefs of Police

The International Association of Chiefs of Police is another highly regarded authority on policing issues from the perspective of an agency executive. In 2008, The International Association of Chiefs of Police published an executive brief about effective strategies for ECD implementation (2008). The International Association of Chiefs of Police first recommends forming a committee to review and implement the ECD within a law enforcement agency (International Association of Chiefs of Police, 2008). According to the report, part of any responsible policy for ECD usage is deciding where to place the ECD on a use-of-force continuum (The International Association of Chiefs of Police, 2008). The International Association of Chiefs of Police suggests the ECD should be placed upon the same level as that of chemical defense spray prior to empty hand control to

avoid a physical and potentially injurious confrontation between the officers and subject (2008).

The International Association of Chiefs of Police also point out the need for a carefully planned and comprehensive training program for ECD's (2008). In addition to training, the ECD program should also be vigilantly tracked by police management for signs of effectiveness or potential misuse (International Association of Chiefs of Police, 2008). Lastly, the report recommends implementation of ECD using a phased rollout program (International Association of Chiefs of Police, 2008). Agencies should consider specialized groups, such as SWAT teams, to test and evaluate the ECD before full department implementation begins (International Association of Chiefs of Police, 2008).

2.4.2 Policy Literature

2.4.2.1 General Policy Guidelines

In an article for *Law & Order*, Staton discusses ECD policy implementation. He begins by suggesting that agencies should partner with other agencies as they consider moving forward with ECD implementation (Staton, 2008). Networking can examine successes and failures in other agencies to stave off potential pitfalls in the policy construction process (Staton, 2008). As discussed by the Police Executive Research Forum, the number of activations is also of interest in policy construction. Staton

recommends an agency set limitations for the number of ECD activations on one suspect (2008).

The article also recommends agencies limit the number of ECD's that can be used against one subject, so as to prevent multiple ECD strikes at one time (Staton, 2008). Staton asserts ECD's are not risk free and misuse of the device with overuse, use against a risk group, or negligent use can increase the risk of misuse (Staton, 2008). Staton concludes the ECD should be placed in the use-of-force continuum above passive guidance but before empty-hand control (2008). This placement ensures the device is not used against those who are not physically combative (Staton, 2008). Finally, Staton finds the need for medical intervention and observation to be important aspects of any ECD policy (Staton, 2008).

2.4.3 Use of Force Continuum Placement

2.4.3.1 Resistance Displayed

The aforementioned literature suggests controlling the overuse or misuse of the ECD has much to do with deciding how and when the ECD can and should be deployed. Crow and Adrion found that as a suspect's resistance level increases and becomes more offensive or aggressive against an officer, the likelihood of an ECD usage against the suspect increases as well (Crow & Adrion, 2011). The study found that when a

suspect is more resistant, their threat to the public becomes more apparent, thus justifying the need for an ECD (Crow & Adrion, 2011).

Officers in this study were found less likely to use the ECD when a suspect was brandishing a weapon, but more likely to use an ECD when a suspect provided verbal threats or was evading arrest (Crow & Adrion, 2011). Crow and Adrion suggest individual department ECD training policies focus on scenario-based instruction (2011). The authors find that different officers may view levels of resistance differently from one another, and this variation can impact the variation of force used by the officer (Crow & Adrion, 2011).

2.4.3.2 Force Continuum Style/Placement

Force continuums for departments vary widely. Each law enforcement agency maintains its own justification on where and why each level of force can be used by officers. Paoline and Terrill wrote an article on this particular topic. To better understand the "how" and "where" of ECD deployment, it is important to start with an overview of a force continuum in general. Force continuums are usually metaphorically described as an object. For example, force continuums can be linear (like a ladder) with each step up being more aggressive by an officer against a subject (Paoline & Terrill, 2012). There are circular continuums where an officer stands in the middle and moves around the circle to other levels of increased force (Paoline & Terrill, 2012). There are also matrix styles, where force is available like a toolbox and the

officer must independently justify each use of force “tool” he or she selected (Paoline & Terrill, 2012). Paoline and Terrill suggest the matrix style to be most appropriate to officers given the wide availability of force options available (2012).

In all continuums, an officer is not required to use lesser amounts of force if a subject is using a higher level of force (Paoline & Terrill, 2012). Thus, officers can “enter” a force continuum at any reasonable and justified response to the resistance being encountered by a subject (Paoline & Terrill, 2012). The findings of this study show that most agencies vary in ECD placement (Paoline & Terrill, 2012). Some agencies place the ECD on the continuum at the level of deadly force (Paoline & Terrill, 2012). In contrast, some agencies authorize the ECD for physically passive, verbally resistant subjects (Paoline & Terrill, 2012). The authors found that the majority of agencies place the ECD before the usage of empty hand control (punch, strike, kick), but after verbal non-compliance (Paoline & Terrill, 2012).

Wisecarver and Overholt also discussed ECD placement within an officers force continuum. Wisecarver and Overholt endorse the need for ECD’s in law enforcement as a less-lethal alternative to physical combat tactics (2009). ECD placement should remain near OC spray, and discourage it being increased or decreased (Wisecarver & Overholt, 2009). Officers should be authorized to decide whether to use a drive stun or air

cartridge mode, as dictated by the incident circumstances (Wisecarver & Overholt, 2009). Wisecarver & Overholt conclude well-planned training before the issuance of ECD's to police personnel is critical for every agency (2009).

2.4.4 What We Do Not Know About Police Use of TASER

When considering policy construction, it's important to review the TASER as it has progressed as a police force option. Adams and Jennison researched publically available policy and practices of police agencies to determine which aspects were unique and which aspects were similar (2007). The issues on which they concentrated were: training, deployment, force continuum placement, and field usage of the TASER (Adams & Jennison, 2007). This article supports the literature in this section surrounding policy creation.

The findings suggest there is no consistent basis on which officers are trained to carry the TASER (Adams & Jennison, 2007). Some agencies have 4-hour training blocks; others may have 8-hour training blocks (Adams & Jennison, 2007). Some agencies have full TASER deployment, while other agencies limit the usage of it to specialized officers or divisions (Adams & Jennison, 2007). The force continuum is also sporadic, in that the TASER seems to be placed "almost anywhere" (Adams & Jennison, 2007). Some

agencies authorize the TASER for verbally combative subjects, while others require the subject to be physically combative (Adams & Jennison, 2007).

Policy creation is confounded as well since agencies are varied (Adams & Jennison, 2007). Some agencies have a stout ECD policy, some have a partial ECD policy, and some have no ECD policy whatsoever (Adams & Jennison, 2007). Adams and Jennison cite the aforementioned PERF and IACP reports as guidelines for responsible policy creation and management surrounding the TASER (2007). The findings conclude that the TASER is a relatively new technology, and the aspects surrounding it are widely varied (Adams & Jennison, 2007). Adams and Jennison suggest national attention to unified policy cohesion in order to better advance this new technology (2007).

2.4.5 Civil Litigation and Policy

In a 2007 article by Smith, Petrocelli and Scheer, 54 court decisions surrounding the usage of a TASER were evaluated for their importance to ECD policy creation and program management. The authors conducted case review of each decision to determine the extensiveness of TASER civil litigation, and communicate these cases to policy administrators (Smith et al, 2007). The researchers only reviewed cases in which the TASER was at issue surrounding excessive force claims (Smith et al, 2007).

The article suggests policy managers ensure their officers are being trained not only when to use the TASER, but also when *not* to use the TASER (Smith et al, 2007). This refrain of usage specifically applies to unprovoked non-violent citizens (Smith et al, 2007). Further, officers must be trained to fully verbalize and articulate each and every circumstance surrounding their decision to deploy the TASER in a force incident (Smith et al, 2007).

Policy managers should also remember that all force usage is judged upon the totality of circumstances in each given instance, and policy should follow the same path (Smith et al, 2007). Officers should be given guidance to consider the nature of the offense being committed, the level of resistance from the suspect, the physical characteristics of the suspect and officer, and potential medical circumstances that may preclude the usage of the TASER (Smith et al, 2007). The authors conclude by reminding administrators to have officers identify adverse medical reactions, and summon EMS where necessary (Smith et al, 2007). The researchers point out that adherence to these circumstances will help limit civil liability against an officer and/or agency (Smith et al, 2007).

2.5 Local Agency Policy

2.5.1 PERF Policy Compliance

Much of the literature reviewed discusses the need for ECD's, the importance of preparing and executing a proper training program and ECD policy, and addressing the issue of ECD program management. This information stems from the recommendations provided by The Police Executive Research Forum. In an article from *Criminal Justice Policy Review*, the researchers studied PERF recommendations and their impact on agencies. The focus of this study is to evaluate law enforcement agencies nationwide to determine if the Police Executive Research Forum recommendations are being followed (Thomas et al, 2012). Up to the date of this publication, there were no similar research studies to evaluate this issue (Thomas et al, 2012).

