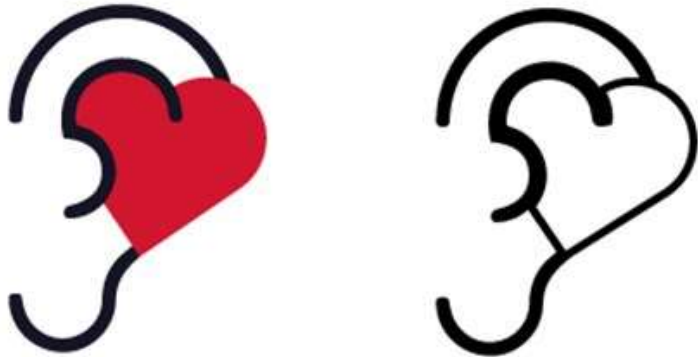


Muff the Police!



Sonic Care at Demonstrations

The threat of police use of force, “non-lethal” and lethal, is part of daily life for many. Black Lives Matter is just the most recent of many generations of activists who have drawn attention to the ways in which police disproportionately target and just excessive force on marginalized and vulnerable people.

Activism is a voluntary role that often makes activists targets for escalated and violent tactics by police. This threat sometimes changes individual and collective behavior and planning, which can have a negative impact on public participation in mass action. Planning and having accurate information the realities of police violence will help you make better decisions about when and how to participate in, and how to organize, demonstrations. Documenting, sharing, and seeking redress for violence can possibly impact public perception about over-policing, contribute to legal cases against police violence, and effect policy change.

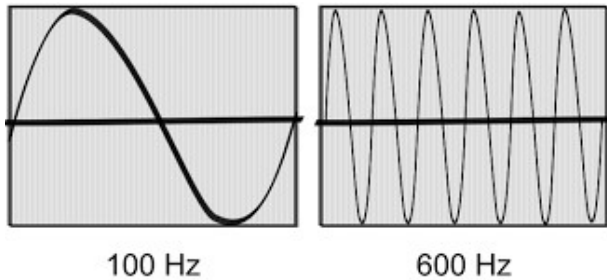
Why do we care about police sound?

The sonic is one aspect of policing that is often overlooked, but is a big part of the way in which police inhabit our public space and affect our movements when we engage in contentious public assemblies such as demonstrations, protests, and rallies. The excessive use of sonic force is one way in which police create conditions of discomfort and pain for those wishing to assemble in public. It is often true that police use excessive sonic focus at assemblies that are calling for police and military accountability, which can be heard as a form of retaliation.

What is sound?

Sound is an invisible form of vibrational energy that must travel through a medium (air, bones, flesh). As listeners, we hear because the wave energy is converted by our ears into sounds in our brains. In most cases, the body’s reaction time is quickest for auditory, not visual, signals. Hearing is an important sense for locating ourselves in space and alerting us to changing environmental conditions. We hear sound immersively, surrounded with a variety of natural and human made sounds that are called a “soundscape.” A healthy and enjoyable soundscape is a public good that contributes positively to our sense of a good living place, our mental health and wellbeing.

Sound is easy to measure. Sound frequencies are the number of waves per second, measured in Hertz. Sound energy is measured in decibels (dBs). The rate of dB increase is logarithmic, which means that for every 3dB increased, the sound energy is doubled. A sound at 83dB has twice as much energy as 80dB. This matters when measuring energy and wearing hearing protection.



Decibels	Sound Source
10	a pin dropping
20	rustling leaves, ticking watch
30	whisper
40	babbling brook, quiet library
50	light traffic, refrigerator
60	conversational speech, sewing machine
70	dishwasher, toilet flushing
80	vacuum cleaner, garbage disposal
90	shouting, lawn mower, MRI machine
100	subway train, blow dryer
110	rock band, leaf blower, jackhammer
120	thunder, screaming baby
130	stadium crowd, ambulance siren
140	jet engine at takeoff
150	cap gun, balloon popping
160	handgun, fireworks
170	shotgun
180	rocket launch



Sound measurement is not entirely synonymous with hearing measurement, because hearing happens in the body and is subject to each body's specific medical and emotional history, state of being, and proximity in space. Two people standing next to each other can experience entirely different sound worlds. This is important to remember when caring for each other at demonstrations.

What is police sound?

Police sound is sound made by police. There are a few types of sounds we're interested in here 1) amplified police voices 2) sirens 3) alarms. The police voice is the first sound technology. The police train cadets to sound like the voice of authority. When a police officer speaks while on duty, she is doing so in an official capacity and she is accountable to her words as representing the force. Public facing extensions of this voice include whistles, megaphones, radios, public address systems, and the LRAD.

