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Music to My Ears

An Argumentative Essay About the Importance of Hearing Protection Among Adolescents

Hearing loss is a social and public health issue silently affecting the adolescent population.[1-3] Though its affect is well known among the elderly, its impact on children and adolescents remains of growing concern due to the increased exposure of these age groups to loud noises and the little data available on this topic.[2,3] In the United States, it has been reported that nearly 1 in every 5 teenagers has some form of hearing loss.[3-5] Healthy People 2020 seeks to increase the use of hearing protection in adolescents when exposed to loud sounds or noise.[6] This topic is especially important among individuals aged 12-19 years of age since they are frequently exposed to loud noise through various avenues, including personal music playing devices, earbuds, sporting events, band practice, and chores such as lawn mowing or leaf blowing.[6,7] Healthy People 2020 estimates that over 410 adolescents per 1,000 aged 12-19 have never used hearing protection devices when exposed to loud noise or sounds.[6] It is especially important to increase awareness on ways to protect hearing in these age groups by addressing the problem of noise induced hearing loss (NIHL), changing the attitude of adolescents about ear protection, and increasing the availability of patient education on this topic since NIHL is an irreversible yet preventable condition.[8]

Data gathered from the National Health and Nutritional Examination Surveys (NHANES) estimates that over 30 million Americans aged 12 years or older were reported to have bilateral hearing loss between the years of 2001-2008.[3,7,9] In addition, it is estimated that these numbers increase to about 20.3% when unilateral hearing loss is taken into consideration, translating to 48.1 million individuals.[3,9] However, most recent findings from the NHANES study 1988-2010

suggest that the prevalence of hearing loss among US adolescents aged 12-19 showed no significant increasing or decreasing trends between the years of 2008-2010.[3] Findings also suggest that there were no consistent associations between hearing loss and noise exposures despite the decreased use of hearing protection and the increased exposure to loud noise during this time period.[3] So why was there a discrepancy? Potential limitations of this study could have been due to underreported hearing loss since hearing related behaviors including hearing protection use and noise exposure were all self-reported.[3] Another limitation is the exclusion of a group of participants on the basis of incomplete examinations; those excluded could have had more severe hearing loss making them less likely to want to participate.[3] Further investigation is warranted on this topic since there are currently no updated population statistics available for adolescents and hearing loss. All current findings lead back to the data collected from the NHANES. It is important to consider that the current findings are dated since the study last took place in 2010. So much has changed between then and now, including the amount of noise around us, but one thing remains the same: hearing protection and general awareness about the dangers of loud noise can help prevent noise induced hearing loss.[10-13]

Hearing damage can be measured using temporary threshold shifts (TTS), which is expected to normalize within a few minutes to hours after noise exposure.[2] However, many studies conducted on animals have shown that repeated threshold shifts may result in a permanent threshold shift (PTS), which translates to a permanent hearing loss.[2] According to research done using repeated moderate noise exposure on young rats, the extent of HL after loud noise exposure depends on several factors that contribute to the total energy content of the noise.[14] These factors include noise intensity, exposure time, repetition rate, and interval time.[14] They found that varying degrees of hearing loss occurred based on the modifications of these

four factors.[14] Rats that had prolonged exposure times to higher noise intensities were more likely to experience hearing loss when compared to the rats who were exposed to the same intensities over shorter time periods.[14] Also, rats who had been exposed to repeatedly moderate noise became somewhat more resistant to loud noise when exposed later in life.[14] This may be translated to the human population since most individuals report that they have experienced an attenuation of hearing after loud noise exposure, but only a portion of those individuals end up having permanent hearing loss.[3] A reason could be that they have just not been exposed to the noise long enough.[14] Concern then lies in the event that eventually leads to hearing loss; therefore, preventative measures must be taken to decrease overall risk. Mannström and colleagues discussed several other studies that found that younger animals were more sensitive to the effects of loud noise than older animals.[14] Noise exposure at a young age may produce temporary, reversible, or no immediate HL during adolescence. However, the lasting effects may exacerbate the progression of age-related HL.[2,14]

