Conducted Energy Weapon

Version 1.0 · Current · October 2026 · Codebook variable: `I_CEW`

Definition

A conducted energy weapon (CEW) is an electrical less-lethal weapon designed to temporarily incapacitate or gain compliance from a person by delivering electrical energy through propelled probes, direct contact, or both.

This category includes TASER-family devices and comparable conducted electrical devices used in either probe mode, where darts or probes establish an electrical circuit through the body, or contact/drive-stun mode, where the device is pressed against the body principally to produce localized pain.

This definition corresponds with the research dataset, where `I_CEW` is coded when an electronic control device is discharged in probe-deployment mode, applied by drive-stun contact, or otherwise makes an active electrical connection with the decedent. Merely drawing, pointing, displaying the laser, or activating a warning arc without electrical contact does not qualify.

How It Is Designed to Work

Conducted energy weapons can operate through two related but distinct mechanisms.

Probe mode: neuromuscular incapacitation

In probe mode, two or more probes are propelled toward the subject, and when sufficient probe contact and separation are achieved, electrical pulses stimulate motor nerves and can produce involuntary skeletal-muscle contraction. The intended operational effect is temporary neuromuscular incapacitation, reducing the person's ability to continue coordinated voluntary movement during the electrical cycle.

The effectiveness of probe mode therefore depends on factors including:

- successful deployment of both probes;
- adequate probe spread;
- probe penetration or electrical contact;
- clothing thickness;
- subject movement;
- distance;
- probe placement; and
- whether enough muscle mass is captured within the electrical circuit.

A technically successful discharge does not necessarily result in complete incapacitation, as probe miss, insufficient spread, clothing disconnect, wire breakage, partial contact, and physiologic or positional factors can all produce incomplete effects. Accordingly, CEW effectiveness should be measured separately from CEW deployment.

Contact or drive-stun mode: pain compliance

In contact mode, the electrodes are placed directly against the person, producing intense localized pain but substantially less whole-body neuromuscular incapacitation than a successful probe deployment. For that reason, probe-mode incapacitation and contact-mode pain compliance should not be treated as functionally identical interventions, even though both are captured within the broader CEW category.

Evidence of Effectiveness

Overall assessment

The evidentiary record for conducted energy weapons is more extensive than for most comparable less-lethal technologies. The strongest evidence is not that a CEW will reliably incapacitate every person on every deployment, but that agency adoption and field use can reduce some forms of subject and officer injury when CEWs replace physical force or more injurious tactics. Results are not uniform across agencies or studies, and the presence of a CEW may itself alter officer and subject behaviour, which places the injury-reduction findings in a more complicated light.

Operational effectiveness

Brandl and Stroshine (Brandl & Stroshine, 2017) analyzed 504 police use-of-force incidents involving either OC spray or a CEW in a large municipal police department, and their study is particularly useful because it treats effectiveness as an empirical outcome rather than assuming that deployment equals success. The study reinforces an important point for this evidence library: the operational question is not simply whether the device discharged, but whether the intervention actually incapacitated or controlled the subject sufficiently to accomplish the police objective.

Failures can arise from:

- probe misses;
- one-probe contact;
- inadequate probe spread;
- clothing interference;
- poor target exposure;
- broken wires;
- short deployment distance;

- subject movement; or
- incomplete neuromuscular effect.

Injury-reduction effect

MacDonald, Kaminski and Smith (MacDonald et al., 2009) analyzed 24,380 use-of-force incidents across 12 police departments and found, after controlling for encounter and departmental characteristics, that CEW use was associated with significantly lower odds of injury to both civilians and officers. In two departments examined longitudinally, injury incidence declined by approximately 25% to 62% after CEW adoption.

Smith and colleagues (Smith et al., 2007) analyzed 1,645 use-of-force incidents from two agencies and found that CEW use was associated with reduced odds of officer and subject injury, as well as reduced severity of subject injury, in one agency, while in the second agency CEW use was not significantly related to injury and pepper spray was instead associated with reduced suspect injury. This difference suggests that CEW effects are context-dependent rather than universal, and that policy, training, deployment thresholds, available alternatives, and agency culture may all influence whether CEW introduction reduces injuries.

Taylor and Woods (Taylor & Woods, 2010) used a quasi-experimental design comparing seven agencies that deployed CEWs with six matched agencies that did not, and found that CEW agencies experienced lower rates of officer injury, severe suspect injury, and injuries requiring medical treatment. Their findings support the proposition that CEWs can reduce physical struggles and resulting injuries when used as an alternative to more direct physical force.

The weapons-effect problem

Ariel and colleagues (Ariel et al., 2019) provide an important counterweight to the injury-reduction literature. Using a randomized controlled trial in England and Wales, they found that the presence of a TASER was associated with more use of force overall, including a 48% higher incidence of force among TASER-equipped officers during treatment conditions, a 19% higher incidence among officers not themselves carrying TASERs but working in treatment conditions, and a 23% higher force rate force-wide. Assaults on officers also doubled during treatment conditions.