The police use a variety of alert and warning sounds as a kind of "pure cry" of attention. Sometimes these sounds direct the gaze at the officer, sometimes at a potentially dangerous situation. Sometimes these sounds can also be used as part of a dispersal tactic due to their sheer volume of sound and irritating pitch(es).

Police whistles and sirens are designed to "penetrate" through the noise of streets. Whistles have been in use since the late 19th century, with two different types: foot patrol and traffic whistles. These remain part of the officer's uniform but mostly phased out of daily use in major US cities when police moved from foot patrol to car-based patrol. The electronic megaphone is a portable public address system with a handheld microphone, amplifier, and speaker. First introduced in the 1950s, it is still a ubiquitous part of policing crowds.

Police cars are equipped with electronic sirens on the hoods. Siren types include wails (descending tones from 1800-600Hz), yelps (linear rising falling 500Hz to 2000Hz), and high-low sweeps (950 and 1150Hz). Over the 20th century, the police adopted louder and louder voice, siren, and alarm technologies to cut through louder ambient soundscapes of modern cities. The sound of the police siren has risen 40dB in many North American cities since the early 1900s.

Research has shown that the use of siren in the "Lights and Sirens" protocol for vehicle response to emergency calls is effective only at short ranges and very low speeds. This protocol has been called "ineffective and dangerous" due to possibility of accidents at intersections, and contributes negatively to the wellbeing of those living in proximity to emergency response dispatch centers.

Another element of police sound is control over the sounding of public space. Over the course of the 20th century, cities have adopted more and more noise ordinances, which gives police officers the pretext for engagement with people deemed sonically unruly. Additionally, police often control the location and duration of amplified sound in public space through permits, which are especially onerous for those practicing public speech daily, be it a preacher or a musician.

What is a LRAD?

The Long Range Acoustic Device (LRAD) is the name of a family of military-grade sound amplification devices used by police. The technological innovations of this device are a few: it renders low distortion sound reproduction for clear communication in directional focus at a 30-degree angle and at extreme volumes that allow for long distance communication. Second, the LRAD has a built in “deterrent tone,” which is specifically created not just to be at annoying frequency and repetitive pattern, but to be the loudest possible sound the device can make.

In extremes of loudness, proximity, and duration of sound, LRAD can function as a “directed wave energy weapon” that is used as a “less lethal” form of force by police. This means that the force of the wave energy is so intense on the body that it can cause temporary or permanent damage.

There are several different LRAD models in use. Some are smaller and worn by police as body chest packs (such as the 100x), others are hitched to trailers and others are mounted on vehicles (often a 300x). Each model has different maximum volumes, but all have volumes that can be injurious. Each LRAD consists of a square speaker system with built-in amplifier and a microphone handset attached by a cord. A knob on the back allows police to switch between microphone and deterrence signal.

Directional, like a water cannon

Filling the air of public space with invisible and harmful material,
like pepper spray or tear gas

Broadcasting like a megaphone

Annoying like an alarm

Invisible force like a bomb blast



LRAD History

The LRAD was developed by a private contractor after the al-Qaeda attack on the USS Cole in 2000. The US Navy requested a new type of device to communicate directionally and at long distance. The LRAD was one response to that request. It came to market in 2002 and was used in naval operations, Iraq, and Afghanistan.

Although built for long distance military applications, the LRAD became part of domestic US policing with the NYPD at the Republican National Convention in 2004. In 2009, it was first deployed to injurious levels on civilians in Pittsburgh at a G20 convention. The exact number of US police departments that own LRADs is still unknown. In the US, police LRAD use is largely made possible by the 1033 program signed into law in 1997, which make US military surplus equipment available to civilian law enforcement agencies. To date, this program has transferred more than \$5 billion in military gear to police departments.

Although LRAD was in use in the US since 2004, the use of the device against demonstrators in Ferguson made the device nationally known. The LRAD Corporation used Fox News footage of use in Ferguson in their promotional materials, and reported significant sales increases in the months following. The LRAD is now a staple of policing of large crowds and is often used in a continuous range of styles from police megaphone, to crowd dispersal device, and as a weapon.

Police violence, aka “excessive force:” although there is no standard definition, generally this means use of force greater than that which a reasonable officer would use under the circumstances, the minimum amount force required to achieve a safe outcome during procedures.

