

Can You Hear Me Now? : The Correlation between Hearing Loss and Marching Band

Introduction

As many as 6.5 million American teenagers suffer from some form of hearing loss (Seppa). The number of hearing impaired teens has increased by nearly a third over the last twenty years. Many experts attribute this increase to the increased use of mp3 players, and the loud volume at which the music is played (Seppa). However, other aspects of a teen's environment have an effect on hearing, as well. Marching band, for example, has been proven to cause permanent hearing damage (Keefe).

Part I: The Ear

Parts of the Ear

The outer ear is the most noticeable part of the human ear (Sherman). The auricle, from the Latin root meaning "leaf", is the entire outer ear. The auricle is made of cartilage. The ear is attached by many muscles (Sherman). The majority of these muscles serve no purpose other than attachment. The helix, the curve of the upper ear, comes from the Greek word for "curve" or "folding in" (Sherman). The ear has its own defense system, a series of hairs and sweat glands deigned to keep foreign objects out of the ear canal. The end of the ear canal is then connected to the tympanic drum, commonly known as the eardrum. This "drum" has many nerve endings and blood vessels that can be easily damaged or ruptured (Sherman). The three most commonly known parts of the ear are the malleus

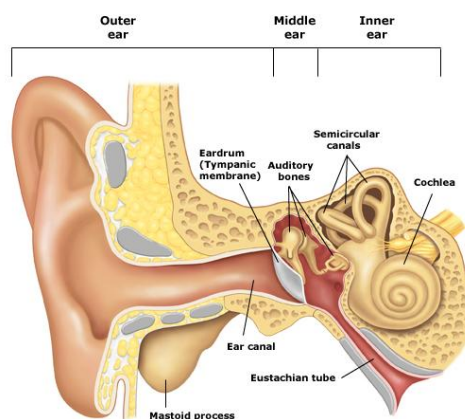


Figure 1 The ear consists of the outer, middle, and inner ear.

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(“hammer”), incus (“anvil”), and the stapes (“stirrup”). All three bones comprise what is known as the ossicular chain. The eustachian tubes located in the middle ear are made of bone and cartilage and are lined with hairs called cilia. These tubes let fluid drain down the throat and keeps an equal pressure on both sides of the eardrum (Sherman).

How We Hear

Not only does the ear allow us to hear sound, it also allows us to stand, turn, and walk.

“Sound is produced when an action...sets air molecules vibrating”

(Sherman). These vibrations then travel to the ear in the form of sound waves, and the waves that pass through the air are transferred as energy. The outer ear collects the sound waves in the air and streams them through to the ear canal. From there, the sound waves bounce off of the eardrum, causing vibrations (Sherman). These vibrations are then turned into impulses that are sent to the brain to interpret as sound (Sherman).

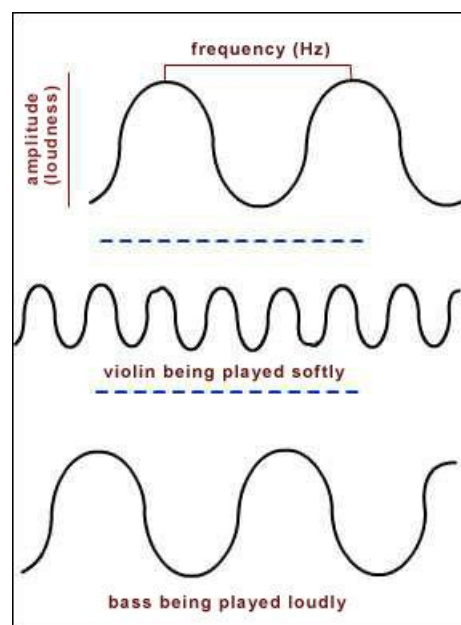


Figure 2 Sound waves travel through the air in frequencies

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Part II: Technicalities of Band

Performance Areas

At the very beginning of their usage, marching bands were forms of communication. Today, however, they are used purely for musical and visual entertainment. Marching bands perform in a vast number of areas. Some include band rooms, practice fields, and football fields, each with their own acoustic qualities (Keefe). A bowl arena, for example, would reflect music back towards the band, causing phasing. Phasing occurs when

the music does not arrive to the ears of the audience at the same time (“Marching band – Definition”). This can be a result of the poor placing of certain sections in a drill set.

Not only would you suffer from damage on the field, but in a classroom, as well. Rehearsing indoors may relieve the strain of learning and memorizing difficult music, but with a cost. Surrounded by hard surfaces, a marching band full of teenagers may not have the desire to lower their dynamic (volume) from an outdoor level to an indoor level. While all band members are corralled into a room with all instruments playing at full volume, the risk of permanent ear damage increases because of the close proximity and the loud dynamics of marching music (Keefe).

