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Canadian Hearing Report

Revue canadienne d'audition

Vol. 5 No. 5

Canadian Academy of Audiology
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Bad Assumptions about Hearing Protection

Hearing Protection Devices: Out With the NRR and In With a Double Rating?

Peer Reviewed

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Just when you thought that the G20 worries were over, it seems that it never ends. In courtrooms all around Toronto, there are legal suits and counter-suits, and even inquiries as to who knew what, when, and …. Thank goodness we only have to deal with issues of hearing and hearing loss. And if you think that the G20 was all about arriving at an international consensus about the economy or the environment, you are wrong. It was also about crowd management and using loud sounds to control and disperse protesters … now we're getting into the realm of audiology.

In this issue of *Canadian Hearing Report* we have an overview in our "From the Courtrooms" column about Sonic Cannons, also knows as Long Range Acoustic Devices. And the only reason that these very large loudspeaker systems are "long range" is because they are very loud. We can recall the movie *Apocalypse Now* where it opened with American gunship helicopters flying low, blasting the music of Wagner's "Ring Cycle" opera – perhaps the most intense piece of classical music ever written. The Viet Cong soldiers scattered without firing a shot because of the loud sound. And Manuel Noriega was driven to distraction by American forces when loud rock music was played continually and aimed at his Panamanian compound. Loud sounds, whether music or a screeching broadband spectrum, can certainly cause a person to cease, desist, and even flee the scene. This was the proposed scenario by the Toronto Police Service and the Ontario Provincial Police, and a deposition was given to the Ontario Superior Court of Justice on behalf of the Canadian Civil Liberties Association to prevent this Noriega-style of crowd dispersion.

"Acoustic devices" come in all shapes, sizes, and powers. Ultra-low frequency sounds can cause the recipient to feel nauseated. Ultra-high frequency sounds, only audible by teenagers and younger children, can assist retail store owners my clearing away the younger customers who may be congregating around the entrance. Mid-frequency audible sound can be used to alert people, but also to break up crowds and protests.

We really are still in our infancy when it comes to the effects of different sounds on our auditory systems and our bodies. Just because there is no measureable hearing loss on an audiogram does not mean that there has not been a significant alteration on more central auditory structures.

And what do rogue, intense auditory signals do to the hearing aid? Can an ultra-high frequency sound cause a hearing aid to enter compression despite being beyond the audible bandwidth, thereby minimizing the amount of gain and output that a hard of hearing person may obtain? I suspect that this was more of a problem with the analog hearing aids where the compression detector was located in the hearing aid circuitry but no research to date has looked at this potential problem for modern digital hearing aids.

The theme of hearing loss prevention continues with two "Research and Development Focus" articles. The first is by Brad Witt and is about the "bad" assumptions that are made about hearing protection. The other is by Alberto Behar who has written previously for the *Canadian Hearing Report*. He is writing about the proposed new double number rating system for hearing protection devices – out with the NRR and in with a double rating.

We then switch gears for our other "Research and Development Focus" article and we have a peer-reviewed submission (*Canadian Hearing Report* now offers the option of having an article peer reviewed). This issue's peer-reviewed article is by Millett and Ross and is about the ABCs of the school services for children with auditory disorders in Ontario.

And we finish off with a clear article about what will be happening to hearing aid batteries after June 2011. This article is about "no-mercury-added batteries" and is reprinted courtesy of the *Hearing Journal*. We may have to start disabling the low-battery warning signals in modern hearing aids since this change may cause the alarm to go off prematurely.

Marshall Chasin, AuD
Editor-in-Chief

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Juste quand vous pensiez que les tracas du G20 étaient terminés, ce n'est jamais fini, parait-il. Les recours judiciaires et les contres poursuites font rage dans les salles d'audiences à travers tout Toronto, et même des enquêtes sur qui savait quoi, quand et .... Dieu merci, nous avons à traiter seulement des enjeux de l'ouïe et de la déficience auditive. Et si vous pensiez que l'objectif du G20 était d'arriver à un consensus international sur l'économie et l'environnement, vous vous trompez.. C'était aussi pour la gestion des foules et l'usage de sons forts pour contrôler et disperser les protestataires... Maintenant nous plongeons dans le domaine de l'audiologie.