The authors interpreted this as evidence of a possible weapons effect, in which the visible presence of a weapon may influence both officer and civilian behaviour. This study does not establish that CEW discharge itself causes increased aggression; rather, it demonstrates that introducing the technology can change the interaction environment, which is a separate issue from whether the weapon is medically safer than batons, dogs, or physical struggle.

What is missing

Despite extensive CEW research, several questions remain incompletely answered. The literature does not provide a single universally applicable first-shot incapacitation rate, and it remains difficult to determine how

often failed CEW deployment leads to firearm use, how effectiveness changes against armed subjects, whether effectiveness differs substantially by probe placement, the impact of newer CEW models on field success, the relationship between distance and failure, whether repeated cycles improve control enough to justify additional exposure, and how CEWs perform specifically in edged-weapon confrontations where available reaction time may be extremely short. For an edged-weapon dataset, this last issue is particularly important: a weapon may be generally effective in routine resistance encounters yet be tactically inappropriate where failure would leave insufficient time or distance to respond to a lethal assault.

Injury and Safety Evidence

Real-world injury rates

Bozeman and colleagues (Bozeman et al., 2009) conducted one of the most important prospective field studies of CEW injury. Across 1,201 actual law-enforcement CEW uses, 1,198 subjects (99.75%) sustained either no injury or only mild injury; significant injuries occurred in three subjects (0.25%), comprising two intracranial injuries associated with falls and one case of rhabdomyolysis. Most minor injuries were superficial puncture wounds caused by the probes. Two subjects died while in police custody, but medical examiners did not identify the CEW as causal or contributory. The study is particularly valuable because it examined real police encounters rather than controlled exposures in healthy volunteers.

Later real-world evidence

Strote and colleagues (Strote et al., 2010) examined 1,101 CEW uses over six years in one police department. The population was substantially more representative of actual police encounters than laboratory volunteers, as 46.8% had a documented psychiatric history, 72.9% had a substance-abuse history, many subjects presented with altered mental status or intoxication, and CEW-exposed subjects ranged from age 9 to 73. Significant CEW-related injury was rare, and no subjects died.

Bozeman and colleagues (Bozeman et al., 2018) later examined 893 police use-of-force incidents involving 1,399 force applications and found that among 504 CEW uses no significant injuries occurred in that sample. Taken together, these field studies support the conclusion that direct serious injury attributable to CEW exposure is uncommon.

Secondary injury

The electrical current is not the only relevant injury mechanism. Successful neuromuscular incapacitation can cause a person to fall immediately and without protective reflexes, and in the Bozeman field study (Bozeman et al., 2009) two of the three significant injuries were intracranial injuries caused by falls. Secondary injury risk therefore increases when a person is:

- standing at height;

- near stairs;
- near traffic;
- on a hard or irregular surface;
- close to water;
- on a bicycle or other moving conveyance; or
- positioned where an uncontrolled fall could produce serious injury.

A CEW can therefore be electrically low-risk while situationally high-risk depending on the environment in which it is deployed.

Probe injury

The most common direct physical injury is a probe puncture wound, though probe placement can become substantially more consequential when probes strike vulnerable areas such as the eye, face, throat, genitalia, or other sensitive anatomical structures. These injuries are principally mechanical rather than electrical.

Physiologic and cardiac risk

The physiologic safety literature is considerably more controversial than the field-injury literature. Baliatsas and colleagues (Baliatsas et al., 2021) systematically reviewed 33 experimental human CEW studies and found few or no acute adverse health outcomes beyond dart wounds, with no significant adverse changes in cardiac rhythm, metabolic measures, or other physiologic outcomes generally reported. However, the review identified major limitations that substantially constrain the generalizability of those findings:

- all 33 studies were experimental;
- all were conducted in the United States;
- most subjects were healthy and physically fit;
- exposures were generally short;
- long-term outcomes were not studied; and
- the population studied did not closely resemble many people exposed to CEWs during real police encounters.

The authors therefore concluded that the existing evidence cannot confidently establish safety for vulnerable or high-risk populations, including people intoxicated by drugs or experiencing severe physiologic or behavioural disturbance.

Sudden death controversy

Lee and colleagues (Lee et al., 2009) examined agency-level mortality before and after CEW deployment in California and found that in the first full year following CEW deployment, the rate of in-custody sudden death increased 6.4-fold compared with the five-year predeployment average, while firearm deaths also

increased during that first year rather than declining. In subsequent years, mortality rates returned toward predeployment levels.