The authors divide ECD policy aspects into three sections: pre-deployment considerations, peri-deployment considerations, and post-deployment considerations (Thomas et al, 2012). The researchers studied 124 different law enforcement agencies across the country and compared the three above considerations in their results (Thomas et al, 2012). The determination in 2012 was that by-and-large, most agencies do not fully comply with the Police Executive Research Forum recommendations (Thomas et al, 2012). Of the 3 considerations, pre-deployment and peri-

deployment considerations suffer the most from The Police Executive Research Forum recommendations (Thomas et al, 2012). The finding showed that post-deployment considerations, which included medical intervention and after-action reporting, had the largest level of compliance (Thomas et al, 2012).

The authors conclude law enforcement agencies must continue to consider the full implementation of the Police Executive Research Forum's ECD policy recommendations (Thomas et al, 2012). This report seeks to help establish a current practice of law enforcement agencies nationwide, which will support the need to guide and track the use of ECD's in a responsible manner (Thomas et al, 2012).

2.5.2 Arlington Police Department

2.5.2.1 Use of Force Annual Report

The Arlington Police Department produces an Annual Use-of-Force Report, which summarizes force usage and related circumstances from the previous year. Each report has comparisons from the previous six years showing trends and notable force usage observations (Arlington Police Department, 2012). The Arlington Police Department began evaluating the ECD with limited numbers of officers in 2004 (Arlington Police Department, 2012). The Arlington Police Department uses the term Electronic Control Weapon (ECW) instead of ECD. The Arlington Police Department moved

from evaluation to the full implementation of the ECW in 2009, and each succeeding year, issued groups of ECW's to officers (Arlington Police Department, 2012). According to the report, at the end of 2012 the Department had issued 587 ECW's to its officers, and thus completed the implementation of the ECW (Arlington Police Department, 2012).

The findings pointed to a yearly trend (with exception of 2008) of increased ECW usage each year, suggesting more ECW's are in use by the officers as the implementation process grew (Arlington Police Department, 2012). Since 2006, the Department documented 1006 effective applications of the ECW and 63 ineffective applications (Arlington Police Department, 2012). This effectiveness translates into 93.7% efficacy (Arlington Police Department, 2012).

2.5.2.2 General Orders

Arlington Police Department General Orders establish written policies for officers regarding deadly and non-deadly force. It is here that the policy regarding ECD usage is found. First, the department notes that each user must complete 8 hours of training before they can be issued an ECW, and it points out that yearly recertification will occur (Arlington Police Department, 2012). Arlington Police Department uses a ladder continuum for force: officer presence, verbal direction, passive physical guidance, OC spray,

ECW, empty hand control, impact weapon, vascular neck restraint, and deadly force (2012).

The Arlington Police Department largely complies with Police Executive Research Forum recommendations regarding the ECW placement on the use-of-force continuum as a less-lethal weapon. The General Orders authorize an officer to use an ECW, if necessary, to make a lawful arrest, overcome resistance to the same, preventing escape, defending a third person from bodily injury, and preventing unlawful use of another's property (Arlington Police Department, 2012). This policy complies with the recommendation of the Police Executive Research Forum, which suggest ECW only be used for someone displaying physical aggressive resistance, and not against someone merely displaying passive resistance.

The Arlington Police Department policy points out that ECW is not intended to replace any other weapon on the continuum and each use of force must be independently justified (Arlington Police Department, 2012). The Arlington Police Department also adopted the requirements that a supervisor physically respond to all ECW usage, EMS be summoned, and the suspect be "observed" for 2 hours after the ECW use (Arlington Police Department, 2012). These aspects of the ECW policy also comply with the Police Executive Research Forum for post-deployment considerations.

Lastly, the General Orders outline that each time an ECW is discharged (outside of training), a use-of-force report will be submitted through the chain-of-command for supervisor review (Arlington Police Department, 2012). This attention to post-deployment considerations shows attention to the Police Executive Research Forum recommendations. The Arlington Police Department is currently in compliance with the majority of recommendations given by The Police Executive Research Forum as shown in the General Orders Manual.

Chapter 3

Methodology

From the empirical literature review, it is clear that various methods to study have been used when examining the safety of an ECD program within a police agency. Divergence of implementation procedures, training protocol, program management, and classification of injury create confusion in the field. There persists an ever-growing challenge as to the purported safety of ECD. The lack of a research consensus for proving or disproving the safety of ECD's is a confounding issue. The literature showed that the primary impetuses of arguments against the ECD are rooted in subject injury. Given this issue, this study will evaluate whether or not the rate of injury against an intended subject is impacted by the deployment of an ECD at the Arlington Police Department.

One area explored within the literature review is the method by which an agency classifies a documentable "injury" against a human subject. It appears the conjecture between those lobbying against the ECD as compared to those lobbying for the ECD is contingent manner in which an injury is classified. For this study, the policies of the Arlington Police Department will be compared against the existing literature to determine if the Arlington Police Department is utilizing the best practices and standards of deploying their ECD program.

The observations of measurements are quantitative in that individual measurements are contingent upon quantity, or objective parameters. The data (from the year 2008 through 2012) was collected by the Arlington Police Department as part of implementation of ECD's by the department, thus it is considered secondary data. The usage of secondary data is appropriate as it mirrors the pro and anti-ECD empirical literature in that both groups of studies collected data in a similar manner. Since this research project seeks to evaluate the rate of injury experienced from ECD deployment as an evaluation to the pro and anti-ECD arguments, it is critical that similar data collection methods are observed.

Prior to collecting the information, the researcher prepared an application to the Institutional Review Board for the Protection of Human Subjects (IRB). This IRB application was then submitted to the University of Texas at Arlington's (UTA) Research Compliance Office. After review, the UTA Research Compliance Office provided written approval to the researcher to begin the research process. This chapter explains the sample selection criteria, and also explains the sample size. The chapter concludes with an explanation of the analysis procedures utilized during this study.

3.1 Arlington Police Policy

The Arlington Police Department establishes policies and guidelines for a police officer to use and documents levels of force against human

subjects. These policies are referred to as general orders. General orders section 401.00 discusses the manner in which an officer is authorized to utilize both deadly and non-deadly force (Arlington Police Department, 2013). The general orders manual also outlines the method in which an officer must document and report the use of force (Arlington Police Department, 2013).

General orders also outline the process by which the officer's chain of command will review and approve the use of force report (Arlington Police Department, 2013). The general orders divide force into two categories: deadly force and non-deadly force (Arlington Police Department, 2013). The policy defines deadly force as "force that is intended to cause death or serious bodily injury or that a reasonable and prudent person would consider likely to cause death or serious bodily injury" (Arlington Police Department, 2013). All force, including the ECD that is not defined as deadly force is thus considered non-deadly force (Arlington Police Department, 2013).

3.1.1 Use of Force Continuum

The Arlington Police Department employs a linear use of force continuum (Arlington Police Department, 2013). This continuum is constructed metaphorically similar to a ladder; each level of force is positioned higher than the last. The Arlington Police Department requires officers to exhaust lower levels of force, *where possible*, before escalating force to a higher, more aggressive level of force (Arlington Police

Department, 2013). However, an officer is not required to start at the bottom of the force continuum and step through each level of force if the suspect is presenting a higher level of resistance to the officer (Arlington Police Department, 2013). The linear levels of force options available to an officer are as follows:

- Officer presence (uniform, presence)
- Verbal direction (commands)
- Passive guidance/control (hands on/escorting)
- Oleoresin Capsicum (OC) spray
- Electronic Control Device
- Empty hand control (soft or hard, striking, kicking)
- Intermediate weapons (impact weapon, soft or hard)
- Vascular neck restraint
- Approved firearm and ammunition

Arlington Police Department, 2013

Within the policy surrounding the ECD, the general orders manual authorizes the ECD against aggressively resistant subjects or animals, and this policy also permits usage of ECD against subjects threatening resistance or violence against the officer (Arlington Police Department, 2013). The Arlington Police Department does not authorize the usage of the ECD against a passively resistant subject (Arlington Police Department, 2013).

The Arlington Police Department requires its police officers to document force usage on a department approved use of force report before the officer's shift concludes (Arlington Police Department, 2013). This use of force report is then submitted to the officer's supervisor (Arlington Police

Department, 2013). The following force options require documentation of the use of force by an employee:

- Empty hand control
- Drawing firearm in response to a subject
- Pointing firearm at a subject
- Handcuffing a subject without arrest
- Chemical irritant (CS, OC spray)
- TASER or accidental discharge of TASER
- Impact weapon
- Vascular neck restraint
- Discharging firearm on/off-duty (except in training)
- Diversionary device
- Apprehension by [police] dog

Arlington Police Department, 2013

3.1.2 Use of Force Reporting Guidelines

Any officer that utilizes force is required to report *each* usage of force against a subject (Arlington Police Department, 2013). These use of force reports are evaluated by the officer's chain of command for accuracy, prudence, and conformance to policy and law (Arlington Police Department, 2013). Once the report is approved, it is forwarded to the Arlington Police Training Section and entered into a use of force repository system (Arlington Police Department, 2013).