LRAD Deployment

It is unlikely that US police have official procedures for how to use the LRAD safely. Documents obtained through Freedom of Information requests reveal that the NYPD, for instance, uses the manufacturer’s recommendations as the basis of their operations of the device and does not train officers about injurious sound levels, proximities, and durations. Such training is required for other “less lethal weapons” such as pepper spray, flash grenades, and Tasers and is required in Canada, where independent scientific review guided a federal review of LRAD,

In general, police departments are supposed to issue warnings prior to escalations and arrest. This often happens through the LRAD. If you hear a warning from the police, it is likely that this signals that they are planning escalated next steps, be it seizure or use of deterrence tone.

Many protestors have reported the LRAD was used in deterrence mode without prior warning. The wide and long range of the LRAD means that even those who have complied with directions are likely to be struck by sonic force. The LRAD is often used simultaneously in warning mode and in communications mode, rendering police command unintelligible. Additionally, the LRAD is so loud and travels so far that its zone of audibility creates a wide extension of police jurisdiction. Bystanders and those in private spaces can be assaulted by injurious sound energy just because they were in proximity to the event. Although LRAD is directional and has volume knobs, the invisibility of its reach makes it difficult for police to understand its impact on those in its reach.

MYTHS OF LRAD

Myth: By simply turning it on, the LRAD produces pain.

Reality: LRAD has injurious potential in its volume, proximity to the device, and the length of exposure to the sound.

Myth: LRAD focuses primarily on infrasound (20Hz and lower) to trigger loss of bowels, and this “brown note” has been used by militaries since the Nazis

Reality: It is true that during WWII, Nazis used sound to agitate crowds in halls before Hitler would speak, but they were not low frequency sounds. Low frequencies are hard to produce in even the best speaker technologies. Some film soundtracks mix inaudible but felt low frequency sounds to keep viewers agitated. There is no magical “brown note” that makes ones bowels resonate until they are loose. This theory was even debunked on Myth Busters!

Myth: Howling like a wolf at the same frequency can protect you from LRAD exposure because it equalizes the sound pressure in your skull.

Reality: The external sound energy of an LRAD cannot be negated by self-generated internal sound energy. Howling might give you courage but it won't give you protection.

Myth: Folded cardboard or metal shields will protect you just fine

Reality: The LRAD sound is incredibly powerful, and the 1-2 dB dampening provided by these devices is likely not worth the loss of visibility and arm mobility.

Sound as Psychological Warfare

Even when police sound is not physically damaging the ears, it can have profound consequences to those listening. The primary effects of police sound can be psychological. Many police sounds, from sirens to running cars to overhead helicopters, are not deployed to warn anyone of anything or part of necessary police work. These sounds are part of a tactic of intimidation: a display of overwhelming force, a threat of possible future violence, and a form of dominance of the sonic space under contest. (This is the current policing style of NYC protests). Police sounds as psychological warfare are often loud, repetitive, machinic, and may point to (index) their relationship to technologies that can be weapons.

What are harmful effects of exposure to police sound?

The effects of exposure to police sound are related to the use of the device by police as well as one's exposure level, age, and one's preexisting health and wellbeing.

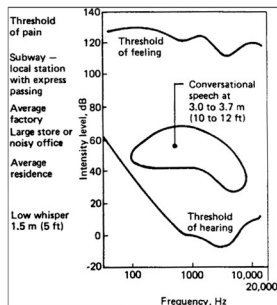
There are possible severe negative impacts of high-decibel sounds on hearing. Sounds that occur above the threshold of pain, a level effected by frequency and one's own body, will produce discomfort and continued exposure can lead to temporary or permanent hearing loss. Sounds at different frequencies have different dB levels before they become painful. For each increase in dBs, there is a decrease in the amount of time you can be exposed before you suffer pain and possible damage.

Exchange Rates of NIOSH and OSHA Standards - National Institute for Occupational Safety and Health 1998; Occupational Safety and Health Administration 2009. According to each governing body, a person can safely be exposed to each decibel level for its corresponding time without risk of NIHL. For example, according to the OSHA standard, a person can withstand an environment with sound levels at 95 dBA for four hours. After four hours they are at risk for NIHL. NIOSH maintains that a person is safe in a 95 dBA environment for less than one hour.