This study does not establish that CEWs caused those deaths. Its ecological design cannot determine the causal mechanism in individual cases, and the temporary first-year increase is difficult to reconcile with a direct persistent toxic effect of the device. Nevertheless, the paper is important because it challenges simplistic claims that population-level CEW adoption necessarily reduces mortality. The evidence library should therefore distinguish absence of demonstrated direct causation from proof that no causal contribution is possible – those are not scientifically equivalent propositions.

Manufacturer Funding and Conflict of Interest

Manufacturer involvement is unusually important in the CEW literature. Baliatsas and colleagues (Baliatsas et al., 2021) found that 17 of the 33 experimental human studies in their systematic review were at least partly funded by the CEW manufacturer, with four additional studies reporting no funding source.

Industry funding does not invalidate a study, as several manufacturer-funded studies reported physiologic changes and many independently funded studies also found low acute risk. However, the concentration of manufacturer-supported research matters because industry-funded studies tended to have small samples, used healthy volunteers, conducted generally short and controlled experimental exposures, poorly represented vulnerable populations, and focused on conditions that differ substantially from real police encounters, which commonly involve intoxication, agitation, prolonged struggle, restraint, underlying illness, environmental stress, or combinations of these factors. Manufacturer funding should therefore be disclosed at the individual-study level whenever known, and systematic reviews that evaluate funding bias should receive particular weight.

Comparative Injury Risk

Nielsen and colleagues (Nielsen et al., 2025) reviewed 19 peer-reviewed studies of real-world less-lethal police force and found that CEW injury results were somewhat heterogeneous but that subject injury following CEW exposure generally appeared lower than with batons and police canines, while handheld OC spray appeared to have the lowest injury rate among the commonly studied modalities. CEWs appear comparatively low-risk, but not necessarily the lowest-risk intervention available, and the relevant comparator should therefore be the realistic alternative in the specific encounter. A CEW replacing a baton, police dog, or prolonged physical struggle may reduce expected injury, whereas a CEW replacing communication, tactical repositioning, or another non-force resolution may increase it.

When Its Use May Be Appropriate

The empirical literature does not establish a universal policy threshold, but several evidence-supported propositions emerge. A CEW is most defensible where:

- a person presents active physical resistance or assaultive behaviour;
- rapid control is reasonably necessary;
- hands-on control would expose officers or the subject to substantial injury risk;
- successful incapacitation would reasonably reduce the need for a more injurious intervention;
- adequate distance and probe placement make successful deployment reasonably likely; and
- the environment does not create disproportionate secondary-injury risk.

Potentially appropriate circumstances can include:

- active assault;
- violent resistance;
- preventing access to a weapon;
- interrupting behaviour that poses an imminent threat;
- circumstances where physical grappling would create substantial risk; or
- circumstances where successful CEW use may prevent escalation to firearm, canine, impact weapon, or other more injurious force.

The key evidence-based question is whether CEW use is reasonably likely to reduce total expected harm compared with the realistic alternatives available at that moment.

When Its Use May Be Inappropriate

Passive or low-level resistance

CEWs constitute a meaningful application of force and are difficult to justify solely to compel compliance from a person who presents little or no immediate safety threat. The injury-reduction evidence supporting CEWs largely concerns their substitution for more injurious force, not substitution for patience, communication, or low-risk control.

Unsafe fall environment

Deployment may be inappropriate when neuromuscular incapacitation would predictably produce a dangerous fall, including where the subject is on a roof, ledge, staircase, or elevated platform; operating a vehicle; in moving traffic; adjacent to a substantial drop; in or immediately adjacent to deep water; or otherwise positioned where sudden collapse creates a foreseeable risk of serious injury.

Flammable environment

Electrical arcing can create ignition concerns where flammable vapours or combustible materials are present, a consideration particularly relevant where officers or others have recently deployed certain chemical sprays or where volatile fuels are present.

Repeated or prolonged exposure

The evidentiary basis for brief CEW exposure is considerably stronger than for prolonged or repeated cycles. Most experimental research reviewed by Baliatsas et al. [(Baliatsas et al., 2021)] involved short exposure in healthy subjects, and extrapolating those findings to multiple repeated cycles in intoxicated, exhausted, physiologically stressed, or medically vulnerable people exceeds the strongest evidence base. Repeated activation should therefore be treated as additional force requiring continuing justification, not as one continuous decision.

Vulnerable populations

The existing scientific literature is insufficient to confidently quantify risks for:

- children;
- elderly or frail persons;
- pregnant persons;
- people with serious cardiovascular disease;
- people with implanted cardiac devices;
- severely intoxicated individuals;
- persons experiencing extreme physiologic stress; or
- persons undergoing prolonged physical struggle or restraint.

The absence of demonstrated harm in healthy-volunteer experiments should not be generalized automatically to these groups.