Arlington Police Officers must consult the Use of Force Reporting Guidelines, which outline the instructions for completing a use of force report. The guidelines are provided by the Arlington Police Department Training Section as a reference for employees completing the use of force report (Arlington Police Department, 2010). Within the guidelines, the training

section explains that use of force reports are intended to be a “concise documentation of specific control techniques used against resistive subjects”, and “the employees attached [report] will provide the detailed description of the incident and justify the employee’s actions” (Arlington Police Department, 2010).

The reporting guidelines also instruct each officer on how to fill out the use of force report (Arlington Police Department, 2010). The use of force report collects the following: police call/report number (uniquely assigned by the police computer-aided dispatch system), arrested person’s (if any) jail ID number, date and time of occurrence, employee data (name, badge, assignment, etc.), subject data (name, age, sex, race), subject actions (level of resistance displayed by subject), employee actions (level of force employed by employee against subject), subject injury, and reason for contact of the subject by the officer (Arlington Police *Department, 2010)*. In the event there is no police report generated for the incident, there is also a section for an officer to hand write a justification for the use of force (Arlington Police Department, 2010).

The training section receives the use of force reports and immediately assigns a unique serial number to each report (Arlington Police Department, 2010). The serial number is tracked within the police department training section database (Arlington Police Department, 2010). Each report must be

entered into the repository and upon doing so is cleared from the pending database (Arlington Police Department, 2010). This process ensures all reports are accounted for and properly documented by the training section (Arlington Police Department, 2010). Reports not entered remain in a pending status for the training section database, and the annual use of force report cannot be generated until all pending reports are entered and cleared (Arlington Police Department, 2010).

3.2 Variable Operationalization

3.2.1 Dependent Variable

Since this project seeks to determine if an adverse rate of injury from the ECD exists at the Arlington Police Department, the *subject injury* category from the use of force report will be the dependent variable for each observation. The dependent variable will be coded as a binary response: the subject is injured or the subject is not injured. The subject injury variable will be operationalized according to the instructions outlined within the Arlington Police Department use of force reporting guidelines. According to these guidelines, the subject injury section is a requirement for the use of force report to be completed and approved (Arlington Police Department, 2010). When an officer is completing this section, the options for subject injury include: injury, injury complained of but not observed, death or serious bodily

injury and no injury complained of or observed (Arlington Police Department, 2010).

For this section, officers must select injured if the subject has visible bodily injury (Arlington Police Department, 2010). There is no definition of bodily injury in the general orders manual for this use of force report. Therefore, the researcher utilized the Texas Penal Code as guidance for these definitions. The Texas Penal Code defines bodily injury as "physical pain, illness, or impairment of any physical condition" (Texas State Legislature, 2011). It is important to note that some officers may deviate from the Texas Penal Code definitions in how they choose to classify injury. However, this project is unable to scrutinize reports for any dissimilar interpretations. It is most likely officers would define injury and serious bodily injury along Texas Penal Code definitions.

An officer will select death or serious bodily injury if the subject dies or suffers serious bodily injury from the encounter. Again, there is no definition for serious bodily injury in the general orders manual for this use of force report. The researcher again consulted the Texas Penal Code for guidance with this definition. The Texas Penal Code defines serious bodily injury as "bodily injury that creates a substantial risk of death or that causes death, serious permanent disfigurement, or protracted loss or impairment of the function of any bodily member or organ" (Texas State Legislature, 2010).

The officer would choose injury complained of but not observed if the subject reports any injury not visible to the officer (Arlington Police Department, 2010). The last option is no injury complained of or observed, and this option is chosen when the subject reports no injury (Arlington Police Department, 2010). An officer must only select one response from the aforementioned choices (Arlington Police Department, 2010).

It should be noted; the use of force report does not make a distinction as to whether the injury resulted from the ECD, or perhaps whether the subject was injured another way during the force encounter. For example, if an ECD is deployed, and the subject falls down to scrape their knee; this would be an injury (Arlington Police Department, 2010). However, the ECD did not *cause* the scraped knee. Rather, the scraped knee is a secondary injury from the ECD use (Arlington Police Department, 2010). According to the guidelines, both direct and indirect injuries are reported as an injury (Arlington Police Department, 2010).

The use of force reporting guidelines direct an officer not to count a subject as injured if they incur typical marks of an ECD (Arlington Police Department, 2010). That is, if a subject suffers electricity signature marks where the electricity entered the skin, or if the subject suffers puncture marks where the metal darts enter the skin, the subject should not be reported as

injured (Arlington Police Department, 2010). The researcher coded the subject not injured as 0 and subject injured as 1.

3.2.2 Independent Variables

This study will utilize seven independent variables of control for the dependent variable. These independent variables will be grouped into three categories: incident characteristics, officer characteristics, and subject characteristics. This will allow the researcher to compare the relationships between each category as a mitigating factor for the observance of the dependent variable. Grouping of the independent variables is also logical as each variable within each category is unique to that particular group definition.

3.2.2.1 Incident Characteristics

For incident characteristics, there are two independent variables: year of occurrence and reason for contact. The year of observation will be calculated by the date of the ECD incident within AIM. This study will evaluate ECD incidents between January 1 and December 31 of each respective year (2008-2012). The researcher will consider observations from each year, and combined metadata from all 5 years.

The reason for contact variable is employed to evaluate the manner in which the reporting officer was notified of the incident. The responses are binary: dispatched or officer-initiated. When an officer is dispatched, a 911-

call operator receives an emergency telephone call. Upon receipt of the call, the operator generates a call for service in the police computer dispatch system (Arlington Police Department, 2013). Once the call is generated, a police dispatcher physically dispatches a police officer to respond to the call (Arlington Police Department, 2013).

By contrast, officers can become involved in a call for service on their own accord. For example, an officer could decide to initiate a traffic stop, or observe a demonstration of perceived suspicious activity and decide to stop and initiate police service call. These types of police responses will be considered self-initiated activity for this research project. The researcher coded dispatched as 0, on-view offense as 1, traffic stop as 2, other incidents as 3, and tactical operations as 4.

The frequencies of the reason for contact variable indicated a large gap between the officers being dispatched versus other types of call initiation. Therefore, this variable was recoded and consolidated into a new variable; dispatched or not dispatched. The not dispatched category is comprised of on-view offense, traffic stops, other incidents and tactical operations. To perform this function, the researcher utilized the transform feature in SPSS. The researcher had SPSS recode the not dispatched response into a new variable. The recoded variable is then observed as a binary response: dispatched or not dispatched. Using SPSS, the researcher

coded the dummy attributes dispatched as 0 and not dispatched as 1. The frequency of the new collapsed variable resulted in a population of 72.8% dispatched and 27.2% not dispatched.

3.2.2.2 Officer Characteristics

Regarding the officer characteristics, there are three independent variables: employee sex, employee race and officer work group. Employee sex will be reported and observed as either male or female. For the purpose of this study, the researcher coded male as 0 and female as 1. The officer assignment variable refers to the division to which the officer was assigned at the time of ECD deployment. For example, the officer may be assigned to the patrol division, youth services/school resource officer, traffic enforcement, or the central investigations (detective) division. The researcher coded uniformed (patrol) operations as 0, central investigations as 1, traffic unit as 2, and youth services (SRO) as 3.

The researcher noted a large gap between responses showing a patrol assignment versus other responses. Therefore, the researcher elected to recode this variable into two attributes: patrol or non-patrol. The non-patrol attribute is comprised of central investigations, the traffic unit, and youth services/SRO. To perform this, the researcher utilized the transform feature in SPSS. The new recoded variable is then observed as a binary response: patrol or non-patrol. Using SPSS, the researcher coded the

dummy attributes patrol as 0 and non-patrol as 1. The collapsed variable indicates assignments as 93.6% patrol and 6.4% non-patrol.

The employee race is classified as either white, African American, Hispanic, Asian, and American Indian. The researcher originally coded white as 0, African American as 1, Hispanic as 2, Asian as 3 and American Indian as 4. For this study, the researcher noted the majority of responses were white (70%). African American and Hispanic responses were 12% each. Asian was 5%, and American Indian was .5%. There were no other responses provided or observed outside of the above responses.

Again, due to few responses for racial minority categories, the responses were collapsed and recoded into two categories: white and non-white. The non-white category includes African American, Hispanic, Asian, and American Indian. To perform this, the researcher utilized the transform feature in SPSS. The researcher coded the recoded attributes as follows: white as 0 and non-white as 1. The recoded variable indicates 70% use of force reports are generated by white officers and 30% non-white officers.