When individuals of any age group are exposed to hazardous loud noise or sounds repeatedly, especially without using adequate hearing protection, the result is usually noise induced hearing loss (NIHL).[8,15] Although viral infections are among the most common causes of acquired hearing loss in children, there have been more studies emerging on the topic of NIHL causing cochlear damage in adolescents.[1-3,15,16] Chronic tinnitus has also been reported in the young population.[17] Research from several articles has shown that prolonged exposure to sound levels greater than 85 decibels may result in permanent hearing loss.[7,14,18] Due to the dangers of hazardous decibels, increased awareness has resulted in more protective measures being taken especially at the workplace. The National Institute for Occupational Safety and Health (NIOSH) lists noise induced hearing loss as “one of the most common occupational diseases and the

second most self-reported occupational illness or injury."[7,12,18] Despite NIHL being listed as a common disease, the same protective measures have yet to be taken when considering children and adolescents.[1,8,19] Studies have shown that children are exposed to the same if not more amounts of noise compared to adults.[1,8,12,19] Leisure activities such as toys, personal music players, and crowded events may produce sounds greater than 85 dB. One study found that classrooms may produce sound levels ranging from 80 to 110 dB and that listening to headphones at the normally used output levels could produce a threshold shift of greater than 10 dB.[1]

Several studies indicate that now more than ever individuals aged 12-19 are consciously indulging themselves in loud music for hours at a time, often using large speakers, earbuds, or headphones.[1,7,11,20] Loud music from sporting events, concerts, dance halls, and of course personal music players produce recreational noise exposures at dangerous levels and can range from 95-115 dB.[1,7] Derebery and colleagues conducted a study to assess the hearing of teenagers before and after a rock/pop concert and found that approximately 72% of the participants experienced an immediate threshold shift in their hearing post exposure. Additionally, 53% of participants reported pressure in their ears, and 25% expressed that they experienced tinnitus.[4] Despite being given the option to use hearing protection, most participants declined, and only 10% chose to use the earplugs provided.[4] According to the study, the main reason as to why individuals chose not to wear the standard foam earplug stemmed down to the overall sound quality of the music.[4]

Attitudes towards ear protection use depend mainly on the attitude of the user towards noise and its effects on hearing.[7] As previously mentioned, sound quality may be of concern to adolescents in addition to the look and fit of the earplug.[11] Musician earplugs provide better

sound quality when compared to standard foam earplugs making it a good alternative if the main reason for lack of use in adolescents is the quality of the sound.[4,11] A study from the Noise and Health Journal assessed five different types of commercially available earplugs. Four of which were premolded musician earplugs, and the fifth was a standard foam earplug frequently distributed for free at music venues.[11] Findings suggest that individuals were more likely to use the earplugs if there was less of a compromise to sound quality. The shorter earplugs which were less visible in the ear were also more favored compared to the types that were easily visible, suggesting that participants were more likely to wear the earplugs at public events if they were discreet.[11]

Balanay et al. discussed attitudes towards noise and hearing protection among college freshmen with a mean age of 19. Their study described individuals with more severe hearing symptoms like hearing loss, ear pain, and chronic tinnitus as having more of an anti-noise attitude.[7] Therefore, these individuals were more likely to use hearing protection.[7] On the other hand, individuals with less severe hearing symptoms like noise sensitivity or acute tinnitus were described as having a pro-noise attitude and were likely to partake in loud activities without hearing protection.[7] One possible explanation for the increased use of earplugs in the anti-noise group could be that individuals with more severe hearing symptoms are more concerned with protecting their hearing to conserve the hearing they have left.[7] It could also be due to previous exposure to patient education causing changes in behavior since several participants reported that they had been previously made aware of the dangers of loud noise exposure.[7,8,12,19] This suggests that knowledge about the dangers of NIHL could prove to be effective in teaching adolescents about the importance of hearing protection.[2,7,8,12,19]