Dans ce numéro de la *Revue canadienne d'audition*, nous avons un aperçu dans notre colonne "From the Coutrooms"qui a trait aux cannons acoustiques, aussi connus sous le nom de dispositifs à ondes acoustiques de longue portée, et la seule raison pour laquelle ces grands haut-parleurs sont de "longue portée" est parce qu'ils sont très bruyants. On peut se rappeler le film *Apocalypse Now* à sa première, avec les hélicoptères de combat américains volant bas, jouant très fort la musique de l'opéra de Wagner "Ring Cycle" – peut-être la pièce de musique classique la plus intense jamais composée, les soldats Viet Cong sont dispersés, sans un seul coup tiré, résultat du bruit intense. Manuel Noriega a été distrait par les forces américaines jouant une musique intense sans arrêt et l'objectif était son isolement panaméen. Les sons extrêmes, que ce soit de la musique ou un grinçant bruit à larges bandes, peuvent certainement amener une personne à s'arrêter, cesser, et même fuir la scène. C'était le scénario proposé par les services de Police de Toronto et la Police provinciale de l'Ontario, et une déposition auprès de la cour supérieure de justice de l'Ontario, au nom de l'association canadienne des libertés civiles est pour prévenir cette dispersion des foules style Noriega.

"Les dispositifs à ondes acoustiques" sont disponibles en toute forme, taille, et puissance. Les sons à ondes au-delà de la gamme des ondes myriamètriques peuvent causer une sensation de nausée chez le récipiendaire. Les sons d'ultra-haute fréquence, seulement audibles aux adolescents et jeunes enfants, peuvent aider les propriétaires des magasins de vente au détail à disperser les clients jeunes pouvant se rassembler à l'entrée. Les sons audibles de hauteur moyenne peuvent être utilisés pour alerter les gens, mais aussi pour casser les foules et les protestataires.

Nous sommes réellement encore au stade de la petite enfance en ce qui a trait aux effets des différents sons sur nos systèmes auditifs et nos corps. Ce n'est pas parce qu'une mesure de la perte auditive est introuvable sur un audio-gramme qu'aucune altération significative sur des structures auditives plus centrales n'a lieu.

Et que font les signaux auditifs intenses et indésirables aux appareils auditifs? Est-il possible qu'un son d'ultra haute fréquence puisse faire qu'un appareil auditif entre en compression même étant au delà des largeurs de bandes acoustiques, minimisant de ce fait les gains et les sorties qu'une personne malentendante puisse obtenir?, c'est ce qui me fait croire que c'était un problème plus pour les appareils auditifs analogiques et la localisation du détecteur de compression dans le circuit de l'appareil auditif mais jusqu'à date, aucune recherche n'a porté sur ce problème potentiel pour les appareils auditifs numériques modernes.

La question de la prévention de la perte auditive continue avec deux articles de "Research and Development Focus". Le premier par Brad Witt porte sur les "mauvaises" suppositions autour de la protection de l'ouïe. L'autre est d'Alberto Behar qui a déjà écrit pour la *Revue canadienne d'audition*. Il touche au système d'évaluation à chiffre double nouvellement proposé pour les dispositifs de protection de l'ouïe – dehors le NRR et bienvenue l'évaluation au calibre double.

Nous changeons de registre après avec notre autre article de "Research and Development Focus" qui est une soumission évaluée par les pairs (La *Revue canadienne d'audition* offre maintenant l'option d'évaluation d'articles par les pairs). L'article évalué par les pairs de ce numéro est de Millet et Ross et porte sur les ABC des services scolaires pour les enfants avec des troubles auditifs en Ontario.

Et pour finir, un article clair sur le devenir des batteries des appareils auditifs au delà de Juin 2011. Cet article, repris avec l'aimable autorisation de *Hearing Journal*, traite des "batteries sans mercure ajouté". Nous pourrions commencer à neutraliser les signaux avertisseurs de faiblesse des piles dans les appareils auditifs étant donné que ce changement pourrait faire que l'alarme soit suspendue prématurément.

Marshall Chasin, AuD
Éditeur en chef

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Audiology Time Machine

This 1981 photo of the graduating class in audiology and speech-language pathology at UBC contains four audiologists (with three still active today) Who are they? Please turn to page 41 for the answer.

Canadian Hearing Report
Revue canadienne d'audition
CAA ACA
peer reviewed

Canadian Hearing Report: Call for Reviewers

Canadian Hearing Report is published six times per year and is the official publication of the Canadian Academy of Audiology (CAA).