3.2.2.3 Subject Characteristics

Within the subject characteristics category there are two independent variables: subject sex and subject race. Subject sex was observed as either male or female. The researcher coded male as 0 and female is 1.

In an effort to maintain continuity of data analysis, the researcher elected to use the same process of collapsing for subject race, as used previously for the employee race variable. The researcher noted the responses in this category are white (38.6%), African American (43.6%), Hispanic (16.4%) and Asian (1.5%). The researcher originally coded white as 0, African American as 1, Hispanic as 2, and Asian as 3.

The subject race response was also collapsed into a recoded variable similar to the aforementioned employee race variable: white or non-white. The researcher coded white as 0 and non-white as 1 in SPSS. The non-white category consists of African American, Hispanic, and Asian. The recoded variable is then observed as a binary response: white or non-white. The researcher identified the recoded responses for white subjects as 0 and non-white subjects as 1. The recoded variable indicated that 38.6% of subjects who had force deployed against them were white and 61.4% were non-white.

3.3 Sample & Data

3.3.1 Administrative Investigations Management System

The Arlington Police Department uses an internal database known as the Administrative Investigations Management (AIM) system to collect and report use of force data. This system is configured to collect the provided data from each use of force report. The training section is able to collect and

report force statistics from the AIM system. From the AIM system, the training section provides a yearly use of force annual report generated from this database (Arlington Police Department, 2013). This procedural step is critical to the study because it ensures the obtained sample is accurate and representative of the actual reported use of force incidents according to the Arlington Police Department.

The researcher first obtained written consent from the Arlington Police Department to research this project using the AIM database. Once approved, the researcher obtained access to AIM was provided a unique login and password. The researcher contacted the software manufacturer to ensure all variables were calculable. The software manufacturer assisted the researcher in the construction of a search tool, which would locate every ECD deployment by the Arlington Police Department against a human subject between January 1, 2008 and December 31, 2012. The researcher maintained the data and took steps to ensure the confidentiality of the sample group throughout the project.

3.3.2 Sample Size

The researcher ran the search criteria in AIM for ECD usage. Once the raw sample group was obtained, the researcher reviewed the data. The AIM system is programmed to respond to the search by reporting every ECD deployment against a human subject. It should be noted that AIM makes no

distinction between multiple officers or subjects regarding ECD deployments as unique incidents. That is, if two officers are present on a call, and one officer deploys their ECD against one subject, the AIM system reports this as two incidents (since there are two officers reported on the use of force form). Or, if one officer deploys the ECD against two subjects, the AIM system reports this as two incidents (since there are two subjects).

In order to overcome the potential observation of duplicate cases, the researcher utilized the AIM system's case assignment ability. The AIM software assigns a unique ID number to each officer and subject involved in a reported use of force encounter. This is designed to allow database searchers to exclude duplicate responses. The researcher was able to screen the raw ECD usage data as provided by AIM and remove duplicate entries. This step is important because the researcher must ensure each ECD deployment against human subjects is only observed once for each case.

The researcher also de-selected incomplete or "null" data responses from AIM. That is, if the use of force report did not have an independent or dependent variable reported, or was left blank by the officer, the researcher did not collect this as an observation. Incomplete responses cannot be calculated properly by the Statistical Package for Social Sciences software, and must therefore be removed.

The raw data between January 1, 2008 and December 31, 2012 returned 1681 cases of ECD deployment by the Arlington Police Department. From the raw cases, the researcher scrutinized the responses by the AIM unique ID number and noted the duplicate observations. Once duplicate cases were identified, the researcher removed a total of 937 duplicate cases utilizing an Excel spread sheet. From the remaining 744 observations, the researcher redacted 5 observations with incomplete data. The final sample size is 739 cases. The individual years and cases are explained below in Table 3.1.

Table 3.1: Sample Size Itemization

Year	Raw Cases	Duplicate Cases	Incomplete Cases	Final Cases
2008	382	248	3	131
2009	249	145	1	103
2010	319	190	0	129
2011	274	133	0	141
2012	457	221	1	235
Total	1681	937	5	739

3.4 Analysis Procedure

This research project is a quantitative longitudinal research model analyzing secondary data. The researcher gathered the aforementioned data and utilized the IBM Statistical Package for the Social Sciences (SPSS) version 21.0 to analyze the data. SPSS was used to run several statistical tests controlling for the variables as are outlined in the research model. The researcher will report the frequency of each variable in the research model is reported. The frequency is important because it explains the basic features of the data within the study including mean, standard deviation, minimum and maximum (Fitzgerald and Fitzgerald, 2014).

Bivariate analysis was conducted to evaluate the manner in which the variables correlate to one another. The first analysis is a Pearson correlation matrix. This Pearson correlation matrix presents the level of correlation (*p* value) of each variable to all other variables in the format of a two-tailed test. The researcher evaluated correlation at or better than $p < .05$. However, this only explains that a correlation exists, it is not able not provide the causation of the correlation.

Next, the Pearson chi-square test was conducted. The chi-square test evaluates the null hypothesis of each independent variable upon the dependent variable (Fitzgerald and Fitzgerald, 2014). In other words, each chi-square test of the independent variables has a null hypothesis that there

is a relationship between the variable and the rate of injury from ECD usage. This relationship will be measured again by p value (Fitzgerald and Fitzgerald, 2014). All values of $p < .05$ or better means the researcher cannot reject the null hypothesis for these variables. The results of the chi-square test will be shown in a cross-tabulated format.

Finally, the study utilizes multiple tests of regression analysis. Regression analysis allows the researcher to predict values of the dependent variable, subject injury, based upon the observation of one or more of the independent variables (Fitzgerald and Fitzgerald, 2014). Using the three groups of independent variables, three tests of binary logistic regression are constructed.

The first test predicts subject injury from the incident characteristics. Within the incident characteristics, there are two variables: reason for contact and incident year. Each reason for contact response is mutually exclusive of the other. Thus, the researcher analyzes coding in a categorized manner. By categorizing the analysis, the regression is analyzed against dispatched versus an on-view offense, or being dispatched versus a traffic stop, or being dispatched against an “other” ECD deployment, or being dispatched against a tactical operation.

The second test predicts the subject injury from the officer characteristics. Within officer characteristics, there are three variables:

employee sex, employee race, and officer assignment. The employee race and employee sex variables are binary. The officer assignment is not binary, and was recoded for analysis. The researcher used SPSS evaluate each coding for officer assignment in a categorized manner. Given this method, the researcher used SPSS to analyze patrol operations against central investigations, or patrol operations against traffic, or patrol operations against youth services/school resource unit.

The third test predicts subject injury from the subject characteristics. This test will predict subject injury as compared to all independent variables. Each binary logistic regression test is explained using the odds ratio, which predicts the existence of the dependent variable because of the existence of one of the independent variables (Fitzgerald and Fitzgerald, 2014).

Chapter 4

Findings

This chapter is devoted to discussions of findings related to the impact upon the rate of injury from an ECD deployment to a human subject. The discussion will be broken down first by univariate analysis to include descriptive findings. Next, the researcher will explain the findings from bivariate analyses. These tests include the Pearson correlation matrix, and the chi-square test. This section will conclude with an explanation of findings from the logistical regression analysis.

4.1 Descriptive Findings

4.1.1 Dependent Variable

The dependent variable is a binary response and considers whether or not a subject was injured, from an ECD deployment. In this study, a total of 739 (N=739) ECD deployment cases were considered. The researcher noted a total of 18.7% of the subjects were reported as injured (N=138), while 81.3% (N=601) subjects were reported as not injured.

4.1.2 Independent Variables

4.1.2.1 Incident Characteristics

The first group of independent variables considered is the incident characteristics: year and reason for contact. The year response separated the incidents by calendar year based upon when the ECD was employed by

the officer. The 2008 calendar year comprises 17.7% (N=131) of the total ECD incidents. The 2009 calendar year comprises 13.9% (N=103) of the total ECD incidents. The 2010 calendar year comprises 17.5% (N=129) of the total ECD incidents. The 2011 calendar year comprises 19.1% (N=141) of the total ECD incidents. The 2012 calendar year comprises 31.8% (N=235) of the total ECD incidents.

The reason for contact variable asks how the police officer was made aware of the incident. This variable has 5 possible selections of response for an officer: dispatched, on-view offense, traffic stop, tactical operation, or other (i.e. pedestrian stop, negligent or accidental discharge of ECD). Officers dispatched comprised 72.8% (N=538) of the total ECD incidents. On-view offense comprised 20.7% (N=153) of the total ECD incidents. Traffic stops comprised 3.4% (N=25) of the total ECD incidents. Tactical operations comprised 0.3% (N=2) of the total ECD incidents. Other deployments comprised 2.8% (N=21) of the total ECD incidents.