A study conducted using fourth and seventh grade students from several Oregon and Washington schools found that adequate teaching about the importance of hearing protection may produce lasting results.[12] Over 1,000 students participated in the study and half of the participants in each grade were exposed to 35 minutes of interactive instruction titled "Dangerous Decibels" regarding hearing and hearing loss.[12] At baseline, the highest polled noise exposure experienced by students within the past year was headphone/earbuds use (80% of fourth graders and 90% of seventh graders).[12] Sixty percent of both fourth and seventh graders reported not using any hearing protection while exposed to the loud noise prior to instruction.[12] Results indicated that fourth and seventh grade students were able to retain the information taught from the session after a three month follow up.[12] However, when comparing the baseline questionnaire to the post presentation results, it was evident that the attitudes and intended behavior of the seventh graders towards hearing loss prevention had changed from the post presentation session. Initially following the presentation, 44% percent of seventh graders reported that they would wear hearing protection at a concert.[12] Results obtained three months later indicated that only 16% of seventh graders would use hearing protection.[12] These findings suggest that increased knowledge does not necessarily produce a change in behavior and attitude. The change could be due to adult influences such as parents or teachers and the influences from an individual's peer group having an effect on how hearing loss awareness and hearing protection is perceived.[12]

A Delphi study was conducted to determine strategies to prevent MP3-induced hearing loss in adolescents. Various parties including adolescents themselves were identified as being key players in the prevention efforts.[13] However, several experts lacked confidence that adolescents nor their parents would be able to perform the necessary behavioral actions needed

to prevent MP3-induced hearing loss if unaware of the dangers of loud music.[13] Headphone manufacturers as well as authorities both on a local and central level were listed as important parties.[13] The study identified two strategies that could possibly help to boost awareness – safer products and public health campaigns.[13] The strategies outlined that authorities should encourage safer product production from manufacturers and that public health awareness campaigns should be readily available about the risks of loud noise, the consequences of hearing loss, and the protective measures to conserve hearing.[13] Surprisingly, schools were not listed as an important key player in prevention efforts. Findings from the Delphi study suggest that although instruction about hearing preservation in schools was listed as applicable, it was not rated as achievable.[13]

Efforts to improve the availability of hearing conservation instruction in schools have been made, and several articles suggest reasons as to why hearing protection is not a regular part of the curriculum. First, there is a lack of public awareness since most individuals are not aware that noise induced hearing loss is a problem.[8,12,19] Hearing seems to be taken for granted until a true problem arises.[8,12,19] Similar to the findings from Balanay et al., individuals who have normal hearing or who do not perceive to have a hearing loss will continue to engage in pro-noise activities without using protection if they feel their hearing is not being affected.[7] Second, there is a lack of perpetuation and continuation of hearing conservation instruction.[8,12,19] There have been several efforts made in schools across the country where a hearing conservation program is implemented but not preserved since the curricula are deemed of lower priority.[8,12,19] Third, there is a lack of effective distribution of existing information about hearing preservation programs, materials, and curriculum.[8,12,19] Organizations such as the Centers for Disease Control (CDC) include web pages with patient education available for public and provider use. An interactive infographic with various sounds and the corresponding decibels is available to test

and see which sounds are deemed harmful.[10] Factsheets, comics, and posters are also readily available and cater to several demographics including adolescent and children populations.[21-24] The National Institute on Deafness and Other Communication Disorders (NIDCD) even has patient education videos appropriate for children and adolescents on hearing and how sounds make their way to the brain.[25] There is a clear lack of dissemination of the information to children and adolescents despite the fact that several experts agree that hearing preservation instruction in schools is relevant and hearing conservation programs such as "Dangerous Decibels" exist.[8,12,13,19]

There is scarce evidence about the effectiveness of earplugs in preventing noise exposure especially among adolescents.[2] On the contrary, there is hard evidence about the effects of loud noise on hearing.[14-17] In today's society, adolescents are exposed to dangerous decibels daily from personal music playing devices, earbuds, sporting events, band practice, and chores.[6,7] Several studies have shown that with adequate education and counseling, many adolescents would be willing to wear hearing protection when exposed to loud sounds.[1,11,12] Therefore, continuous efforts should be made now more than ever to spread awareness of the dangers of noise induced hearing loss and the importance of hearing protection by using different platforms in order to get the information straight to the youth. The best intervention is therefore not feasible for a one-time presentation with this target population. However, a one-time presentation is a step in the right direction and would have to be interactive in order to get the individuals engaged in the material. The main takeaways from this presentation should be focused on highlighting that NIHL is a problem and that the combination of hearing protection and awareness are ways to prevent it. The resources mentioned previously should be utilized in the discussion to convey the message to the targeted population - adolescents. Overall, we must

increase awareness on ways to protect hearing in these age groups since we know that noise induced hearing loss (NIHL) is an irreversible yet preventable condition.[8]

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