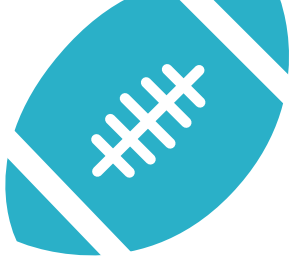
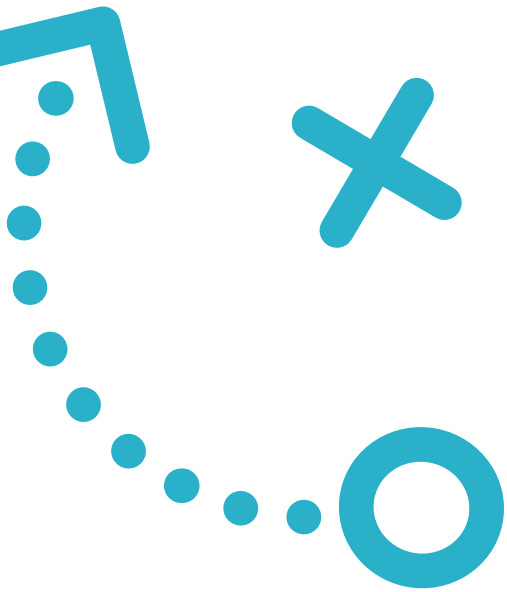


LOUDER!!

Why Are (Some) Sports So Noisy?

By Kathi Mestayer



MY FRIENDS AND I WERE AT A COLLEGE BASKETBALL GAME, HOLLERING and stomping on the bleachers. The shouting and pounding merged us into a single, vibrating, noise envelope of our own making, and we loved every decibel of it. In the middle of the din, we looked up and saw paint chips falling off the ceiling onto the court. The referees had to stop the game to get the court swept clean. Our vibrations were *that* powerful! And we won the game!

That was long before I paid much attention to noise, or started losing my hearing. These days, however, sports-event noise levels are much more ear-splitting (literally and figuratively), with bigger crowds and "LOUDER!" projected on stadium screens.

How Loud Does It Get?

At the top of the list is the Guinness World Record for "loudest crowd roar at a sports stadium," a dubious honor established by Kansas City Chiefs football fans in 2014, at 142.2 dBA (A-weighted decibels are adjusted for human hearing). It beat Seattle Seahawks fans' previous record of 137.6 dBA—whose vibrations were detected by earthquake monitoring equipment in the region.

It's not only football. Noise levels affect basketball, car racing, and soccer, among other sports. By producing 130.4 dBA in noise, Kansas University Jawhawks basketball fans earned "loudest crowd roar in an indoor sports arena" in February 2017. At a 2010 World Cup Soccer match in South Africa, the fans' use of trumpet-like instruments called vuvuzelas (likened to the sound of a jackhammer) brought the sound level up to 131 dBA.

When does noise start to damage our hearing? For the workplace, safe exposure times are set by the National Institute for Occupational Health and Safety (NIOSH), which is a part of the Centers for Disease Control and Prevention (CDC). Because NIOSH's limits are for workers, it assumes exposure on a daily basis, five days a week.

But what about at a game lasting a few hours?

For noise outside the workplace, the National Center for Environmental

Noise-Induced Hearing Loss Affects More Than 50 Percent of Those Not in Noisy Jobs

The Centers for Disease Control and Prevention (CDC) made an announcement February 7, 2017, on the dangers of noise-induced hearing loss (NIHL). Among the many statistics cited, the CDC says:

- 40 million U.S. adults ages 20 to 79 have NIHL
- More than half (21 million) with hearing damage do not have noisy jobs
- One in four U.S. adults who say they have good or excellent hearing actually show hearing damage
- Hearing loss is the third most common chronic health condition in the U.S.
- People report hearing loss at a rate nearly double of those reporting diabetes or cancer.

The CDC says its latest Vital Signs report, using data from more than 3,500 hearing tests in the 2012 National Health and Nutrition Examination Survey (NHANES), shows "much of this [hearing] damage is from loud sounds encountered during everyday activities at home and in the community," such as using a leaf blower or going to a loud concert without hearing protection. Nearly three-quarters of those who are exposed to loud noises never or rarely use hearing protection, the report says.

According to the press release, CDC researchers "found that 20 percent of people who reported no job-related noise exposure had hearing damage in a pattern usually caused by noise. This damage—shown by a distinctive drop in the ability to hear high-pitched sounds—appeared as early as age 20." But it added that while a few studies have linked noise exposure among young people to the use of portable devices and entertainment venues, more research is needed to determine the relationship between this type of early noise exposure and hearing loss in older age.

Untreated hearing loss is linked with anxiety, depression, loneliness, and stress, the CDC says. In addition to causing hearing loss, chronic noise exposure can worsen heart disease and increase blood pressure, among other adverse health effects.

Noise is the only fully preventable cause of hearing loss. Taking care of your hearing should always be part of your overall health. If you suspect a hearing loss, get your hearing checked, and if you do have a hearing loss, get it treated. Avoid noisy areas, and wear protective earplugs or stronger when you need them in noisy environments. —*Yishane Lee*

See HHF's resources on NIHL, at hhf.org/preventing-hearing-loss, as well as our Summer 2015 cover story about NIHL, at hearinghealthmag.com.

Health, also part of the CDC, provides information on how to protect hearing from environmental, non-occupational noise. Repeated exposures for more than 14 minutes at 100 dBA—or for more than only one minute at 120 dBA—may cause hearing damage.