4.1.2.2 Officer Characteristics

The next grouping of independent variables is the officer demographic category, which contains employee sex, employee race, and officer work group. The employee sex variable is counted as male or female. For the employee sex variable, 92.7% (N=685) are male and 7.3% (N=54) are female.

The employee race variable has 5 reported responses of white, African American, Hispanic, Asian, and American Indian. The researcher collapsed these attributes into a binary response of either white or non-white. The white attribute comprises 70.1% (N=518) of the total ECD incidents. The non-white attributes comprise 29.9% (N=221) of the total ECD incidents.

The officer work group variable has 4 responses: uniformed (patrol), traffic, youth services/school resource officer, or central investigations division (CID). For the uniformed officers, 93.6% (N=692) comprised the total ECD incidents. Traffic officers comprised 3.9% (N=29) of the total ECD incidents. Youth services/school resource officers comprised .4% (N=3) of the total ECD incidents. CID officers comprised 2.0% (N=15) of the total ECD incidents.

4.1.2.3 Subject Characteristics

The subject characteristics grouping of variables are subject sex and subject race. For the subject sex variable, 89.3% (N=660) of the responses are male, while 10.7% (N=79) are female.

The subject race was analyzed, and the 5 reported responses of white, African American, Hispanic, Asian and American Indian were collapsed into a binary response of either white or non-white. For this variable, 38.6% (N=285) are white, while 61.4% (N=454) are non-white.

Table 4.1 Variable Descriptive Analyses

Total ECD Deployments (N) = 739		
Dependent Variable		
Subject Injured?	N	Percentage
Yes	601	81.3%
No	138	18.7%
Independent Variable Group: Incident Characteristics		
Year	N	Percentage
2008	131	17.7%
2009	103	13.9%
2010	129	17.5%
2011	141	19.1%
2012	235	31.8%
Reason for Contact	N	Percentage
Dispatched	538	72.8%
Not Dispatched	201	27.2%
Independent Variable Group: Employee Characteristics		
Sex	N	Percentage
Male	685	92.7%
Female	54	7.3%
Race	N	Percentage
White	518	70.1%
Non-White	221	29.9%
Officer Assignment	N	Percentage
Patrol	692	93.6%
Non-Patrol	47	6.3%
Independent Variable: Subject Characteristics		
Sex	N	Percentage
Male	660	89.3%
Female	79	10.7%
Race	N	Percentage
White	285	38.6%
Non-White	454	61.4%

4.2 Correlation Analysis

4.2.1 Pearson Correlation Matrix

The researcher began bivariate analysis by constructing a Pearson correlation matrix. The matrix compared all variables to one another looking at the correlation. This matrix is important because it shows the relationship amongst all variables, not just the dependent variable. The statistical significance of this test is represented by a *p* value. The *p* value is defined as the probability of the researcher obtaining the associated test statistic (Fitzgerald and Fitzgerald, 2014). The level of significance for this matrix is $p < .05$. That is, any *p* value at or below .05 is considered significant. This states the researcher is willing to accept no more than 5 occurrences of statistical significance due to random chance. This level of significance is typically utilized in social sciences, and will be the baseline test statistic for this chapter (Fitzgerald and Fitzgerald, 2014).

The subject race variable is positively correlated with the employee race ($p = .105$) variable. The subject sex variable is negatively correlated with the subject race variable ($p = -.077$). The officer assignment variable is positively correlated to the reason for contact variable ($p = .215$) and subject race variable ($p = .081$). The incident year variable is negatively correlated

with the reason for contact variable (p = -.129), the employee sex variable (p = -.091), and the officer assignment variable (p = -.104).

Of interest, the subject injury variable is negatively correlated with the reason for contact (p = -.089), and incident year (p = -.080). This would indicate a finding that when the subject injury attribute is observed, the officer was dispatched to the call. In other words, more injuries were observed by correlation when an officer was dispatched versus not dispatched to the call. This finding is relevant to the researcher, and will be explored further using logistical regression.

Each correlation suggests the relationship of the two variables occurred outside the possibility of randomness. While the correlation matrix suggests the manner in which all variables are correlated to one another, it does not indicate which variable causes the correlation. Further testing in the format of logistic regression will be needed to conduct predictive analysis. The aforementioned results can be found in Table 4.2.

Table 4.2 – Pearson Correlation Matrix (*p* value)

	Reason for Contact	Employee Sex	Employee Race	Subject Race	Subject Sex	Officer Assignment	Incident Year	Subject Injured
Reason for Contact	1							
Employee Sex	-0.031	1						
Employee Race	0.013	-0.058	1					
Subject Race	0.053	-0.034	.105**	1				
Subject Sex	-0.034	0.004	-0.025	-.077*	1			
Officer Assignment	.215**	0.012	-0.061	.081*	-0.018	1		
Incident Year	-.129**	-.091*	0.056	-0.04	-0.029	-.104**	1	
Subject Injured	-.089*	-0.014	0.021	-0.013	0.003	-0.011	-.080*	1

*=Correlation significant at p < .05 level
**=Correlation significant at p < .01 level

4.2.2 Cross Tabs Chi-Square Test for Statistical Significance

Next, the researcher performed a cross tabs chi-square test for variable correlation significance. The chi-square is different from the Pearson correlation matrix in that the chi-square test will explain if there is a statistical relationship of the independent variables to the dependent variable. However, the chi-square results will not explain the strength of the relationship, if any, of the two variables.

For the chi-square test, the researcher looked for statistical significance using a two-tailed test. The significance of this test result is displayed as *p* value. For this test, the *p* value threshold of significance is $p < .05$. The researcher noted two variables; incident year and reason for contact were statistically significant in this analysis. The incident year has a *p* value of .018, and the reason for contact variable has a *p* value of .015. Again, the researcher cannot determine from this test which of the variables are causal to the *p* value significance. The remaining independent variables were not statistically significant to one another. The findings of Chi-square are listed in Table 4.3.

Table 4.3: Chi-Square Analysis

Independent Variable	Chi-square
Incident Year	.018*
Reason for Contact	.015*
Employee Sex	.694
Employee Race	.573
Officer Assignment	.764
Subject Sex	.940
Subject Race	.730

*=Correlation significant at p < .05 level

4.3 Regression Analysis

The purpose of this research study is to determine if the independent variables impact of the rate of injury upon human subjects from the use of an ECD. The previous analyses reveal the existence of a relationship of two variables to one another, but conduct no predictive analysis. In order to make this prediction on whether or not it is likely an injury will result from an ECD deployment, it is necessary to conduct statistical tests of regression analyses. For this study, the dependent variable is attributed as a binary response: the subject is injured (YES) or the subject is not injured (NO). Since the dependent variable is binary, the researcher will utilize a binary logistical regression manipulation. The study conducts four separate binary logistic regression tests. The first analysis is the incident characteristics, the second analysis is the officer characteristics, the third analysis is the subject characteristics, and the last analysis is a global regression analysis of all independent variables.

Binary logistic regression will report several pieces of data to the researcher, of which, the researcher is most interested in 3 responses. The regression analysis will consider whether or not the independent variables can influence, or predict, the dependent variable. This prediction is expressed as *p* value, or level of significance. The researcher considered an independent variable statistically significant of predicting the dependent variable at the $p < .05$ level. If the findings of regression analysis occur at $p < .05$, the researcher is able to reject the null hypothesis for that analysis.

The researcher is of the opinion that the null hypothesis for each analysis does not exist. The null hypothesis for each analysis of regression states that each independent variable will cause impact upon the rate of injury from an ECD (the dependent variable). If the null hypothesis is rejected, the researcher is then able to accept the alternate hypothesis, which states there is no statistical relationship from the independent variable upon the rate of injury from an ECD (the dependent variable).

The researcher also evaluated the ability to predict the dependent variable from the independent variable. This prediction is expressed in logistic regression as β (Fitzgerald and Fitzgerald, 2014). β, or the logit, represents the amount of increase or decrease of the observation of the

dependent variable based upon the independent variable (Fitzgerald and Fitzgerald, 2014). The logit is represented in strength between 0.0 and 1.0; with numbers closer to 1.0 being more certain the dependent variable will be observed, and numbers closer to 0.0 being more certain the dependent variable will not be observed (Fitzgerald and Fitzgerald, 2014). The logit response can be a positive or negative figure. In other words, the logit will indicate if the dependent variable is occurring more (positive) or occurring less (negative) (Fitzgerald and Fitzgerald, 2014).

The last finding of logistic regression of interest to the researcher is the odds ratio, or exponentiation (Exp (β)) of the prediction (Fitzgerald and Fitzgerald, 2014). The odds ratio prediction tells the researcher how many times the dependent variable is likely to appear given the application of the independent variable. For example, if the Exp (β) ratio is 5.0, then the dependent variable is 5 times more likely to occur when controlling for this particular independent variable. Conversely, if the Exp (β) ratio is 0.1, then the dependent variable is one tenth more likely to occur when controlling for this particular independent variable.