CHR is pleased to offer peer reviewing to all interested authors who submit manuscripts to the journal.

To carry out this process, the editorial board of Canadian Hearing Report is currently assembling a group of volunteer peer reviewers. We are looking for dynamic experts in various fields of audiology to serve on our peer-review panel. The list of the peer reviewers will be published annually in the journal. The manuscripts would be sent and received via email.

If you are interested in becoming a peer reviewer for CHR, please contact Marshall Chasin (marshall.chasin@rogers.com), editor-in-chief to discuss your particular area of expertise.

Army Bands Told "Wear Earplugs"

Britain's Ministry of Defence has ordered its bandsmen to wear earplugs to conform to health and safety laws. All military musicians will now be required to "plug up" before playing their noisy instruments to protect their hearing.

Lieutenant Colonel Bob Meldrum, principal director of music for the Army, admitted that performing music whilst wearing hearing protection was "not without its challenges," but he said the rule was there to protect service musicians from noise-induced hearing loss.

Many musical instruments can reach volumes in excess of 100 dB – the equivalent of a pneumatic drill at close range - and could damage hearing over time. Research from the Musicians' Clinics of Canada shows that bag pipes produce 108 dB SPL and drums can have peak levels in excess of 120 dB SPL.

http://www.bbc.co.uk/news/health-11428833

Hearing Loss and Academic Performance

If noise levels within the classroom are not lowered appropriately, or if a hearing loss is left undiagnosed, the potential consequences are often underestimated – significantly impacting not only a student's academic performance, but also their emotional growth. With an average noise level in the classroom of 60 dB, children struggle to understand their teachers, whose voice is measured at an average 65 dB. With such strong background noise, it is challenging for students with and without hearing loss to follow discussions in class. As a result, students soon find their attention slipping and their motivation decreasing. "Hearing loss develops gradually, and as a result, can often be overlooked by affected children, their parents and teachers," says Dr. Kasper. "Hearing loss isn't generally considered a possible reason for weaker performance in school. In many cases, lack of focus and motivation in class is wrongfully interpreted as a behavioural issue, when in fact, hearing loss, or difficulty hearing, is actually the root of the problem."

http://www.hear-the-world.com/

Dramatic Rise in the Number of Students with Hearing Loss

Although the study found that noise in the classroom is perceived as a nuisance by students, an increasing number of young people are actively exposing their ears to high noise levels in their free time. Although not solely to blame, MP3 players are one reason why the *Journal of the American Medical Association* recently found that 1 in 5 U.S. teens are living with some form of hearing loss.

"Almost every teenager owns an MP3 player and uses it throughout the day at levels of 100 dB or above," states Dr. Craig Kasper, chief audiology officer for Audio Help Associates of Manhattan. "In addition, teenagers consider hearing loss a phenomenon linked to old age and are not aware that damage to the ears is irreversible, which points to the ever growing need for education around this issue."

According to the *Hear the World* survey, 79% of MP3 users in the U.S. between 14–19 years of age set the volume higher than 50% of the possible volume range and 51% set the volume to 70% of the possible volume range or higher. Long-term exposure to 80–85 dB, or any more than 15 minutes exposure to 100 dB, can lead to hearing loss. Music players like iPods can top 100 dB when turned all the way up.

Healthy Ears Hear the First Sound, Ignoring the Echoes

Voices carry, reflect off objects and create echoes. Most people rarely hear the echoes; instead they only process the first sound received. For the hard of hearing, though, being in an acoustically challenging room can be a problem. For them, echoes carry. Ever listen to a lecture recorded in a large room?

That most people only process the first-arriving sound is not new. Physicist Joseph Henry, the first secretary of the Smithsonian Institution, noted it in 1849, dubbing it the precedence effect. Since then, classrooms, lecture halls and public-gathering places have been designed to reduce reverberating sounds. And scientists have been trying to identify a precise neural mechanism that shuts down trailing echoes.

In a new paper published in the Aug. 26 issue of the journal Neuron, University of Oregon scientists Brian S. Nelson, a postdoctoral researcher, and Terry T. Takahashi, professor of biology and member of the UO Institute of Neuroscience, suggest that the filtering process is really simple.

When a sound reaching the ear is loud enough, auditory neurons simply accept that sound and ignore subsequent reverberations, Takahashi said. “If someone were to call out your name from behind you, that caller's voice would reach your ears directly from his or her mouth, but those sound waves will also bounce off your computer monitor and arrive at your ears a little later and get mixed in with the direct sound. You aren't even aware of the echo.”

