

Hearing Loss in Dentistry

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Disabling hearing loss permanently affects approximately 5% of people worldwide¹, with a growing percentage of people afflicted as they age. Unlike other bodily ailments, hearing loss often goes unnoticed and untreated, especially those who have mild to moderate hearing loss. Hearing loss has a detrimental impact on a person's quality of life. It disrupts the ability to verbally communicate, hence people may experience loneliness, isolation, and frustration while also developing tinnitus, the ringing noise in one or both ears.

There are a number of factors that contribute to hearing loss, including genetics, drug use, aging, and *constant exposure to excessive recreational and occupational noise*. Nearly 1.1 billion people between the ages of 12 to 35 years are susceptible to noise induced hearing loss (NIHL)¹, which is influenced by sound pressure level intensity, distance from the source of sound, and the duration of exposure to these loud sounds. Professionals in the dental field (i.e. dentists, dental hygienist, dental assistants) are particularly prone to NIHL and tinnitus because of the constant noisy work environment and career longevity.

According to studies performed in the United Arab Emirates and South Africa, nearly 37% of dental professionals report experiencing tinnitus and hearing loss.^{2,3} Studies conducted in the US also found similar results from self-reported surveys.⁴ Hearing loss can take on many different shapes and patterns, and like fingerprints, no two individual hearing patterns are alike. Hearing cannot be characterized as one number or percentage, but rather a fluctuating hearing level across many different frequencies. The frequency spectrum for speech-understanding spans from 250 to 8,000 Hz. Deep or bass sounds are characterized as low frequency sounds, whereas high-pitched or treble sounds are considered high frequency sounds.

An early study by Taylor et al.⁵ tested the hearing of several dentists and revealed thresholds on the audiogram from 4,000 to 6,000 Hz were elevated, which represents a form of hearing loss. This implies that dentists and other dental related professionals are susceptible to hearing loss that can be detrimental to their ability to understand speech. This can be a result of dentists becoming used to their occupational noise and neglecting the potential harm of routinely loud noise exposure on their hearing.

In-house audio recordings reveal dental instruments' noise levels range from 64 to 81 dBA* across the speech related frequency spectrum, with the turbine at 64 dBA* and the ultrasonic scaler & high volume suction at 81 dBA* from 20cm away.

There is also evidence that hand pieces may affect the upper audible frequency range, that is, greater than 8,000 Hz but less than 20,000 Hz. Studies have shown that high-speed handpieces can generate sound intensities at these upper audible frequency ranges up to 115 dB SPL⁶. According to the Occupational Safety and Health Administration (OSHA) of the United States Department of Labor, the permissible noise exposure per day for 100 dBA and 115 dBA is 2 and 0.25 hours, respectively⁷. While these standards have been deemed permissible, this doesn't rule out the fact that these instruments may be causing harm to your hearing.

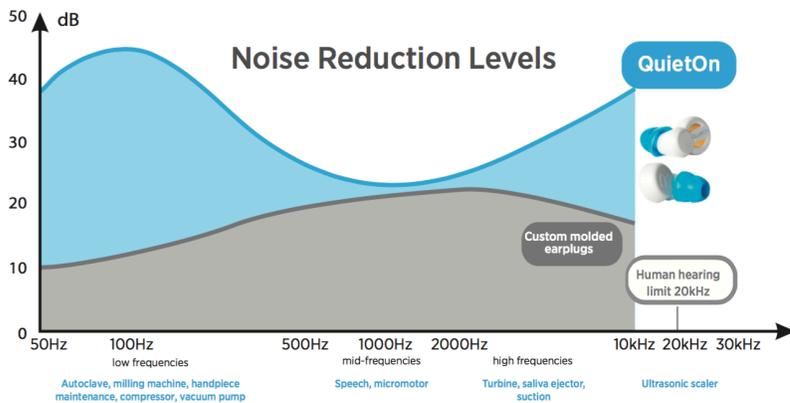
Fortunately, NIHL is preventable if proper protocols are met. According to OSHA regulations, administrative and engineering controls can be utilized to effectively reduce the intensity of the noise in a work environment. However, in a dental clinic, administrative controls are limited because employees are often not interchangeable within a workday. Engineering controls may be accomplished by purchasing dental tools that are considered "quiet" (<80 dB), but this can be costly. A more practical and effective method to prevent NIHL is to utilize personal protective equipment, such as earplugs and earmuffs. There are many different styles, shapes, and sizes of hearing protective devices and even those that utilize filters to selectively attenuate different frequencies of sounds. However, not all hearing protection is appropriate for use in the field of dentistry.