4.3.1 Incident Characteristics Binary Logistic Regression

The first group, incident characteristics, has two independent variables: incident year, and reason for contact. When the application of binary regression, the researcher finds there is a statistical significance

regarding the incident year variable. The incident year has a *p* value of .060, a logit of -.055, an Exp (β) ratio of .946, a standard error of .029, and a Wald result of 3.537. The logit change of -.055 indicates each year after 2008 there is a predicted decrease in the number of injuries from ECD usage.

The reason for contact; dispatched vs. not dispatched, has a *p* value of .032, a logit of .436, an Exp (β) ratio of 1.547, a standard error of .203, and a Wald result of 4.620. The logit change of 1.547 indicates that injury is 1.547 times more likely when an officer is not dispatched to the police call for service. This finding indicates a positive slope increase in the incidence of injury when an officer is not dispatched to a call for service. This finding varies from the Pearson correlation matrix, which showed a negative correlation regarding incidents that were not dispatched. The aforementioned findings are represented in Table 4.4.

Table 4.4: Logistic Regression Incident Characteristics

	β	Sig.	Exp (β)	SE	Wald
Incident Year	-.055	.029*	.946	.029	3.537
Dispatched vs Not Dispatched	.436	.032*	1.547	.203	4.620

** = Regression is significant at p < .05 level*

4.3.2 Officer Characteristics Binary Logistic Regression

The second group, officer characteristics, has three independent variables: employee sex, employee race, and officer assignment. When the application of binary logistic regression, the researcher found there to be no statistical significance of each variable. The employee sex has a *p* value of .694, a logit of -.149, an Exp (β) ratio of .862, a standard error of .378, and a Wald result of .155. The employee race has a *p* value of .920, a logit of -.011, an Exp (β) ratio of .989, a standard error of .105, and a Wald result of .010.

The officer assignment variable, patrol vs. non-patrol has a *p* value of .763, a logit of -.121, an Exp (β) ratio of .886, a standard error of .401, and a Wald result of .091. The findings for officer characteristics logistic regression are represented in Table 4.5.

Table 4.5: Logistic Regression Officer Characteristics

	β	Sig.	Exp (β)	SE	Wald
Employee Sex	-.149	.694	.862	.378	.155
Employee Race	-.011	.920	.989	.105	.010
Patrol vs. Non-Patrol	-.121	.763	.886	.401	.091

4.3.3 Subject Characteristics Binary Logistic Regression

The third group, subject characteristics, has two variables: subject sex and subject race. Under application of binary logistic regression, the researcher finds no statistical significance of each variable. The subject sex has a *p* value of .996, a logit of .002, an Exp (β) ratio of 1.002, a standard error of .305, and a Wald result of .000. The subject race has a *p* value of .192, a logit of -.167, an Exp (β) ratio of .846, a standard error of .194, and a Wald result of 1.701. The findings for the subject characteristics logistic regression test are represented in Table 4.6.

Table 4.6: Logistic Regression Subject Characteristics

	β	Sig.	Exp (β)	SE	Wald
Subject Sex	.002	.996	1.002	.305	.000
Subject Race	-.167	.192	.846	.128	1.701

4.3.4 All Variables: Binary Logistic Regression

The last test of logistic regression was applied to all independent variables. This test is different from the above applications of binary logistic regression in that all variables are considered, not just the grouped variables. The incident year variable has a *p* value of .043, a logit of -.060, an Exp (β) ratio of .941, a standard error of .030, and a Wald result of 4.113. The incident year exponentiation ratio indicates a 6% continuous decrease of subject injury each year after 2008. The dispatched vs. not dispatched offense variable has a *p* value of .022, a logit of .475, an Exp (β) ratio of 1.608, a standard error of .208, and a Wald result of 5.227. The dispatched vs. not dispatched exponentiation ratio indicates an approximate 61% increase of subject injury when an officer is not dispatched to a call involving an ECD usage.

The employee sex variable has a *p* value of .626, a logit of -.187, an Exp (β) ratio of .830, a standard error of .383, and a Wald result of .237. The employee race variable has a *p* value of .520, a logit of .134, an Exp (β) ratio of 1.143, a standard error of .208, and a Wald result of .414. The employee assignment; patrol vs. non-patrol has a *p* value of .386, a logit of -.359, an Exp (β) ratio of .699, a standard error of .414, and a Wald result of .752.

The subject sex variable has a *p* value of .941, a logit of .023, an Exp (β) ratio of 1.023, a standard error of .307, and a Wald result of .006. The subject race variable has a *p* value of .578, a logit of -.110, an Exp (β) ratio of .896, a standard error of .198, and a Wald result of .309. The incident year variable is the only result from this manipulation to show statistical significance. All other variables have no statistical significance. The results of the metadata from this logistical regression test are represented in Table 4.7.

Table 4.7: Logistic Regression Metadata

	β	Sig.	Exp (β)	SE	Wald
Incident Year	-.060	.043*	.941	.030	4.113
Dispatched vs. Not Dispatched	.475	.022*	1.608	.208	5.227
Employee Sex	-.187	.626	.830	.383	.237
Employee Race	.134	.520	1.143	.208	.414
Officer Assignment	-.359	.386	.699	.414	.752
Subject Sex	.023	.941	1.023	.307	.006
Subject Race	-.110	.578	.896	.198	.309

* = Regression is significant at $p < .05$ level

Chapter 5

Discussion and Conclusions

The purpose of this study was to determine, statistically, if several independent variables impact the rate of injury from ECD usage on human subjects at the Arlington Police Department. In order to accomplish this investigation, the researcher assembled a comprehensive review of relevant empirical literature, which helped shape the research question for this study. The literature review reveals gaps in current research. Some differences between agencies and articles are found in the training, implementation and management processes of each agency's ECD program.

The largest gap centers upon the classification of an injury. Some studies use different measures to qualify a subject as injured. There is also variation about noting a subject as injured directly from the ECD, or as a secondary injury from the encounter (i.e. scraped knee). Thus, the researcher determined the best manner to conduct this study was to evaluate only if the subject was injured from an ECD usage. This method includes any secondary injuries encountered during the ECD encounter. The researcher did not consider additional dependent variables because the crux of the pro and anti-ECD literature centers upon the onset of injury

from an ECD. The researcher feels this research question holds great value.

In Chapter 3, the researcher explained the method of this study. This evaluation assesses the ECD program at the Arlington Police Department. The researcher operationalized all variables and explained the manner in which attributes would be documented. Then, the researcher gathered data commensurate with the variables. After the data was obtained and coded, the researcher utilized SPSS for the statistical manipulations. Chapter 4 of this study explains the findings from the statistical manipulations.

This chapter will focus upon the discussion of findings and related conclusions of the data. First, the researcher will identify the limitations of this study. Next, the researcher will also explain the meanings of the statistical results in Chapter 4 as a predictive figure. Then, the researcher will explain how this study contributes to the criminal justice academic field. Finally, the researcher will conclude this chapter with suggestions of future research and policy implications regarding the ECD and the rate of injury upon human subjects.

5.1 Research Limitations

This study has some research limitations, which bear discussion when the reader considers the conclusions. First, there is a potential

researcher bias to the subject and the study site. The researcher is employed by the Arlington Police Department as a police sergeant. The researcher was not compensated for this study, and the project was completed outside of the review of the Arlington Police Department. Once the project was completed and submitted, the Arlington Police Department was provided a copy. To further prevent the suggestion of bias, the researcher provides both pro and anti-ECD literature review in chapter 2 of this project to give the reader an unbiased depiction of the current ECD safety argument.

Further, the researcher limited the scope of the study to a quantitative evaluation of preexisting secondary data. In other words, the researcher studied only what was already documented. The researcher did not expose any officers or subjects in this study to additional instrumentation or screening. The researcher also excluded biographical information from the data to maintain confidentiality of the data.

Internal validity threat exists in the method of data collection. The most glaring threat regards human error. The researcher relied upon human involvement for the data collection. All obtained data is presumed to be correct as observed, entered, and recorded within the department repository. It is possible, based upon simple human error, that use of force reports were lost after submitted by the reporting officer. Reports

could be imperfectly handled by the chain of command (delayed in submission or correction). Officers could mistakenly report incident details inaccurately (i.e. race, sex, date).

Reports could have been improperly handled at the Training Center, or entered incorrectly into the Administrative Investigations Management (AIM) system. Furthermore, the AIM system is antiquated and lacks the ability to differentiate between more than one officer and one subject on a use of force incident. Currently, anyone searching for data must screen the resulting search data further to eliminate duplicate entries. Using a unique serial number for each case collected and entered into AIM, a researcher is able to accomplish this. However, since this process is an additional human action, there is potential for error. There may be no way to ensure all data is correctly captured and entered given the current process, however, the researcher closely scrutinized each piece of data to avoid error.