Takahashi studies hearing in barn owls with the goal of understanding the fundamentals of sound processing so that future hearing aids, for example, might be developed. In studying how his owls hear, he usually relies on clicking sounds one at a time.

For the new study, funded by the National Institutes of Deafness and Communication Disorders, Nelson said: “We studied longer sounds, comparable in duration to many of the consonant sounds in human speech. As in previous studies, we showed that the sound that arrives first – the direct sound – evokes a neural and behavioral response that is similar to a single source. What makes our new study interesting is that the neural response to the reflection was not decreased in comparison to when two different sounds were presented.”

The owls were subjected to two distinct sounds, direct and reflected, with the first-arriving sound causing neurons to discharge. “The owls' auditory neurons are very responsive to the leading edge of the peaks,” said Takahashi, “and those leading edges in the echo are masked by the peak in the direct waveform that preceded it. The auditory cells therefore can't respond to the echo.”

When the leading sound is not deep enough in modulation and more time passes between sounds, the single filtering process disappears and the owls respond to the sounds coming from different locations, the researchers noted.

The significance, Takahashi said, is that for more than 60 years researchers have sought a physiological mechanism that actively suppresses echoes. “Our results suggest that you might not need such a sophisticated system.”

http://uonews.uoregon.edu/archive/news-release/2010/8/healthy-ears-hear-first-sound-ignoring-echoes

Hear the World Survey Reveals Underestimated Impact of Noise in the Classroom

Just in time for back to school, an international study conducted by Hear the World shows that noise levels in the classroom have a considerable impact on a child's physical health and academic performance. The study, which surveyed just short of 500 school children in Germany, France, Italy, UK, Switzerland, and the United States, found that the students reported feeling distracted, irritated and stressed by high levels of noise during class.

Beyond the potential for premature hearing loss due to continuous exposure to loud noises in the classroom, the study revealed that noise coming from the inside and outside of the class ranked high as a reason why students might be having trouble concentrating (6.5 on a scale of 10). In addition, other negative effects of a loud classroom were feelings of stress (5.4), headaches (5.1), and a growing level of aggression (4.6).

Noise in the classroom often comes from a multitude of sources, which in turn, makes it difficult to control. Beyond outside noise like traffic and construction, inside noise sources include student activity, classroom equipment such as computers and projectors, echo within the room, neighbouring classrooms and ventilation/heating systems.

William F. Austin Receives Azteca Eagle Award, Highest Non-Citizen Award in Mexico

Starkey Laboratories, Inc., a world leader in hearing technology, is proud to announce that William F. Austin, CEO and founder of the Starkey Hearing Foundation, was presented with the Azteca Eagle Award by President Felipe Calderon on Tuesday, September 14, at the Presidential Palace Los Pinos in Mexico City.

The Azteca Eagle Award is the highest honor bestowed by the Mexican Government to a non-citizen and was presented to Austin in recognition of his humanitarian service to Mexico. The ceremony was held in honor of Mexico's 200th anniversary of independence celebration. U.S. Secretary of Labor Hilda Solis attended the event along with numerous heads of state from other countries.

"I am very grateful to receive this honor in the name of the people who have made it possible," said Austin. "No one can do much alone. It takes a team to significantly impact the challenges we face in life."

Since the Foundation's inception in 1973, the Starkey Hearing Foundation has conducted several missions annually throughout Mexico. The demand for help in Mexico has increased over the past 35 years, and the Foundation has met that demand, distributing more than 100,000 hearing aids to those in need.

"Mexico was the start of our international outreach," said Austin. "We partnered with Flying Samaritans in 1973 to deliver hearing aids to the underprivileged in various Mexican communities."

Four other U.S. citizens have received the distinguished Azteca Award: Dwight D. Eisenhower, Ted Kennedy and Bill and Melinda Gates.

http://www.starkey.com/corporate/in-the-news/2010-09/17-Azteca-Award

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REPORT BY THE EXECUTIVE DIRECTOR OF CAA:

2010 ANNUAL GENERAL MEETING

It is once again my immense pleasure to report on the activities of the Academy, and to share with you my long-term vision for building a bright future for this professional organization.

What exactly is a vision? For me, it is a view of something possible, a guiding and reinforcing statement of intent, focus and ongoing commitment.