Edged-weapon confrontations without sufficient tactical margin

A CEW should not be considered an automatic substitute for a firearm merely because it is classified as less lethal. Against a person armed with an edged weapon, probe failure or incomplete incapacitation may leave an officer or third party exposed to lethal injury. Relevant considerations include:

- distance;
- cover;
- containment;
- availability of lethal-force backup;
- subject movement;
- target exposure;

- reaction time; and
- whether failed CEW deployment could be safely absorbed without catastrophic consequence.

The scientific literature supports CEW use as a potentially injury-reducing option but does not establish that CEWs reliably stop every armed assailant.

Relevance to Edged-Weapon Encounters

The general CEW evidence demonstrates meaningful injury-reduction potential, but it does not establish that a CEW is a reliable substitute for firearm force in every edged-weapon encounter. The central question is whether the officer has enough time, distance, and tactical margin to tolerate probe failure or incomplete neuromuscular incapacitation.

Potential role

A successful probe-mode CEW deployment can provide a uniquely valuable outcome in an edged-weapon encounter: rapid physical incapacitation without the penetrating trauma of a firearm. Where neuromuscular incapacitation is achieved, the device may interrupt an advance, interfere with coordinated weapon use, create an opportunity for disarming or restraint, and prevent escalation to more injurious force. This potential is consistent with the broader field evidence showing reduced officer and subject injury in some policing contexts (MacDonald et al., 2009; Smith et al., 2007; Taylor & Woods, 2010).

Conditions favouring deployment

Deployment is more plausible where officers have enough separation to deploy the probes before contact, adequate target exposure, sufficient probe spread, limited clothing interference, cover or another officer able to respond if the CEW fails, and time to reassess before the subject can reach another person. A contained armed subject at distance is therefore materially different from an edged-weapon subject already closing rapidly.

NMI and ability to obey “drop the knife” commands

A successful probe-mode deployment can temporarily disrupt voluntary motor control, which creates an important interpretation problem where the subject is holding an edged weapon. Officers may deploy the CEW and immediately order the subject to drop the knife. During effective NMI, the subject may be physically unable to coordinate a voluntary release of the weapon, so continued possession of the knife during the electrical cycle should not automatically be interpreted as deliberate noncompliance or active resistance.

Experimental research shows that the degree of incapacitation depends on probe spread and location, with wider probe spread generally increasing incapacitation while some exposure patterns may leave meaningful upper-extremity control intact, meaning CEW effects can range from partial impairment to substantial body lockup rather than producing one uniform response.

The operational distinction is critical: whether the knife remains in hand is an observable fact; whether the subject can voluntarily release it is a question of motor capacity; and whether the subject refuses to release it is a behavioral inference. Those should not be treated as equivalent.

Immediately after the electrical cycle, officers should also recognize that motor recovery may require some interval before coordinated compliance is possible. The Sixth Circuit's 2026 decision in *Phelps v. City of Saginaw* is useful by analogy: the court held that a jury could attribute jerking and flailing to TASER effects and concluded that the subject may not have been given sufficient time to recover and comply before additional cycles.

This does not eliminate the threat posed by a retained knife, which can remain dangerous even where retention is involuntary, particularly if another person is within reach or the subject is regaining voluntary movement. The evidence-based point is narrower: NMI-induced inability to release a knife should not be mistaken for deliberate resistance merely because the weapon remains in the subject's hand.

Failure consequences

CEW effectiveness depends on successful probe placement and electrical connection, and failure can result from probe miss, one-probe contact, inadequate spread, clothing disconnect, wire failure, or incomplete neuromuscular effect (Brandl & Stroshine, 2017). In an edged-weapon encounter, unsuccessful deployment may leave the subject fully capable of continuing the assault while the officer has spent time attempting a less-lethal intervention.

Risk trade-off

For the subject, a successful CEW deployment may substantially reduce the probability of firearm injury, although secondary falls and probe injury remain relevant. For police and third parties, the primary risk is the consequence of incomplete incapacitation, and the suitability of a CEW therefore depends less on whether CEWs are generally effective and more on whether failure can be safely absorbed in the specific encounter. A CEW may be a reasonable edged-weapon option where distance, containment, cover, and transition capability create that margin; it should not be considered an automatic substitute for lethal force when the threat is already immediate.

U.S. Legal Considerations

Fourth Amendment framework

Police CEW use during an arrest or seizure is generally evaluated under the objective-reasonableness standard of *Graham v. Connor*. The central considerations include severity of the suspected offense, whether the person poses an immediate threat to officers or others, and whether the person is actively resisting arrest or attempting to flee. CEW-specific case law adds further emphasis to warnings where feasible, mode of use,

number and duration of cycles, immediacy of the threat, degree of resistance, whether resistance is violent or merely non-compliant, and whether the person is already restrained or controlled.