NIOSH Standard		OSHA Standard	
Sound level (dBA)	Duration (Hours: Minutes: Seconds)	Sound level (dBA)	Duration (Hours: Minutes: Seconds)
82	16:00:00	85	16:00:00
85	8:00:00	90	8:00:00
88	4:00:00	95	4:00:00
91	2:00:00	100	2:00:00
94	1:00:00	105	1:00:00
97	0:30:00	110	0:30:00
100	0:15:00	115	0:15:00
103	0:07:30	120	0:07:30
106	0:03:45	125	0:03:45
109	0:01:53	130	0:01:53
112	0:00:56	135	0:00:56
115	0:00:28	140	0:00:28
118	0:00:14	145	0:00:14
121	0:00:07	150	0:00:07
124	0:00:03	155	0:00:03
127	0:00:01	160	0:00:01

Sounds below the threshold of pain

Sounds that are loud but below the threshold of pain still can create physical and psychological stress. Loud sound can disrupt communication and concentration, making it hard to talk and listen. Loud sound makes it harder to concentrate, which can lead to mistakes and accidents. Loud sound can add to nervousness, annoyance, tension, stress, anxiety, and a sense of general dread. Loud sounds trigger higher breathing and heart rates, higher blood pressure, and higher releases of stress hormones. Importantly, loud or aggressive sounds can trigger memories of traumatic exposure to other police violence or to violence in general.



Hearing injuries

Temporary hearing loss: A temporary shift in the auditory threshold, where one experiences reduced hearing. People who experience a temporary threshold shift may often also experience temporary tinnitus.

Permanent hearing loss: Loud sounds damage the hair cells of the cochlea in the inner ear. The hair cells convert the vibration of sound into electrical signal for the brain, and if they are broken they do not grow back. Permanent hearing loss cannot be corrected by surgery or hearing aids.

An adult with healthy ears can withstand more sound energy than others may be able to. Here are some examples of people more affected:

Babies and children

Babies and children have a higher risk of hearing loss from exposure to loud sound. Both have thinner skulls, which means less protection from loud sound. Very young children cannot signal discomfort, and children cannot give consent to be in a space.

Those with pre-existing hearing loss

Exposure to loud sounds affects those with existing hearing loss differently. If you have not healed from a temporary hearing loss and are re-exposed to loud sounds, you are more likely to be injured.

Comrades hit by LRAD report the following:

In the moment:

- surge of adrenaline
- eardrums beating hard
- felt as if bleeding from nose/ears/mouth
- sinuses, nose, throat, and ears “as though they were on fire”
- immediate migraine
- woozy feelings
- acute pain in sinuses
- disorientation
- desire to leave scene

Afterwards, up to one week

migraines
sensitive to sounds, especially loud sounds
woozy
facial pressure
inability to sleep
dulled hearing
difficulty understanding speech
feeling full in the ears
ringing in the ears
hypersensitivity to sound

Ongoing

Permanent nerve hearing loss
Sensitivity to noise
ringing in one or both ears
reduced capacity to work at other loud events
fear of re-injury
tinnitus, bilateral and vertigo
barotrauma
ear fluid drainage
dizziness

Our sounds

In addition to police sounds, the sounds of demonstrators can fatigue the ears as well. The most obvious example is amplified sounds such as megaphones, especially those directed toward the crowd itself. Being in the middle of a large chanting crowd is often between 85-90dB. Marching bands also produce loud sounds, and you should be careful to avoid long exposure to the direct path of bells of horns. Similarly, drums produce powerful sound energy with sudden onset, which can damage ears with prolonged exposure. Megaphone operators should sporadically check in with listeners about volume and musicians should be careful about directing their sound energy away from nearby listeners.

How to protect yourself

The most important thing to deal with at demonstrations is fear. If you get afraid or make others afraid, the police have already done their job without using weapons. When we are afraid we make bad decisions and self-preservation trumps solidarity

When police display weaponry and gear while policing demonstrations the first reason is to intimidate people into leaving, preemptive censorship of behavior, or compliance. The first way to protect yourself is to have accurate information about the scene. Do not spread rumors of LRAD or other less lethal weapons, instead try to get a trusted person or yourself to set eyes on the gear. If you see LRAD on site, calmly let people know what it is and what its capacities are, dispel rumors and let people know how to move in relation to the LRAD. Alert organizers, legal observers, and medics, but keep and spread calm. Request that legal observers or media keep eyes on the LRAD and to be prepared to record if deployed.