Although our board of directors recognizes that the list of actual accomplishments is at this point a relatively small one, this new road we have chosen is full of challenges and opportunities for the audiology profession – and for the academy itself – and should ultimately reap immense benefits for you our professional members.

The CAA Work Plan – initially laid out during the board's February 2009 Strategic Planning exercise – was tweaked and refined during a similar weekend retreat in Winnipeg this past spring. CAA plans to see the audiology profession flourish beyond historical boundaries to the benefit of all involved. Together we will be part of an important turning point in the history of the CAA as we tackle more strategic areas regarding visibility, branding, collaboration, and membership growth.

In the current regulatory environment, audiology is able to stand alone. If there ever was a time to be a member of the CAA, that time is NOW! audiologists can practice everywhere! In all but three provinces, regulatory bodies ensure minimum practice standards and quality of practice for the profession. In the remaining provinces where no college or regulatory body exists, a "Mutual Recognition Agreement" ensures the same standards of practice for audiologists across Canada.

The CAA mandate is to be the unified voice for audiology in Canada. Some important activities towards this end have included the following:

- Participation on the **Concerned about Classrooms Coalition**. The coalition, which represents 20 organizations, has received encouraging letters of acknowledgement and support from various provincial governments across the country respecting concerns and increased awareness of the impact of noise in classrooms;
- Participation in a **Canadian Inter-organizational Steering Group (CISG)** concerned about the practice of audiology & speech language pathology in Canada. One project reached conclusion in 2010 – the Infection Control Guidelines initiative – while a second – Auditory Processing Disorders Guidelines – should conclude by the end of this calendar year.
- Collaboration with **Federal Health-care Partners (FHP), Veterans Affairs Canada (VAC), Third Party Payers such as Blue Cross, and the NIHB Secretariat**, to effect positive change (i.e., fees) for patients/clients of audiologists;
- A national "**Hearing Health Care Initiative**"– a collaborative with like-minded professional associations and regulatory bodies spearheaded by the Canadian Hearing Society;
- Our internationally acclaimed **CAA Conference & Exhibition**, a world-class educational and social event.
- Our own ***Canadian Hearing Report*** grew in 2010 to 6 issues per year. This necessitated an aggressive search for articles, and more submissions from the membership of news items, briefs, and clinical reports of interesting cases. CAA's publication for hearing health care in Canada contains scientific articles, clinical and business management tips, as well as important news from the Canadian and international health care scenes. Marshall Chasin continues to serve CAA admirably in a volunteer capacity as editor-in-chief, and truly deserves so much credit for this wonderful and very professional journal.
- An ambitious marketing campaign to promote the academy and expand our professional presence within government agencies, universities and colleges, the Canadian auditory industry and the public sector. **Tate Marketing**, based in the GTA, is our agency of record, and now leads our branding and visibility efforts.
- A new and improved **website** launched in June of this year, including a member Facebook page.
- Concluded this past spring was a **CAA Survey** of audiology practice in Canada, targeting both CAA members and non-member audiologists. This has increased CAA knowledge and

intelligence regarding membership needs and characteristics.
- Promotion of hearing and ear health awareness during **National Audiology Week** October 19–28, 2009. A number of audiology promotional "tools" have been created and are posted on our website.

Last year I described to you my vision for CAA, stating that we would be focusing in the coming year on core business tenets:

1. On the need for increased visibility, CAA
    - Undertook branding and marketing initiatives
    - Created a new website
    - Developed audiology promotional tools, including posters, stickers, colouring sheets and hearing test pads personalized for CAA
    - Created "Information Fact Sheets" for the public on a variety of topics such as tinnitus

2. On the need for increased communication, CAA
    - Sent monthly "Message from the President of CAA" e-newsletters
    - Sent regular e-blasts to members on a variety of issues that affect them including VAC, Disability Tax Credits, the National Occupational Classification system, and various fee/funding updates
    - Increased the publication of our official journal Canadian Hearing Report from 4 to 6 issues annually
    - Added a Facebook page to our website for members to communicate, network and mentor with colleagues

3. On the need for better collaboration and cooperation with stakeholders, CAA has been in contact with
    - Professional associations
    - Regulatory and licensing bodies
    - Canadian universities,
    - Government and Third Party Payers

4. On the need for cost-effective administration and resource management, CAA
    - Is updating and upgrading Board/Staff Policy & Procedure Manual
    - Has establishing a contract staff team to serve in the areas of conference management, administration, accounting, marketing and IT/website.
    - Is developing over time a plan for phased fee increases based on findings from the member survey