Intermediate force

In *Bryan v. MacPherson*, 630 F.3d 805 (9th Cir. 2010), the Ninth Circuit characterized dart-mode TASER deployment as an intermediate, significant level of force. Bryan involved a motorist who was unarmed, stationary, approximately 20 feet from the officer, and not advancing when the CEW was deployed, and the court concluded that the force was excessive under those circumstances. The case is important because it rejects any characterization of probe-mode CEW use as trivial or de minimis force.

Warning

Bryan also reinforces the importance of warning where feasible before deploying significant force. A warning is not universally required in every rapidly evolving encounter, but failure to warn can weigh against reasonableness when circumstances permit officers sufficient time to provide one.

Passive resistance and qualified immunity

In *Mattos v. Agarano*, 661 F.3d 433 (9th Cir. 2011) (en banc), the Ninth Circuit considered two CEW cases and concluded that reasonable juries could find the uses of force excessive. However, the officers received qualified immunity because the relevant law had not been clearly established at the time of the underlying incidents in 2004 and 2006. This distinction is critical for the legal library: a court can find that conduct violated the Fourth Amendment while still granting qualified immunity because the law was not sufficiently clear when the officer acted.

Repeated exposure

Federal appellate courts have been especially skeptical of repeated CEW applications once a person no longer poses an immediate threat or meaningful resistance. The constitutional justification for an initial cycle does not automatically justify later cycles, and each additional application is assessed in light of the subject's behaviour and threat at that point.

Clearly established law

CEW qualified-immunity analysis is highly circuit- and fact-specific. The strongest recurring principles are that CEW force becomes increasingly difficult to justify when the subject poses no immediate threat, the underlying offense is minor, resistance is passive rather than violent, the person is already controlled or restrained, officers repeatedly cycle the device after resistance has ended, or significant force is deployed without warning where warning was feasible. Conversely, courts are more likely to find CEW use reasonable where a subject is actively assaultive, violently resisting, attempting to access a weapon, or otherwise creating an immediate safety threat.

Ethical and Moral Considerations

The ethical case for CEWs rests primarily on harm substitution. The technology is justified most strongly when electrical incapacitation replaces an intervention with a greater expected probability of serious injury or death.

Harm reduction

The strongest empirical justification for CEWs is not that they are harmless but that, in many policing contexts, they appear capable of reducing injury compared with prolonged physical struggle, handheld impact weapons, police canine bites, or potentially higher levels of force. That distinction should remain explicit.

Technology-driven escalation

The randomized evidence from Ariel et al. [(Ariel et al., 2019)] complicates a simple harm-reduction narrative. If carrying or displaying a CEW increases the probability that force will occur at all, then a weapon can be safer per use while still contributing to more coercive encounters overall. Ethical assessment therefore requires examining both harm conditional on deployment and whether the availability of the weapon changes the probability that force is used at all.

Repeated use

If an initial CEW cycle fails, the ethical justification for another cycle depends on whether the subject continues to present a threat or active resistance and whether another intervention would produce less total harm. Repeated cycling solely because the first exposure failed to achieve compliance risks converting a less-lethal intervention into cumulative punishment.

Vulnerability and uncertainty

Where the evidence is weak for a particular population, ethical analysis should acknowledge uncertainty rather than treating absence of evidence as evidence of absence. This is especially important for medically vulnerable, intoxicated, elderly, very young, pregnant, or physiologically exhausted subjects.

Dignity and pain

Even when no lasting physical injury occurs, CEW exposure intentionally produces involuntary loss of muscular control, pain, fear, and temporary loss of bodily autonomy. An ethical assessment therefore cannot reduce “harm” solely to documented emergency-department injury.

Evidence Limitations

The CEW literature is substantially larger than the literature for many other less-lethal technologies, but it has important limitations.

First, laboratory subjects differ from police subjects. Much experimental safety research uses healthy volunteers, often police officers, exposed for short periods under controlled conditions.

Second, manufacturer funding is common. Baliatsas et al. [(Baliatsas et al., 2021)] found manufacturer involvement in 17 of 33 experimental human studies.

Third, field research is observational. Officers do not randomly select force options during real incidents, creating treatment-selection and confounding problems.

Fourth, injury definitions vary. Some studies count superficial probe wounds as injury while others focus on injuries requiring treatment.

Fifth, device models change. Findings from older M26 or X26 platforms cannot automatically be assumed to quantify the exact effectiveness or physiologic profile of later devices.

Sixth, mode matters. Probe mode and drive-stun mode have different intended mechanisms but are sometimes aggregated.

Seventh, exposure duration matters. Evidence supporting brief exposures should not automatically be generalized to prolonged or repeated activation.

Eighth, effectiveness is inconsistently defined. Studies variously measure incapacitation, control, injury reduction, use-of-force reduction, arrest completion, or agency-wide outcomes.