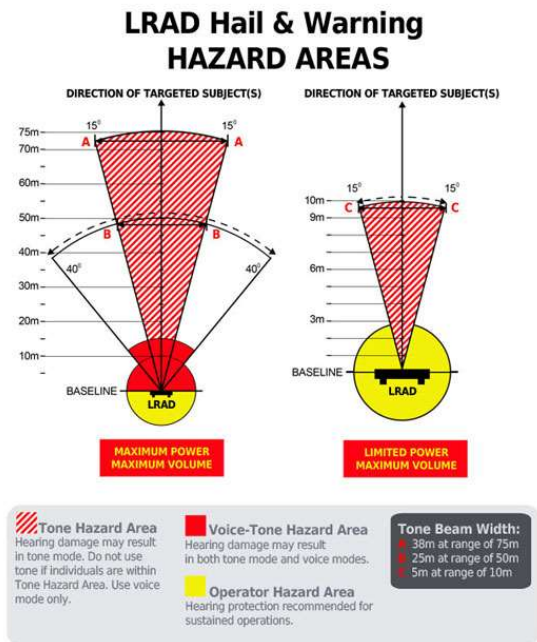
Stay calm, comrades!

- Breathe deeply and remind yourself this is only temporary
- Keep yourself and others calm, help panicking people to leave locations calmly
- Do not spread rumors and actively question whether info is verified, get eyes on things if you can safely
- Always walk instead of run, unless it's a life-threatening situation
- Create solidarity through singing, linking arms, chanting, holding hands
- Engage those being quiet and make sure you aren't leaving people out
- Bring and share food, water, calming sprays (with consent)

If LRAD is deployed: protect your ears, get out of the way

If LRAD is deployed, assess the situation. If it is used as a communications device, put in ear plugs and check out the scene for routes of escape from possible injurious exposure. Be aware that LRAD is often used in injurious way in conjunction with or following other tactics, such as deployment of pepper spray or targeted arrests. If other tactics are deployed, be prepared for possible injurious LRAD exposure.

If the LRAD is turned to the deterrence tone or is used with police voice that is so loud you cannot hear a comrade's voice over the device's sound, you may want to get out of the way. LRAD is a highly directional, cone shaped ray of sound energy. Its rate of spread is about 30 degrees (see figure). Walking away from it will not be as effective as walking perpendicularly to it until you are out of the cone of sound. Covering your ears will lessen the amount of sound but render you less able to protect yourself from other police tactics. Other makeshift earplugs include wax or other non-toxic, semi-firm substances that will not break off into the ear and can be easily removed. Tissue is better than nothing.



If you attend demonstrations where LRAD or other loud police sound is used, you may consider buying musicians earplugs, which reduce sound volume up to 20 dB without sacrificing ability to hear language. Likewise, sport and hunting earmuffs can be worn, although these are more cumbersome part of your pack. When purchasing, check the Noise Reduction Rate (NRR) and try them on for good fit.

How to record LRAD

You have the constitutional right to photograph police and government officials who as they work in plainly visible public spaces. To successfully record an LRAD interaction, make sure that you are sufficiently out of harm's way and stay situationally aware. Ideally you would start the recording before the exposure begins. Be far enough away to show the scene as it unfolds. Record the entire duration of the exposure. If there are important things that the police are doing but cannot be seen, speak them out loud. Say how far away you are from the police, pointing out landmarks that could be useful later. Immediately upload the video to the cloud or email it to someone else. If possible use an app such as Mobile Justice (by the ACLU) to record the video.

You can easily monitor your police sound exposure levels if you have a smart phone. A dB meter just samples the moment, so you need to take continuous samples to get your whole exposure. A "noise dosimeter" will capture all the sound energy you have been exposed for the duration. The latter is used in workplace sound exposure measurement.

The dB meter sampling at its highest rate is the cheapest solution for activists. A standalone dB meters are relatively inexpensive. A simpler solution is a smartphone app, although it will drain precious battery life during an action. Mac users should download the NIOSH Sound Level Meter (NIOSH SLM) app.ⁱ Android users should try SoundMeter or Decibel Pro.ⁱⁱ Mac is better for accurate dB readings because their microphone is proprietary technology and calibrated to the specific model. With these apps you can capture the duration of your exposure and download/email the results. It is a good practice to do this immediately after exposure if possible, in case of arrest.

Get to know the software in advance, test out daily life to see how loud it is. Once the LRAD is on site, check your base level before exposure to sound by monitoring crowd sound without the LRAD on. Once it seems LRAD will be turned on, start the meter. If you only start after, that's okay – just remember how long it took from first exposure until you turned your device on. Be sure to note the duration of your exposure, the dBs of your exposure, your distance from the sound, and any change in location closer or further away from the sound. Keep this in a log.