5. On the need for new quality member services and benefits, CAA

    - Expanded educational opportunities such as the 1st Annual CAA Spring 2010 Audiology Seminar in Richmond BC, and the next one in April, 2011 in Moncton NB
    - Exclusive insurance programs such as liability, home and auto, extended health, office, life, and dental at special "made for CAA" rates
    - Free publications such as *Canadian Hearing Report*
    - Discounted fees for the CAA Conference, our Spring Audiology Seminar, and membership in the International Society of Audiology
    - Web-based services investigated that would permit CAA to track CEU's; offer online webinars; and record conference/seminar presentations for after market, at a cost, for members who cannot attend in person.

On the "we can do better" list from last year:
- Our website needed to be completely revamped with refreshed content to meet our goals of introducing web-based products and increasing membership … and though a work in progress it now does!
- We needed to provide better access to, and networking for, fellow members across Canada…and with Facebook, we now do!
- Issues experienced with our new database management system, particularly with regard to member renewals and conference registrations, needed to be corrected and resolved … and – for the most – they have!
- We also needed to provide a more meaningful and comprehensive media buy to our suppliers/manufacturers by integrating Conference sponsorships and exhibit tables with *CHR* advertising sales and other mutually beneficial opportunities. We are working on all of this, trust me!

One very exciting development this past year was our successful application to the International Society of Audiology to co-host, together with CASLPA, the 2016 ISA Congress in October 2016 in Vancouver BC. I want to acknowledge the efforts of Tourism Vancouver in helping us put together our bid and to CAA/CASLPA long-time member Zofia Wald-Mroz for actually presenting the bid to the ISA Executive Committee last March in San Paolo, Brazil.

I would be remiss if I didn't recognize the very significant contributions of the following individuals:

Susan Knight, Kathryn Knight, Jeremy Avery, and Jeff Tate of our marketing team
Denis St. Michel, CAA Webmaster
Teresa Gamble, CAA Site Support/Technical Advisor
Kim McFadden, CAA Admin Assistant
John Kelley and Nick Tsiourlis, CAA accountants
David Shaw and Megan Goddard, CAA Conference Administration

My deep appreciation also goes to President Carri Johnson and other members of the CAA Board of Directors for being so supportive since I came on board nearly 2 years ago.

Thank you for your ongoing support of CAA, demonstrated so visibly by your attendance at our annual conference and trade show. Erica Wong and Patty Van Hoof, our conference co-chairs, and all the accomplished volunteer members of our Planning Committee, have done an amazing job putting "thoughts into action", and should be commended for their hard work.

Finally, I will embrace the idea of meeting and working with more of our professional members across the country, and I am truly grateful for this opportunity.

Respectfully submitted,

Tom McFadden
Executive Director
Canadian Academy of Audiology

RAPPORT DU DIRECTEUR GÉNÉRAL DE L'ACA :

ASSEMBLÉE GÉNÉRALE ANNUELLE DE 2010

C'est encore une fois un immense plaisir pour moi de présenter les activités de l'Académie, et de partager avec vous ma vision à long terme, laquelle a comme objectif de garantir un avenir fructueux à cet organisme professionnel.

Qu'est-ce qu'une vision exactement? Selon moi, il s'agit de quelque chose de réalisable, d'une prise de position servant à guider et à favoriser nos intentions, notre concentration et notre engagement continu.

Notre conseil d'administration reconnait que la liste de nos accomplissements est relativement courte pour l'instant, mais le nouveau chemin que nous avons choisi est rempli de défis et de possibilités pour la profession d'audiologie, et pour l'Académie elle-même. Ce parcours engendrera une multitude d'avantages à nos membres professionnels.

Le plan de travail de l'ACA - exposé pour la première fois durant l'exercice de planification stratégique du conseil en février 2009, a été modifié et amélioré lors d'une réunion similaire à Winnipeg au printemps dernier. L'ACA prévoit un développement extraordinaire de l'audiologie, une avancée qui ira au-delà de ses limites historiques, au grand bonheur de toutes les parties concernées. Ensemble, nous ferons partie d'une étape décisive dans l'histoire de l'ACA, une étape durant laquelle des éléments stratégiques comme la visibilité, la stratégie de marque, la collaboration et la croissance du nombre de membres seront étudiés.