Ninth, mortality causation is difficult to isolate. Deaths following CEW use commonly involve multiple concurrent risk factors including intoxication, severe agitation, struggle, restraint, underlying disease, and other force.

Tenth, edged-weapon encounters are underrepresented. The general CEW evidence base does not directly establish the probability that CEW deployment will safely resolve rapidly developing knife or edged-weapon confrontations.

Bottom Line

Effectiveness

Moderate-to-strong evidence supports the conclusion that CEWs can facilitate control and reduce some officer and subject injuries when they replace physical struggle or more injurious force options, though immediate incapacitation is not guaranteed and field effectiveness depends heavily on probe contact, spread, distance, clothing, subject movement, and deployment circumstances.

Injury

Large field cohorts have found that the overwhelming majority of CEW-exposed subjects sustain no injury or only minor injury, most commonly probe punctures, supporting a generally low direct serious-injury risk in real-world studies.

Serious injury/death

Serious outcomes can occur through secondary falls, probe injury, prolonged struggle, or complex encounters involving multiple physiologic and force-related factors, though existing evidence does not establish a simple causal relationship between routine CEW exposure and sudden death.

Comparative safety

CEWs generally appear less injurious than batons and police canine bites, while handheld OC spray may carry a lower overall injury rate.

Risk-benefit assessment

The strongest evidence supports CEWs as a harm-reduction technology when they substitute for a realistically more injurious intervention. Their justification is substantially weaker when they replace communication, time, distance, tactical repositioning, or other low-risk alternatives.

Research caution

The experimental safety literature is limited by healthy-volunteer samples and substantial manufacturer funding. Conclusions about vulnerable populations, repeated exposure, and highly dynamic armed encounters should therefore remain qualified.

Core Peer-Reviewed Evidence

1. Baliatsas, C., Gerbecks, J., Dückers, M. L. A., & Yzermans, C. J. (2021)
Human Health Risks of Conducted Electrical Weapon Exposure: A Systematic Review.
JAMA Network Open, 4(2), e2037209.
DOI: 10.1001/jamanetworkopen.2020.37209

Priority: Essential / highest-value medical systematic review.

Contribution: Systematically evaluated 33 human experimental CEW studies.

Key finding: Acute adverse physiologic outcomes were uncommon in the experimental literature, but the underlying studies poorly represented real police populations.

Critical limitation: Most participants were healthy and physically fit; long-term outcomes were not studied.

Funding concern: Seventeen of 33 included studies were at least partly funded by the CEW manufacturer.

2. MacDonald, J. M., Kaminski, R. J., & Smith, M. R. (2009)

The Effect of Less-Lethal Weapons on Injuries in Police Use-of-Force Events.

American Journal of Public Health, 99(12), 2268–2274.

DOI: 10.2105/AJPH.2009.159616

Priority: Essential comparative field study.

Contribution: 24,380 use-of-force incidents across 12 police departments.

Key finding: CEW use was associated with significantly lower odds of civilian and officer injury after adjustment for encounter characteristics. Injury incidence declined approximately 25% to 62% following adoption in two departments examined longitudinally.

Strength: Large multi-agency real-world dataset.

Limitation: Observational designs cannot fully eliminate selection effects.

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3. Bozeman, W. P., Hauda, W. E., Heck, J. J., Graham, D. D., Martin, B. P., & Winslow, J. E. (2009)

Safety and Injury Profile of Conducted Electrical Weapons Used by Law Enforcement Officers Against Criminal Suspects.

Annals of Emergency Medicine, 53(4), 480–489.

DOI: 10.1016/j.annemergmed.2008.11.021

Priority: Essential real-world safety study.

Contribution: Prospective multicentre review of 1,201 actual police CEW uses.

Key finding: 99.75% of subjects experienced no injury or only mild injury; significant injury occurred in 0.25%.

Important finding: Two of the three significant injuries were intracranial injuries caused by falls.

Strength: Physician review and real-world exposure.

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4. Taylor, B., & Woods, D. J. (2010)

Injuries to Officers and Suspects in Police Use-of-Force Cases: A Quasi-Experimental Evaluation.

Police Quarterly, 13(3), 260–289.

DOI: 10.1177/1098611110373994

Priority: High / strong quasi-experimental evidence.

Contribution: Compared four years of data from seven CEW agencies with six matched non-CEW agencies.

Key finding: CEW agencies had lower rates of officer injury, severe suspect injury, and injuries requiring medical attention.

Strength: Stronger causal design than ordinary retrospective single-agency studies.

Limitation: Agency-level deployment does not isolate the effect of each individual CEW use.

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5. Smith, M. R., Kaminski, R. J., Rojek, J., Alpert, G. P., & Mathis, J. (2007)
The impact of conducted energy devices and other types of force and resistance on officer and suspect injuries.
Policing: An International Journal, 30(3), 423–446.
DOI: 10.1108/13639510710778822

Priority: High.