You need to do some math to figure out exposure to sound when using ear production. To do it, take the NRR number (in dB) of the protection, subtract seven, and then divide by two. This is the number you would subtract from your exposure dB.

After exposure

- Check in with your group immediately after, encourage anyone with injuries to document them
- If you have any signs or symptoms of LRAD exposure, go to an ear, nose and throat specialist for a check up
- Rest your ears by avoiding loud and/or sudden sounds
- Check in over time with those reporting injuries, continue to support them as they heal and if they decide to pursue legal redress for their injuries

How to build your event in an LRAD era

It is always a good idea to have first aid available at your demonstration. If you have street medics in your community, you can ask them to attend and ask them what the planners should have on hand for participants. It is a good idea to bring earplugs if you suspect LRAD will be brought on hand. Brief your organizers in advance about the LRAD and have them spread calm and information in event of its deployment, especially noting those with prior ear injuries and those with children. Always try to have multiple ways out of a space and know where they are at all times.

Legal pathways of redress

Police departments usually maintain the fiction that LRAD is never injurious and will only be used in communications mode. To date, no US police departments have shown that they have facilitated independent scientific research on the effects of LRAD exposure on the body, and instead follow biased manufacturer protocols for use and state that even the deterrence level of sound energy was within their legal usage.

The ACLU of Pennsylvania has successfully sued Pittsburgh police for a woman's LRAD sonic injury at the 2009 G20 protests, and the New York National Lawyers Guild currently has a case for injury of journalist/activists who attended a Black Lives Matters action in New York City in December 2014.

These lawsuits claim that plaintiffs First (rights to assembly, speech, and freedom of the press), Fourth (unreasonable search and seizure), and Fourteenth amendment rights (equal protection and right to life, liberty, and property) have been violated by improper LRAD use.

Your pathways to legal redress

- identify and document LRAD injuries and keep note of the injured person's changing signs and symptoms
- If anyone recorded the LRAD usage, get their contact information and ask for a copy of the recording
- If you have any signs or symptoms of LRAD exposure, go to an ear, nose and throat specialist for a check up.
- Call your local National Lawyers Guild to report your injuries. If you do not have a local chapter of the NLG, speak with a civil rights lawyer.
- You may want to report the police related injury to your local Civilian Complaint Review Board or other police oversight committee. Before doing that, check with a lawyer, because in some cities filing a complaint renders you ineligible for other forms of redress.

For More Information, Please read:

ANIKA EDREI, SHAY HORSE, JAMES CRAVEN, KEEGAN STEPHAN, and MICHAEL NUSBAUM v. THE CITY OF NEW YORK, New York City Police Department ("NYPD") Commissioner WILLIAM BRATTON, and Officers NYPD LUETENANT "JOHN DOE #1" MAGUIRE and "JOHN DOE #2" (the names being fictitious as the officers' true names and shield numbers are not currently known), in their individual and official capacities: United States District Court Southern District of New York.

Coakley, Sarah, and Kay Kaufman Shelemay

2007 *Pain and its transformations : the interface of biology and culture.*
Cambridge, Mass.: Harvard University Press.

Cusick, Suzanne

2006 *Music as torture / Music as weapon.* Trans 10.

Daughtry, J. Martin

2015 *Listening to war : sound, music, trauma and survival in wartime Iraq.* New York: Oxford University Press.

Goodman, Steve

2010 *Sonic warfare : sound, affect, and the ecology of fear.* Cambridge, Mass.: MIT Press.

International, Amnesty

2011 *Arms for Repression: Will they be covered by an Arms Trade Treaty?* Pp. 21-22.

Ministry of Community Safety and Correctional Services, Public Safety Division

November 2011 *Review of Police Use of Long-Range Acoustic Devices.*

Parker, James E.K.

Towards an Acoustic Jurisprudence: Law and the Long Range Acoustic Device.
Law, Culture and the Humanities.

Wood, Lesley J.

2014 *Crisis and control : the militarization of protest policing.* London
Toronto New York: Pluto Press ; *Between the Lines ;* Distributed by Palgrave
macMillan.

Text attribution: A Public Display of Affection



For more info/corrections: daphnegacarr@gmail.com

ⁱ The Center for Disease Control on the dB app: <https://blogs.cdc.gov/niosh-science-blog/2017/01/17/slm-app/>

ⁱⁱ Testing the accuracy of smartphones and sound level meter applications for measuring environmental noise in [Applied Acoustics](#) 106:16-22. DOI: 10.1016/j.apacoust.2015.12.01