The study has external validity threat because it lacks generalizability of to any other police agency with the same research question. This study is focused at the Arlington Police Department. The impetus of the researcher is to create a viable research model that could be used by another agency. With this model, outside agencies could

operationalize their own study in a manner consistent with their best practices and current policies.

Other police agencies likely vary from the Arlington Police Department in policies and regulations. For example, some agencies that use the ECD may vary in their training, use of force policy, use of force continuums, use of force reporting guidelines, classification of injury, and monitoring procedures. Unfortunately, these multiple variances create a limitation of finding generalizability. While the exact variable operationalization is not likely to be duplicated, the research model and question itself can be.

5.2 Research Conclusions

The purpose of quantitative research is to determine if causation can be predicted amongst variables in the research model. The researcher hypothesized there is no statistical significance from the independent variables upon the rate of injury impact from ECD usage. The findings from the statistical conclusions support the researcher's hypothesis. This conclusion is based upon the strength of the relationship of the statistical findings in the study. Chapter 4 discussed the findings particular for this project. This section will discuss the meaning of the findings from Chapter 4.

In most cases, there is no statistical impact upon the rate of injury from ECD usage by the Arlington Police Department. This conclusion is true when controlling for all but two variables: incident year and reason for contact. First, the researcher will discuss the bivariate conclusions. Then, the researcher will provide an analysis of predictability of injury onset from the independent variables.

The analysis of data shows several correlations. The correlations were identified with Pearson Correlation Matrix. This matrix distinguishes correlation of one variable to another when all variables are considered. This test shows which variables interact with one another. However, the researcher cannot draw predictive conclusions about these correlations because the test does cannot forecast the interactions. The researcher must employ logistical regression in order in order to predict causation.

The researcher next used a chi-square analysis to test the strength of relationship amongst variables. The researcher finds no significance amongst all of the variables with the exception to the incident year. This finding suggests there is a statistically significant strength of relationship between subject injury and the incident year. The remaining findings from the chi-square analysis are consistent to the conclusions of this study relevant to the research hypothesis.

Next, the researcher applied logistical regression. Logistical regression is used to predict a binary response from a binary predictor (Fitzgerald and Fitzgerald, 2014). For this analysis, the independent variables were separated into four groups: incident characteristics, officer characteristics, subject characteristics and metadata.

The first grouping, incident characteristics, revealed a significant relationship when the test controlled for reason for contact. The reason for contact variable regression has a positive exponentiation ratio (1.547). This figure indicates the onset of subject injury from ECD usage is 1.547 times more likely when the officer is not dispatched to the call, versus when an officer is dispatched to the call. In essence, each time an officer is not dispatched to a call for service, there is a 55% increased chance of a subject injury. Given this result, the researcher cannot reject the null hypothesis for this variable, which states there *is* a statistical relationship of the reason for contact to the rate of injury impact.

This increase in subject injury when an officer is not dispatched to a call is of interest. Self-initiated calls for service are calls not dispatched by a 911 call-taker. The causes for this increase may be attributed to the nature of the call itself. When an officer has to stop their patrol procedures to initiate a call for service, there could be an augmented level of hazard to the call. It is possible there are suspicious characteristics

greater than normal patrol procedures would create. This in mind, officers may be heightened in their response. The increased level of response may cause a need to use force faster or an increased level of force.

For the officer and subject characteristics grouping of logistical regression, there are no statistically significant predictions of subject injury. The researcher is able to reject the null hypothesis and conclude that employee race, employee sex, officer assignment, subject race and subject sex do not increase the rate of injury from the usage of an ECD. These conclusions are consistent with the research hypothesis.

For the final manipulation, the researcher tested all variables without grouping them by characteristic. In this test, the researcher finds five independent variables with no statistical significance: employee sex, employee race, officer assignment, subject sex and subject race. This suggests the researcher can safely conclude there is no statistical predictive value of the rate of injury from ECD usage when controlling for these variables.

The researcher noted the incident year variable is statistically significant to predict the rate of subject injury. In this finding, there is a decreased logit and an increased exponentiation ratio. The decreased logit states the change in appearance of the dependent variable is negative, or down. The increased exponentiation ratio indicates the

change is occurring each time the dependent variable is observed. The researcher can conclude from these findings that the rate of injury from ECD usage decreases each year after 2008, and is predicted to continue doing so. This finding indicates the researcher cannot reject the null hypothesis, which states there *is* a statistical significance of the incident year to the rate of injury from ECD usage.

Before 2008, the Arlington Police Department was conducting evaluation of the ECD in a limited fashion. In the evaluation phase, only a few ECD's were deployed to officers for daily use. The ECD's were carried in an impact resistant box, rather than worn upon the officer's gun belt. The Arlington Police Department evaluated the ECD several years, and meticulously collected data on effectiveness of the devices. Ultimately, the Arlington Police Department elected to fully implement the ECD near the conclusion of 2008.

Beginning in 2009, and each year thereafter, the Arlington Police Department ECD program grew dramatically. The department purchased and issued ECD's to its officers as fast as the operating budget would allow. It took a few years to complete full implementation. During the time of implementation, dozens of ECD's were being issued each month of each year. The implementation process concluded in 2011 with 564 sworn officers carrying ECD's during their daily duties (Arlington Police

Department, 2012). At the conclusion of 2012, there were 587 sworn officers carrying the ECD during their daily duties (Arlington Police Department, 2012). The largest ECD growth took place in 2009 and 2010 (Arlington Police Department, 2012).

The researcher knows the total number of ECD's grew each year, and therefore, the total number of usages should also increase. This was found to be true when the full implementation program concluded in 2012 (Arlington Police Department, 2012). The researcher found this increased number of ECD usages in each successive year, culminating with the highest reported number of usages in 2012 (Arlington Police Department, 2012). The increased exposure to ECD usage certainly increase the chances of subjects to be injured during an ECD encounter. Interestingly, the additional ECD's and additional usages did not prove to cause more subject injury according to the study results. The research provided by the Arlington Police Department in the 2012 Use of Force Annual Report shows a 5-year trend of injury reduction, from 6.9% to 3.7% (2012).

When calculating the predictive value of injury from the incident year variable, the rate of injury actually decreased. This finding of deceased number of injuries from ECD usage is predicted to continue trending down. This conclusion supports the research hypothesis by

allowing the researcher to conclude there is no statistically negative impact on the rate of subject injury.

In comparison to other injuries sustained during force encounters at the Arlington Police Department, the overall trend of injury onset is also trending down, slightly, each year (Arlington Police Department, 2013). This is an important finding as it suggests overall use of force attention to training, management and oversight by the Arlington Police Department. Therefore, the reduced number of ECD injuries is consistent with the overall injury trend of the Arlington Police Department.

The downward trend of subject injury from ECD usage is consistent with the empirical literature. Alpert and Dunham concluded from their study that additional ECD usage and implementation would result in reduced citizen injuries (2010). The results are parallel findings from the National Institute of Justice's article, which suggested that increased ECD usage would prevent the need for higher levels of physical force and potential injury to citizens and officers (Alpert et al. 2011). The conclusion also supports the literature from Paoline, Ingram and Terrill, who asserted ECD would cause less injury when compared to injuries from hand combat or other intermediate weapons (2012).

Previous research regarding ECD injury is difficult to map when considering similarities or differences of this study. Different researchers

have found, generally, that usage of ECD will reduce the potential for subject injury. The previous research mirrors the findings of this project. This study is similar to the previous research in that there are a reduced number of subject injuries from ECD usage at the Arlington Police Department.

One particular previous research indicates more injuries will result from ECD usage due to the impact of darts or arcing of electricity across the skin. This study does not count the appearance of expected results of ECD usage. Previous studies vary on that data. Therefore, the information from this result is similar and different to reporting of injury from ECD employment.

Additional preceding research indicates more male subjects are exposed to the ECD than female subjects. This study found the same similarity. This may likely be due to the total number of available subjects in police contacts. Research has shown that male subjects are more likely to be contacted by police officers for criminal investigation.

The Arlington Police Department conducts its own research into the use of force statistics, and also covers the ECD as a segment of that report. The 2012 Annual Use of Force Report indicated all officers were equipped with ECD's as of 2012, and also the usages of the ECD were going up by year (Arlington Police Department, 2012). There was an

indication from the annual report that the injury rate was also steadily declining each year (Arlington Police Department, 2012). The limitation of the report is that it doesn't predict or explain the decline of the changes in injury. The findings of this report suggest the researcher's findings are similar to the findings of the Arlington Police Department annual report.