Contribution: 1,645 use-of-force incidents from two agencies with multivariable injury modelling.

Key finding: CEW use was associated with reduced injury and reduced injury severity in one agency, but not significantly associated with injury in the second.

Key value: Demonstrates that CEW effects are not necessarily identical across agencies.

Limitation: Observational design and agency-specific policies.

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6. Strote, J., Walsh, M., Angelidis, M., Basta, A., & Hutson, H. R. (2010)
Conducted Electrical Weapon Use by Law Enforcement: An Evaluation of Safety and Injury.
Journal of Trauma, 68(5), 1239–1246.
DOI: 10.1097/TA.0b013e3181b28b78

Priority: High real-world safety study.

Contribution: Retrospective cohort of 1,101 CEW-exposed subjects over six years.

Key finding: Significant CEW-related injuries were rare and no subjects died.

Strength: The cohort included substantial psychiatric illness, substance use, intoxication, and altered mental status, making it more representative of real police encounters than volunteer studies.

Limitation: Single-agency retrospective design.

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7. Ariel, B., Lawes, D., Weinborn, C., Henry, R., Chen, K., & Brants Sabo, H. (2019)
The “Less-Than-Lethal Weapons Effect”–Introducing TASERs to Routine Police Operations in England and Wales: A Randomized Controlled Trial.
Criminal Justice and Behavior, 46(2), 280–300.
DOI: 10.1177/0093854818812918

Priority: Essential behavioural/policy counterpoint.

Contribution: Randomized controlled trial examining the effect of CEW presence in routine policing.

Key finding: Force occurred more often under CEW treatment conditions; force incidence increased 48% among equipped officers and 23% force-wide. Officer assaults also increased.

Key value: Demonstrates that the effect of introducing a weapon extends beyond injury conditional on discharge.

Limitation: Evaluates weapon presence and organizational behaviour rather than physiological safety or incapacitation success.

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8. Nielsen, M., Munkholm, J., Banner, J., & Wingren, C. J. (2025)
Injury rates following conducted electrical weapons and other less-lethal force modalities in real-life police settings: a comparative literature review.
Forensic Science, Medicine and Pathology, 21, 1396–1406.
DOI: 10.1007/s12024-025-01020-9

Priority: Essential current comparative synthesis.

Contribution: Reviews 19 real-world studies comparing CEW, OC, baton, canine, and physical force.

Key finding: CEW injury outcomes were heterogeneous but generally lower than baton and canine; OC appeared to have the lowest injury rate.

Limitation: Variation in study design and injury definitions limits precise comparative probabilities.

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9. Lee, B. K., Vittinghoff, E., Whiteman, D., Park, M., Lau, L. L., & Tseng, Z. H. (2009)
Relation of Taser (Electrical Stun Gun) Deployment to Increase in In-Custody Sudden Deaths.
American Journal of Cardiology, 103(6), 877–880.
DOI: 10.1016/j.amjcard.2008.11.046

Priority: Important mortality counterpoint.

Contribution: Examined in-custody sudden death and firearm-death rates before and after agency CEW deployment.

Key finding: Sudden death increased 6.4-fold in the first full year after deployment and returned toward baseline in later years.

Interpretive caution: Ecological association does not demonstrate that CEW exposure caused individual deaths.

Key value: Prevents overstatement that CEW adoption has been conclusively shown to reduce mortality.

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10. Brandl, S. G., & Stroshine, M. S. (2017)

Oleoresin Capsicum Spray and TASERs: A Comparison of Factors Predicting Use and Effectiveness.
Criminal Justice Policy Review, 28(3), 279–306.
DOI: 10.1177/0887403415578732

Priority: High for operational effectiveness.

Contribution: Analyzed 504 use-of-force incidents involving OC spray or CEW deployment.

Key value: Directly examines factors associated with weapon use and incapacitation effectiveness rather than relying solely on injury outcomes.

Limitation: Single-department observational study.

Evidence Rating

Operational effectiveness: ★★★★☆
Substantial field evidence, but no universal incapacitation rate and meaningful technical failure modes remain.

General injury evidence: ★★★★★
Multiple large real-world studies and systematic reviews.

Serious-injury probability: ★★★★☆
Large field studies consistently indicate low direct serious-injury rates, although secondary falls and vulnerable-area probe injuries remain important.

Mortality evidence: ★★★☆☆
Direct causal evidence linking routine CEW exposure to death is weak, but mortality questions remain complicated by confounding, vulnerable populations, and ecological findings.

Comparative evidence: ★★★★☆

CEW use generally appears less injurious than baton, canine, and some forms of physical force, while OC may carry lower injury risk.

Industry-independence of evidence: ★★★☆☆

Strong independent field evidence exists, but manufacturer funding is substantial in the experimental physiology literature.

Overall confidence: Moderate-to-high.