Anything over 140 dBA is above NIOSH's ceiling limit listed in its occupational noise exposure report, which says: "Exposure to continuous, varying, intermittent, or impulsive noise shall not exceed 140 dBA." The report continues: "The allowable exposure time at 140 dBA is less than 0.1 seconds"—the blink of an eye. In other words, hearing protection must be worn for exposures above 140 dBA.

Notably, duration measurements for the 140 dBA–plus world records at sports stadiums were not recorded.

Why So Much Noise?

It's a good question—why do fans subject themselves to this level of noise? One reason is the home-team advantage. If the stadium is packed with home-team fans who roar at the right time, the visiting team might make a mistake, like a false-start at the beginning of a play. Noise also makes it harder for the quarterback's team members to hear him call the play.

Another reason to make noise is to get the fans worked up, and feeling like part of the game, with their team. Football teams often call their fans "the 12th man"—an important addition to the 11 players on the field.

In fact, noise is so important that some stadiums, like the Seattle Seahawks' CenturyLink Field, are designed to be especially noisy, with roof overhangs and metal bleachers. The Atlanta Falcons even piped fake crowd noise into their football stadium, costing them a fine and their spot in the 2016 draft pick.

What About Your Workout?

Sound-level measurements don't have to break world records to harm your hearing, though. Volumes at fitness classes have been measured at above 100 dBA. That's the combined effect of background music, equipment noise, and reverberation—an echo effect, in which the sound ricochets off of hard surfaces, such as mirrors and drywall. If the reverb lasts long enough, it will reduce speech intelligibility.

Background music is used to set the pace (and vary it), keep people

100 dBA
sporting event:
14 minutes can cause damage

110 dBA
rock concert:
2 minutes can cause damage

120 dBA
siren:
1 minute can cause damage

90 dBA
leaf blower:
2 hours can cause damage

80 dBA
traffic noise (from inside a car)

70 dBA
washing machine

Sound levels are measured in dBA, or decibels adjusted for human hearing. At more than 140 dBA—the Guinness World Record in sports stadiums—participants should wear hearing protection to reduce potential damage to ears.

Sources: CDC, Guinness World Records.

moving, and make the workout feel more energetic and fun. Bonnie Schnitta, the owner and CEO of SoundSense, an acoustical consulting firm, managed an acoustical retrofit for a gym manager in 2000. "He was getting complaints from people in the classes," Schnitta says. "The reverb and the background music were making it hard to hear the instructor."

The retrofit consisted of attaching wood planks to the ceiling with a space between each, and a noise-absorbing product called SoundTex behind it. The result was a big improvement; the sound level went down to 80 dBA from 90 dBA, and the reverb time to 0.8 seconds from 3.2 seconds. People could hear both the instructor and the music better.

Why is noise such a common problem in workout spaces? Partly because of the hard surfaces. But it's also our decisions. "People often aren't thinking about noise during the design phase. They think it's not going to be an issue," Schnitta says. "Then, when they decide to fix it later, the cost is often more than if it was included in the early design phase."

What Can You Do?

As with any noisy situation, avoid it—or at least invest in protection. Visit NIOSH's online Hearing Protector Device Compendium for recommendations (cdc.gov/niosh/topics/noise/hpdcomp). The user-friendly site allows searches by type, brand, attenuation (sound energy reduction), noise reduction, and

Of course, earplugs may not help if you're in a fitness class and need to hear the instructor. Talk to the instructor and gym manager about improving acoustics to protect gym-goers' hearing, an equally important part of overall fitness.

other features, so you can compare products. It includes everything from earplugs and earmuffs to devices with noise-cancellation technology and the ability to accept communication input from outside sources.

Of course, earplugs may not help if you're in a fitness class and need to hear the instructor. Talk to the instructor and gym manager about improving acoustics and making sure protecting gym-goers' hearing is as important as overall fitness.

Schnitta and a working group at the American Society for Testing and Materials have been meeting to discuss a standard for noise levels in stadiums. "The first step will be to gather data on sound levels at several stadiums," she says. "Then, we'll work on developing a draft standard. It's going to be a big effort, but the need is there."

In collaboration with researchers from several universities, NIOSH has studied noise exposures for sports officials and referees. Their research on sound pressure levels of varying referee whistles was presented at the National Hearing Conservation Association this February.

"We found that the whistles of sports officials can produce levels between 105 and 120 dB at the ear of the person blowing the whistle," says William J. Murphy, Ph.D., the coordinator of NIOSH's Hearing Loss Prevention Program and one of the study authors.

After evaluating nearly 200 decibel-measuring smartphone apps, most of which came up short, NIOSH saw an opportunity for an app with greater accuracy and functionality to measure occupational noise. In January 2017 it launched its free Sound Level Meter ("NIOSH SLM"), available for now for the Apple iPhone. While NIOSH says the app isn't meant to replace a professional sound meter, it hopes that as part of a smartphone it is more portable and easier to use on an everyday basis.

I have no idea how loud my long-ago college basketball game was. I do know that now, I would be sprinting for the exit. But the memory helped me understand how shared loud noise can make us feel part of something very exciting, while doing something harmful in the long term. Maybe it's the hearing equivalent of 20/20 hindsight.

Staff writer Kathi Mestayer serves on advisory boards for the Virginia Department for the Deaf and Hard of Hearing and the Greater Richmond, Virginia, chapter of the Hearing Loss Association of America. For references, see hhf.org/spring2017_references.

Share your story: *Are you a fan of noisy sports? Tell us how you protect your hearing at editor@hearinghealthmag.com.*

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