Verbal communication is crucial for a dental professional so it is important that hearing protective devices do not block out speech signals. This is difficult to accomplish, since hearing protection that does not employ active noise cancellation technology cannot distinguish between complex sounds (i.e. speech) and steady-state noise (i.e. any constant or non-dynamic sounds). Passive noise-cancellation devices utilize a fixed pattern of attenuation across the frequency range, thus requiring no power to insulate the ear from external sounds. Active noise cancellation devices require power to record ambient noise that is electronically turned 180° out-of-phase and played back with a headphone. The sound from the headphone combines with the original acoustical noise effectively cancelling it out. Many active noise-cancelling systems do not attenuate complex speech sounds to the same level as steady-state noises.



*These numbers may vary a little depending on different manufacturers and distances.

Unlike other hearing protection devices, the QuietOn Dental Active Noise Cancelling earplugs combine a unique, one-of-a-kind active noise cancellation technology with comfortable passive noise cancelling eartips, making it optimal for use in a dental setting. One of the most noteworthy features of QuietOn earplugs is how effectively they cancel noise across a wide spectre of sound frequencies, with more emphasis on the low and high frequencies. This means that the mid-frequency noise cancellation is weaker, making it possible to communicate with patients and staff.



The ability to understand speech in noise is dictated by the signal to noise ratio (SNR), where a higher SNR is better for understanding. Most hearing protection reduces the full frequency spectrum at the same level, which would not affect the SNR. However, the QuietOn earplugs do a better job of preserving speech sounds while reducing the background noise intensity thus increasing the SNR, thus improving the speech understanding capabilities in noise.

Additionally, the 50-hour battery life per single charge uses a compact charging case that easily supports USB connection. Here is what some consumers in the field of dentistry had to say after using these earplugs:

QuietOn earplugs have effectively reduced the burden caused by the high-pitched noise of dental instruments. I feel myself much more refreshed after a work day, which is why this easy-to-use hearing protection has become a part of my daily work.

- Pentti Rytivaara, Dental specialist, OralSurgery

In my opinion, the ear plugs work well in the way that they only block some sounds. I'm released from the general background noise in the clinic. I notice how much noise there actually is when I take them off...I am happy to escape from the background noise. It is just super cool that there is a charger in the box...so the ear plugs can be recharged, when they are put in.

- Sally Masri, Dentist

QuietOn Dental Active Noise Cancelling earplugs are certified hearing protectors that meet the EN352 series of European standards that have been optimized to attenuate noises that are specific to the various industries. They are lightweight, hold long battery life for uninterrupted work days, and sits within the ear so as not to obstruct the placement of loupes over the ears. Unlike most hearing protection, QuietOn weighs more importance in preserving speech by not attenuating the mid frequency region as much as the low and high frequencies, making it possible to communicate with patients and staff members without having to remove the device from the ear. Considering hearing loss and tinnitus are both irreversible, it is important to be aware of the dangers of noisy environments and neglecting to wear hearing protection predisposes one to hearing loss. The QuietOn Dental earplugs can effectively protect dental professionals from permanent hearing damage induced by occupational noise while not obstructing the everyday work routine.

About Author

Completed Doctor of Audiology program from the University of Illinois with a background in Biomedical Engineering from Georgia Tech. He has a passion to spread awareness about noise exposure and hearing loss prevention. He was previously involved in NIH funded research labs investigating binaural hearing abilities in bilateral cochlear implant users. He is currently pursuing a DMD at the Dental College of Georgia and is combining his expertise to shed light on the potential dangers of occupational noise in the field of dentistry.

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