Research-library conclusion

Conducted energy weapons are among the most extensively studied less-lethal police technologies. Real-world evidence generally supports their value as a harm-reduction option when they replace prolonged physical struggle, handheld impact weapons, police canine bites, or potentially more injurious force. Large field studies consistently report low rates of significant direct injury, although secondary falls and probe-related trauma can produce serious harm. Experimental physiologic research generally suggests low acute risk but is limited by healthy-volunteer samples, short controlled exposures, and substantial manufacturer funding. CEWs should therefore be understood neither as harmless nor as a reliable substitute for lethal force in every confrontation. Their strongest justification is comparative: where a successful deployment is reasonably likely to achieve control with less expected harm than the realistic alternatives. Their weakest justification is against passive, minimally resistant, already-controlled, or situationally vulnerable persons, or where deployment failure would expose officers or third parties to an immediate lethal threat.

References

Ariel, B., Lawes, D., Weinborn, C., Henry, R., Chen, K., & Brants Sabo, H. (2019). The "Less-Than-Lethal Weapons Effect"—Introducing TASERs to Routine Police Operations in England and Wales: a Randomized Controlled Trial. *Criminal Justice and Behavior*, *46*(2), 280–300. https://doi.org/10.1177/0093854818812918

Baliatsas, C., Gerbecks, J., Dückers, M. L. A., & Yzermans, C. J. (2021). Human Health Risks of Conducted Electrical Weapon Exposure: a Systematic Review. *JAMA Network Open*, *4*(2), e2037209. https://doi.org/10.1001/jamanetworkopen.2020.37209

Bozeman, W. P., Hauda, W. E., Heck, J. J., Graham, D. D., Martin, B. P., & Winslow, J. E. (2009). Safety and Injury Profile of Conducted Electrical Weapons Used by Law Enforcement Officers Against Criminal Suspects. *Annals of Emergency Medicine*, *53*(4), 480–489. https://doi.org/10.1016/j.annemergmed.2008.11.021

Bozeman, W. P., Stopyra, J. P., Klinger, D. A., Martin, B. P., Graham, D. D., Johnson, J. C., . . . Vail, S. J. (2018). Injuries associated with police use of force. *Journal of Trauma and Acute Care Surgery*, *84*(3), 466–472. https://doi.org/10.1097/TA.0000000000001783

Brandl, S. G., & Stroshine, M. S. (2017). Oleoresin Capsicum Spray and TASERs: a Comparison of Factors Predicting Use and Effectiveness. *Criminal Justice Policy Review*, *28*(3), 279–306. https://doi.org/10.1177/0887403415578732

Lee, B. K., Vittinghoff, E., Whiteman, D., Park, M., Lau, L. L., & Tseng, Z. H. (2009). Relation of Taser (Electrical Stun Gun) Deployment to Increase in In-Custody Sudden Deaths. *The American Journal of Cardiology*, *103*(6), 877–880. https://doi.org/10.1016/j.amjcard.2008.11.046

MacDonald, J. M., Kaminski, R. J., & Smith, M. R. (2009). The Effect of Less-Lethal Weapons on Injuries in Police Use-of-Force Events. *American Journal of Public Health*, *99*(12), 2268–2274. https://doi.org/10.2105/AJPH.2009.159616

Nielsen, M., Munkholm, J., Banner, J., & Wingren, C. J. (2025). Injury rates following conducted electrical weapons and other less-lethal force modalities in real-life police settings: a comparative literature review. *Forensic Science, Medicine and Pathology*, *21*(3), 1396–1406. https://doi.org/10.1007/s12024-025-01020-9

Smith, M. R., Kaminski, R. J., Rojek, J., Alpert, G. P., & Mathis, J. (2007). The impact of conducted energy devices and other types of force and resistance on officer and suspect injuries. *Policing: An International Journal of Police Strategies & Management*, *30*(3), 423–446. https://doi.org/10.1108/13639510710778822

Strote, J., Walsh, M., Angelidis, M., Basta, A., & Hutson, H. R. (2010). Conducted Electrical Weapon Use by Law Enforcement: An Evaluation of Safety and Injury. *Journal of Trauma: Injury, Infection & Critical Care*, *68*(5), 1239–1246. https://doi.org/10.1097/TA.0b013e3181b28b78

Taylor, B., & Woods, D. J. (2010). Injuries to Officers and Suspects in Police Use-of-Force Cases: a Quasi-Experimental Evaluation. *Police Quarterly*, *13*(3), 260–289. https://doi.org/10.1177/1098611110373994

HOW TO CITE

Edged-Weapon Response Lab. (2026). *Conducted Energy Weapon*. In *EWRL Evidence Library* (Version 1.0). https://droptheknife.org/evidence-base/I_CEW (https://droptheknife.org/evidence-base/I_CEW)