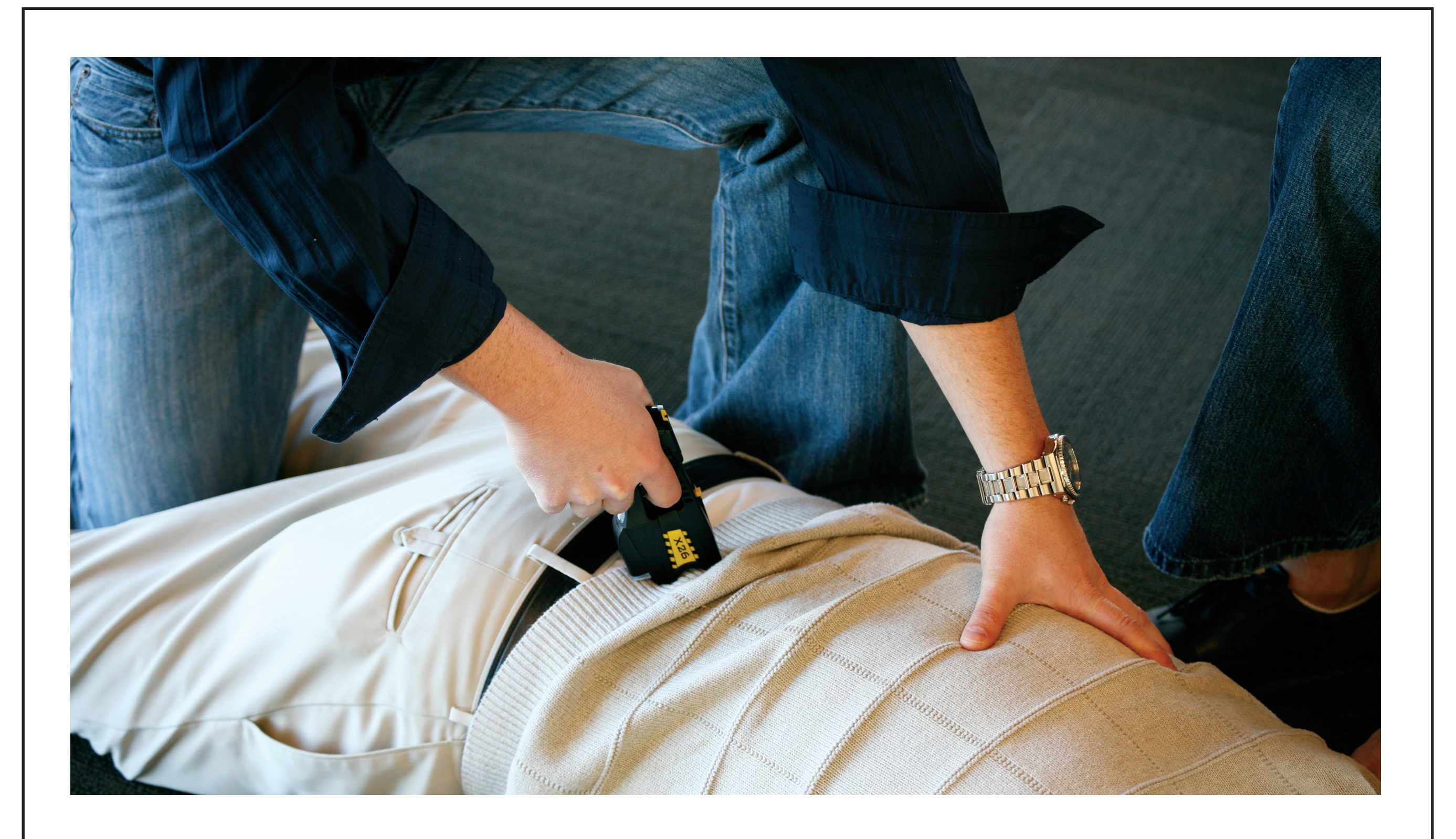


## Introduction

The TASER Electronic Control Device (ECD) is currently available for law enforcement and civilian use. ECDs are used on subjects to control or repel violent / agitated behavior in two ways. The primary method is deployed probes. Human research, to date, has primarily examined this method. The second method is the Drive Stun (DS) comprised of direct contact with the front ECD electrodes. ECD research to date has primarily been done utilizing deployed probe based methodology. There has been limited information reported on the DS application, which is used in this study.