Marching Components

The standard marching band consists of woodwinds (piccolo, flute, clarinet, saxophone), brass (trumpet, trombone, mellophone, baritone, sousaphone), marching percussion (snare drums, tenors, basses, cymbals), and pit percussion (xylophone, vibraphone, marimba, suspended cymbal, bongos). There are many components to a marching band’s halftime show. Each place on the field where a member stands is called a drill spot, and each page of drill is called a set. Depending on where one’s spot is during a certain set, one may hear different musical components of the tune. For example, if the fifth page of the drill has a student



Figure 3 Students rehearse their halftime show after school. Students who play the mellophone are placed in front of the drumline.

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standing in front of the drumline, he or she would be more susceptible to hearing damage than someone placed near the clarinets.

Part III: Sound Level

What Is a Decibel?

A decibel (dB) is a unit used to measure the loudness of sound (Keefe). An SPL (sound

DECIBEL SCALE (dBA)

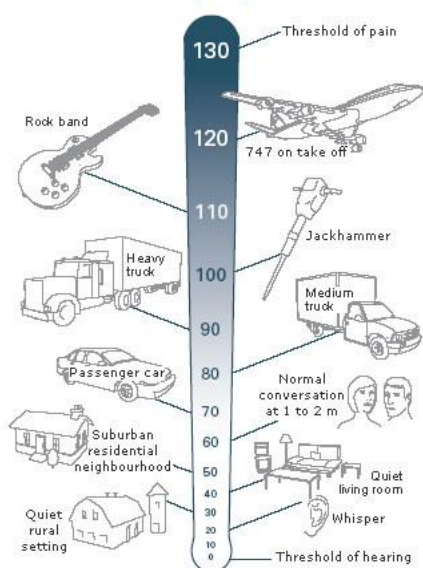


Figure 4 A decibel scale with decibel levels varying by sound

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pressure level) “is a measure of the amplitude of the pressure change that produces the sound” (Keefe). The amplitude of the pressure is the loudness that one hears (Keefe). There are many typical sounds that do not create any type of damage, such as normal conversation, whispering, and even the dial tone of a telephone (“Decibel (Loudness) Comparison Chart”). Safe decibel levels can go up to 95 dB before extended exposure can cause permanent hearing loss (“Decibel (Loudness) Comparison Chart”).

Noises over 95 dB include motorcycles, rock concerts, and power tools (“Decibel (Loudness) Comparison Chart”). At these points, the decibel levels are all bearable. However, even a gunshot or a jet engine can cause permanent damage even while wearing hearing

protection (“Decibel (Loudness) Comparison Chart”).

Decibels in Music

Seeing as a decibel is a measurement of loudness and sound, it’s only natural for musical instruments to have decibel levels of their own. For example, the flute has a decibel range of 92 –

103 dB (“Decibel (Loudness) Comparison Chart”). Many instruments have the same decibel range (“Decibel (Loudness) Comparison Chart”).

Who’s Affected?

Every member of the band is affected in some way: band members, drum majors, and even the band director (Keefe). However, some members are also affected much more than others. The band members with the greatest risk

for hearing loss are the drumline members (Keefe). An experiment at Duke University showed that during a drumline rehearsal, the average SPL over the hour and a half exposure time was 99.8 dBA (Keefe). This can cause

permanent damage to the eardrum, and can affect the lives of band members (Keefe).



Figure 5 The Winter Springs High School drumline

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Part IV: Importance and Prevention

The Importance of Hearing in Music

Listening is key in music. Balance, intonation, and note accuracy are vital when playing a piece of music. Balance is the collective band playing a set dynamic so that one section or an individual doesn’t stick out of the group. Balance is a blend of all instruments. Think of a pyramid: at the top, there are the soprano instruments such as the flutes. In the middle, there are the alto instruments such as the saxophones. Below the altos are the tenors, including the mellophones. And at the bottom is the bass, tubas. Other than balance, intonation is very important. Intonation is a musician’s ability to realize pitch accuracy. If a note is not in tune, then the pitch will not be correct, and the music will not be as it was meant to sound.

When in band, one is always at risk for hearing loss. If exposed to the band atmosphere for a prolonged period of time, hearing could be severely impaired. While not able to hear, one could not perform. Band is about listening; playing in sync with the other members and functioning as one band. This would not be achieved without hearing.

Not all hearing damage can be avoided. Earplugs are a simple and effective way to prevent hearing loss (Keefe). Student music programs could increase the awareness of hearing loss, so as to decrease the risk amongst students (Keefe).

Conclusion

There are many reasons for hearing loss. Sounds that are too loud for the eardrum can cause it to rupture or, it would take louder sounds to cause the vibrations needed to send impulses to the brain. All band members are at risk, yet drumline members are at a higher risk than others because of their extensive exposure to sounds well above the safe limit.

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Figure 1

"The Human Ear." *DJ Tech Tools*. Web. 29 Nov 2010.

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Figure 2

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Figure 3

"Band Practice." *Winter Springs High School Band of Gold*. Web. 29 Nov 2010.

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Figure 4

"Decibel Scale." *Sound Smart*. Web. 16 Nov 2010.

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Figure 5

"Game Night 10-8-10." *Winter Springs High School Band of Gold*. Web. 30 Nov 2010.

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