5.3 Contribution to Academia

This study contributes to the criminal justice academic field in that the model itself can be replicated for usage elsewhere as a research framework. However, other researchers must recognize the variance amongst the empirical literature regarding several key points to this study. Most importantly, there is a lack of agreement amongst studies to accept exactly how the safety and efficacy of an ECD is to be evaluated. The pro-ECD literature provides numerous empirical studies showing the ECD is a safe and effective use of force alternative.

However, the pro-ECD literature fails to agree upon a collective method of study, classification of injury, amount of training, and force continuums. This makes it difficult to simply accept any one study as universal. This study varies from the research of Paoline and Terrill in that "expected results of ECD usage" (i.e. dart puncture marks, electrical signature marks on skin) are not counted as injuries. Paoline and Terrill pointed out in their study that counting these as injuries could increase the

rate of injury to over 80% (2011). This discrepancy of injury classification is important to academia as research continues.

By contrast, oppositional ECD literature provides an argument opposing the safety of the ECD because the assertion that the devices cause injury or even death (Amnesty International, 2003). The conundrum with these assertions is that they lack empirical support. The data provided that suggests ECD's cause injury is mostly circumstantial. But researchers and police agencies should not dismiss these articles. Rather, the academic field should embrace these arguments more than pro-ECD literature. The reason for this is based upon the demand for police organizations to generate legitimacy from force options. Police agencies have a responsibility to the citizenry of whom they govern, and a large portion of that citizenry is attentive to this type of oppositional literature.

The researcher cannot suggest that this study is the best and most universal. Rather, this study sought to provide a robust framework from where other researchers could begin similar research. Therefore, the researcher believes the academic world benefits from this research model by allowing for model duplication in other places.

5.4 Future Research

This study is vulnerable to research limitations as discussed in section 5.1. Future research should seek to overcome these limitations. The researcher of this study is employed by the Arlington Police Department. Future studies may choose to select researchers not personally connected to the test location. As with any research, there could be a potential of researcher bias. The introduction of neutral researchers can help overcome this limitation.

Human error is another issue facing this study. There was a potential for loss of data when using physical paperwork. Additional problems are encountered with human data collection or data entry. Future research could address these problems by using alternate data observation and collection methods. Electronic collection systems would be the most robust method to overcome this limitation. Researchers could also use surveys as a means of data collection. Adopting better data collection by removing human interaction will help overcome this limitation.

Generalizability of this study is another limitation. The project outcomes are difficult, if not impossible, to replicate at other agencies. However, future researchers can overcome this issue by adopting this research model as a whole, rather than trying to duplicate the results at other agencies. Testing the incidence of injury from ECD deployment

using the same model will help other agencies examine ECD safety and efficacy.

Additional research to this study must also include an understanding as to the elevation of injury rates from a dispatched call for service to a self-initiated call for service by a police officer. This finding could be further researched by closely analyzing incidents not dispatched to a police officer. Perchance there is an increased level of force utilized because the officer had to stop their work pattern to go and deal with the incident, which manifested itself in front of the officer. Perhaps officers are more likely to use force when they generate the incident themselves. There is a need to study this finding in order to further refine the understanding of why the rate of injury is impacted in this variable.

Additional research might also include a continuation of this study at the Arlington Police Department each year. The research could seek to continue looking at the yearly ECD injuries to see if injuries still trend downward. There is no cost to undertake the evaluation each year, and currently, there is no such evaluation process in place at the Arlington Police Department. With regards to the findings, it is important that the Arlington Police Department be able to legitimize each action it takes with the community in which it polices. Continuing this level of analysis would be a wise consideration. Also, this research can be molded to other types

of force used by the Arlington Police Department (i.e. OC spray, empty-hand control) to test for the same incident, subject and officer characteristics when predicting injury onset. This variation allows the department to curtail all training for use of force, not just ECD training.

Outside police agencies may choose to use this research model within their own agency as a means to determine if they can reach the same conclusion of this study. The Arlington Police Department would benefit from publishing this research for usage by other agencies as well as research organizations, such as the Police Executive Research Forum. Sharing information for future research limits the potential for incorrect findings outside this study.

The disparity of how to classify an injury from the ECD exists everywhere. As of the date of this publication, there is no unification of this method. Future research should seek to clarify and standardize that variable. Future research would benefit to effectively establish a standardized method of injury classification.

5.5 Policy Implications

The researcher included studies from the Police Executive Research Forum (PERF) and the International Association of Chiefs of Police (IACP) regarding ECD implementation. Specific to this study, the Arlington Police Department is largely in compliance with the majority of

recommendations suggested by PERF and IACP, as discussed in Chapter 2. It is likely that due to strict adherence to the PERF and IACP recommendations that the Arlington Police Department has a reduced prediction of subject injury from ECD usage. Also, the department has no other statistical relationships to subject injury, and this is also likely due to adoption of the PERF and IACP guidelines. The Arlington Police Department should continue to closely manage the ECD program and be attentive to changes that impact the usage of an ECD.

The researcher suggests a policy change in the form of data collection by the Arlington Police Department. First, written policy is unclear on injury classification and designation. There should be a better explanation of how an officer shall classify injuries on a use of force report. Officers should have clear understanding of what exactly constitutes injury. These changes should be included in the general orders manual.

The Arlington Police Department should next consider updating or changing the AIM system. The AIM system is outdated and difficult to use. For this project, and to avoid error, the researcher obtained assistance directly from the AIM software developer. The Arlington Police Department should not have to reach out to the AIM designer each time they want to run a complex search tool. Additionally, when using AIM there is a risk of counting force usage more than once since the AIM

system cannot discern multiple officers and victims. Researchers must scrutinize individual case numbers to prevent case duplication. Updating the software can help prevent this potential error. Given the advancement of technology there are likely other more robust systems designed for this type of data storage and retrieval.

The Arlington Police Department should consider improving the written use of force document with an electronic reporting method. Using an actual piece of paper and people to physically handle the reports creates potential for human error. As a solution, police officers could enter force usage data electronically in a manner that would be consistent to department field reporting. Officers could conduct direct entry on the mobile data computer (MDC). Or the department could add a segment in the police offense reports. These changes will greatly reduce the potential for lost reports, delayed reports, or inaccurate data produced from human error.

Policy changes in the training division should also be considered. This change is based upon the finding that subjects are 51% more likely to suffer injury from ECD usage when an officer is not dispatched to the police call. Agency executives will benefit from this type of training evaluation and analysis. From the findings, the Arlington Police Department might begin with an in-depth analysis of the ECD injuries from

the not dispatched attribute. This evaluation should determine if officers are more likely to use force because the officer had to take police action instead of being dispatched to the incident.

After carefully analyzing the difference between dispatched and not dispatched calls, the department may compare the results of the findings against the current ECD training program. The training staff should collect and analyze the results and compare those against the dictated policy to ensure officers are still being properly trained to deal with these not dispatched incidents. This recommendation of ongoing policy evaluation is critical ensure officers are not becoming over reliant upon the ECD. Also, this recommendation can ensure officers are not underestimating the threat of a subject and responding with lower force than justified.

The researcher concludes that the Arlington Police Department mirrors the empirical literature regarding ECD placement on the use of force continuum. Wisecarver and Overholt recommend that the ECD is placed between OC spray and empty hand control, and the Arlington Police Department conforms to this recommendation (2009). The Arlington Police Department only allows ECD deployment against subjects who are actively resisting. The policies specifically exclude passive resistance as a justified ECD usage. Both policies are consistent with the research of Paoline and Terrill (2012).

As the Arlington Police Department continues its usage of the ECD, it can do so with a renewed finding of legitimacy. The researcher concludes the Arlington Police Department is safely and effectively deploying the ECD as a use of force option for its police officers and citizens. The findings of this project are consistent with aforementioned empirical literature. As the project began, the researcher predicted there to be no statistical relationship between the ECD variables and subject injury. Given these results, the researcher can accurately conclude the hypothesis is validated.

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Biographical Information

Brook Rollins graduated from Texas A&M University in December 2001 with a Bachelor's Degree in Science and Health. Following graduation, Mr. Rollins was hired by the Arlington, Texas Police Department as a police officer. He has worked as a patrol officer, field-training officer and detective in the auto theft unit. Mr. Rollins obtained his Master Peace Officer license from the Texas Commission on Law Enforcement (TCOLE).

Mr. Rollins promoted to the rank of sergeant in January 2010. After promoting, he was assigned to the patrol division as a field supervisor and worked various districts and shifts. Mr. Rollins also worked as a sergeant over the north geographic criminal investigations division in 2012. Mr. Rollins currently serves as a sergeant for the Special Operations Division (SWAT Team).

Mr. Rollins enrolled at the University of Texas @ Arlington in 2012 to obtain his Master of Arts in Criminology and Criminal Justice degree. Mr. Rollins studied police and use of force issues during his graduate school tenure. His future career plans include promotion into the command structure of the Arlington Police Department.