The DS method of application is known to cause a painful stimulus but, unlike the deployed probes, it is not believed to cause regional muscle incapacitation. ECDs have been the subject of scrutiny since individuals occasionally die unexpectedly sometime after DS exposures. Criticism of the DS has occurred and a casual relationship has been hypothesized through cardiac or respiratory compromise. This project examines this possibility.



## Discussion

In the United States, TASER ECDs are often used by law enforcement agencies to control or subdue people. There have been arrest-related deaths reported in situations where an ECD has been used at some point during the arrest process. Although these types of deaths also occur when ECDs are not present, they have been scrutinized as potential contributory factors.<sup>1,2</sup>

To date, human research examining modern-day ECDs has not found a contributory connection.<sup>3,4,5,6</sup> However, most of this research has utilized the theory of deployed probe methodology. Deployed probe methodology should theoretically yield results that are applicable to a worst-case scenario due to the greater separation distance of the electrical current contact points. While no connection has been found, there have been claims of injury or death based on DS ECD application methods.<sup>7</sup>

This work represents initial investigatory human research to examine the possibility of a connection between DS ECD application and worsening, measurable human physiology.

## References

- <sup>1</sup> Strote J and H Hutson. TASER use in restraint related deaths. *Prehosp Emerg Care*, 2006; 10:447-450
- <sup>2</sup> Amnesty International. United States of America excessive and lethal force? Amnesty International's concerns about deaths and ill-treatment involving police use of TASERs. Available at: [http://www.amnestyusa.org/countries/usa/Taser\\_report.pdf](http://www.amnestyusa.org/countries/usa/Taser_report.pdf);2006
- <sup>3</sup> Ho JD, et al. Cardiovascular and physiologic effects of conducted electrical weapons discharge in resting adults. *Acad Emerg Med*, 2006; 13:589-595
- <sup>4</sup> Ho JD, et al. Respiratory Effect of Prolonged Electrical Weapon Application on Human Volunteers. *Acad Emerg Med*, 2007; 14:197-201
- <sup>5</sup> Ho J, et al. Physiologic effects of prolonged conducted electrical weapon discharge on acidotic adults. *Acad Emerg Med*, 2007; 14 (supplement 1):S63. Full manuscript in press.
- <sup>6</sup> Levine SD, et al. Cardiac monitoring of human subjects exposed to the TASER. *Am J Emerg Med*, 2007; 33:113-117
- <sup>7</sup> Neal-Lomax, et al v. Las Vegas Metropolitan Police Department, et al, United States District Court for the District of Nevada, Case Number 2-05-cv-1464.

## Methods

Volunteers underwent informed consent at an ECD instructional course. Our volunteer population was made up of either law enforcement officers or physicians. The subjects had 10-second DS applications delivered as 2 5-second pulses with a 1 second rest between pulses. Applications were to the trapezius and lower extremity using a factory standard TASER X26 ECD.

Subjects had either limited cardiac or right-hemidiaphragm ultrasonography performed. Cardiac images were analyzed using M-mode through the anterior leaflet of the mitral valve for evidence of arrhythmia. Diaphragm images were analyzed using an intercostal oblique view, using the liver as a sonographic window. Images were interpreted by a skilled emergency physician, for heart rate, presence of sinus rhythm, or diaphragm respiratory movement. All images were obtained using a SonoSite MicoroMaxx with a P17/5-1 MHz probe (SonoSite, Inc., Bothell, WA). Data were analyzed using descriptive statistics.

## Results

21 subjects were enrolled, 10 had cardiac and 11 had diaphragm views. For the subjects with cardiac views, the pre-exposure mean heart rate was  $95.2 \pm 14.8$ , range 82 to 114. The mean heart rate during the first pulse of the ECD exposure was  $139.0 \pm 14.7$ , range 111 to 150. The mean heart rate during the last pulse of the exposure was  $131.6 \pm 16.7$ , range 106 to 156.

All cardiac views were confirmed to be normal sinus rhythm throughout the monitoring period. The mean heart rate one minute after exposure was  $93.1 \pm 19.5$ , range 55 to 118. The diaphragm was noted to move consistent with respirations during all ECD pulses in all subjects with diaphragmatic views.

## Conclusions

Drive Stun exposure did not cause abnormal rhythms or apnea in this small sample of ECD exposed subjects. There was an increase in heart rate that resolved within one minute of the exposure.

We did not find a connection between measurable, worsening human physiology and ECD DS exposure. This work is consistent with previously reported findings of human ECD studies utilizing deployed probe methodology.