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Editorial

Hearing Screening and Prevention of Hearing Loss in Adolescents



Even before primary school age, children are exposed to loud noises, for example, noisy toys or a noisy environment. But more at risk of damaging their hearing are young people who frequently listen to loud music, whether individually through headphones or earbuds, or in groups, for example, at concerts or discos: one in six U.S. adolescents has high-frequency hearing loss. That is why adolescent audiometry also has to include high frequencies 6 and 8 kHz [1]. In the Netherlands, online speech-in-noise self-tests are used to raise awareness among young people and prevent music-induced hearing loss. In this editorial, we discuss how these online tests can help raise awareness and can possibly be used in a national screening program for all adolescents aged 10–18, leading to enhanced audiometry with youngsters at risk.

Evidence

Temporary tinnitus as a result of exposure to loud noise is common in adolescents. In studies that use self-reporting of hearing complaints in adolescents, 60% of them show a temporary ringing noise in the ear after going out [2,3]. In addition to tinnitus, hearing loss at high frequencies (above 3000 Hz) is a first consequence of exposure to loud noise. In the United States, 7%–16% of young people between 12 and 19 years report often hearing a whistle or beep in the ear [4,5].

Hearing Screening

In Western countries, neonatal hearing screening with otoacoustic emissions and abbreviated auditory brainstem response techniques is well established. Participation is large: >99% of all babies are screened, and the sensitivity and specificity of the tests are high. In most Western countries, childhood hearing screening (at 5 years of age) is performed by the school medical officer through a screening audiogram of both ears: the threshold of hearing is measured at 500, 1,000, 2,000, and 4,000 Hz. Research shows that in the period between hearing screening on newborns and the fifth year of life, the number of children with significant sensorineural hearing loss doubles, to about .5%–1.0% of all children [6]. Regular adolescent hearing screening takes place in only a few countries due to the fact that

acquired hearing impairment between the ages of 5 and 15 is not common. There is only an increase of <.2% of all young people who experience significant hearing loss in that age bracket, and few need to wear hearing aids or to apply other interventions. It, therefore, seems that tone audiometry, as happens at the age of five, whether or not accompanied by the loss of 6 and 8 kHz frequencies, is not cost-effective at later ages. The same conclusion can be drawn for measuring otoacoustic emissions. Clearly, the risk of hearing damage, including tinnitus, is greatest in adolescents through exposure to loud music, a tendency that seems to be increasing. Therefore, it makes sense to research how optimal cost-effective detection of hearing loss can be achieved. Online hearing tests can offer such a cost-effective solution. A Dutch cost-benefit study based on estimated effects of preventive interventions concludes that the Dutch online hearing test “Earcheck” provides such a prevention tool.

Online Speech-in-Noise Test in The Netherlands: Ear Check

The online speech-in-noise test (www.oorcheck.nl) Ear Check determines the understanding of speech through nine different words presented in stationary noise. The success of this online Ear Check is clear: more than 1,000,000 tests have been completed so far. The test is often incorporated in teaching materials and can be performed in the classroom as well as at home. To take the Ear Check one needs: a quiet measurement environment and a computer, tablet, or smartphone with internet access. If a reliable “insufficient” result is obtained, the user is recommended to visit a hearing specialist. The Ear Check has a sensitivity of 95% and a specificity of 98% [7]. Moreover, the site www.oorcheck.nl offers young people (12–25 years) information on sound and hearing, the causes and consequences of hearing loss, and ways to protect their hearing. In addition to the Ear Check, various checks can be done, including the MP3 Check (test for personal music player listening behavior), the “Check-Out” (test for listening behavior in leisure activities), and a “high frequency test” (which determines the level of pitch the young person is able to hear). Free teaching materials are available for all youngsters aged 12–14. The online Ear Check has been introduced nationally as hearing screening instrument for adolescents.

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Awareness of the Risks of Loud Noises and Hearing Protection

Hearing damage due to exposure to loud noises can be prevented by (1) the use of hearing protection; (2) increasing the distance to the sound source; (3) decreasing the volume of music; and (4) less frequent exposure to loud noise. It is necessary that young people are well informed about the risks related to exposure to loud noises and have the skills to limit or avoid these risks. Several studies show a relationship between knowledge about hearing loss and intention to use hearing protection [8–11]. In the case of the use of hearing protection, young people tend to wear protection inconsistently and not for a long time [12–14]. Training in optimal use of protective earphones seems to be effective [15].

Social Psychological Characteristics of Risk Behavior of Young People

There are increasing indications that young people are relatively unworried about hearing loss compared to other health problems, as shown, for example, in a survey among thousands of MTV viewers [16]. Young people who realize that they run a risk of hearing damage, are hardly inclined to take preventive measures to avoid hearing damage [3,17–19]. Current research indicates that opinions and behaviors of peers are a stronger influence on the behavior of young people than campaigns to inform them of the risks of loud music to their hearing [3,20,21].

Reducing the Noise Level and Wearing of Hearing Protection Ear Plugs

There are two projects that deserve to be followed in order to judge the impact they have on adolescent behavior. In Sweden, a national project has been initiated to limit noise levels in public spaces [22]. Noise measurements are carried out in concert halls, cinemas, and restaurants where the sound often is too loud. If the level actually is too loud, then the consequences are: reduction of the level and the provision of earplugs. Since 2014 a Covenant is in force in the Netherlands on the prevention of hearing damage by music between the Ministry of Public Health and associations for events and music venues. This includes agreements on the maximum noise level, informing the public on the risks of loud music to their hearing, and making available hearing protection. Through this Covenant, large music venues are motivated to take action to prevent hearing loss. Compliance with and effect of this Covenant have yet to be measured.

Conclusions, Considerations, and Recommendations

There is some evidence that adolescents change their behavior after self-testing their hearing [7,23–25]. Even more than other interventions, self-testing appears to enhance the awareness of the risk of hearing loss due to exposure to loud noise. Although hearing loss due to exposure to too loud noise is expected to be small among young people, the experience of slight hearing damage, including tinnitus, can lead to a change in their risk-taking behavior if young people are made aware of these risks through information about the operation and function of their hearing, the risks of loud music, and measures for the prevention of hearing loss, such as buying and wearing earplugs, taking “listening breaks,” and not to be too close to the

speakers during concerts. Collective prevention by public health services in municipalities seems to be most appropriate to reach these goals. Online hearing tests and questionnaires are an important tool in increasing awareness. This is why we recommend taking actions by those public health services that encourage young people to test their own hearing online. If the outcome of the questionnaire and/or repeated reference on the online test gives rise to a need to measure the hearing status, then regular diagnostic audiometry has to be performed involving not only frequencies 500, 1,000, 2,000, and 4,000 Hz but also 6,000 and 8,000 Hz [1].

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