Compte tenu de la réglementation contextuelle d'aujourd'hui, l'audiologie est capable de se débrouiller seule. S'il n'y a jamais eu un moment pour devenir membre de l'ACA, c'est MAINTENANT. Les audiologistes peuvent pratiquer partout! Toutes les provinces, à l'exception de trois, comptent un organisme de réglementation permettant de garantir des normes minimales de pratique et des traitements de qualité. Dans les quelques provinces où il n'existe pas de collège ou d'organisme de réglementation, un « accord de reconnaissance mutuelle » assure les mêmes normes de pratique à travers le Canada.

Le mandat de l'ACA est de former une seule voix pour l'audiologie au Canada. Voici quelques activités importantes en lien avec cet objectif :

- Participation à la coalition **Concerned about Classrooms**, une coalition touchant le bruit en classe. Cette coalition, laquelle représente 20 organismes, a reçu des lettres de reconnaissance et de soutien de plusieurs gouvernements provinciaux à travers le pays au sujet des inquiétudes et de la sensibilisation des répercussions du bruit en classe;
- Participation à **un groupe directeur inter-organisationnel canadien** (GDIOC) qui se penche sur les pratiques d'orthophonie et d'audiologie au Canada. Un des projets s'est terminé en 2010, soit l'initiative relative aux lignes directrices sur le contrôle des infections, et un autre devrait s'achever à la fin de l'année : les lignes directrices relatives aux troubles du traitement de l'information auditive;
- Collaboration avec les **partenaires fédéraux en matière de soins de santé (PFSS), les anciens combattants Canada (ACC), les tiers payants comme la Croix bleue, et le secrétariat du Programme des services de santé non assurés (PSSNA)**, pour apporter des améliorations (par exemple, sur le plan des frais) aux patients et aux clients des audiologistes;
- Collaboration avec des associations professionnelles et des organismes de réglementation dans le cadre d'une **« initiative de soins de santé auditive »** menée par la Société canadienne de l'ouïe;
- Notre événement éducationnel et social de renommée mondiale **Conférence et présentation;**
- Notre propre magazine, « **Canadian Hearing Report** » compte maintenant 6 publications par année depuis 2010. Cette hausse nécessite une recherche poussée d'articles et une augmentation des soumissions de sujets, de programmes et de rapports cliniques sur des cas intéressants par les abonnés. Les publications de l'ACA sur les soins de santé auditive au Canada contiennent des articles

scientifiques, des trucs de gestion clinique et d'activité, et des nouvelles importantes provenant de la scène canadienne et internationale de soins de santé. Marshall Chasin continue de rendre de fiers services à l'ACA à titre de bénévole dans le rôle de rédacteur en chef. C'est en grande partie grâce à M. Chasin que nous avons un magazine extraordinaire et très professionnel;

- Campagne de marketing ambitieuse pour promouvoir l'Académie et accroître notre présence professionnelle au sein des agences gouvernementales, des universités et des collèges, ainsi qu'auprès de l'industrie canadienne de l'audition et du secteur public. **Tate Marketing**, une entreprise basée dans la région du Grand Toronto, est notre agence de référence; elle est responsable de notre stratégie de marque et de notre visibilité;
- Nouveau **site Web** amélioré sur la toile depuis juin dernier, comprenant entre autres une page Facebook pour les membres;
- Le printemps dernier, une **étude de l'ACA** sur les pratiques en audiologie au Canada a été menée. Elle ciblait les audiologistes membres et non membres de l'ACA. Cette étude a amélioré les connaissances sur les besoins et les caractéristiques des membres;
- Promotion de l'audition et sensibilisation de la santé auditive durant la ***semaine nationale de l'audiologie***, du 19 au 28 octobre 2009. Un certain nombre « d'outils » promotionnels pour l'audiologie ont été créés et instaurés sur notre site Web.

L'an dernier, je vous ai décrit ma vision de l'ACA, et je mentionnais que nous devions nous concentrer sur les éléments de base en matière d'activité durant l'année suivante :

1. Besoin de visibilité accrue, ACA
   - Initiatives de stratégie de marque et de commercialisation
   - Création d'un nouveau site Web
   - Développement d'outils promotionnels pour l'audiologie, y compris des affiches, des autocollants, des feuilles à colorier et des coussins personnalisés au nom de l'ACA pour les tests d'audition
   - Création de « fiches de renseignements » pour le public sur une multitude de sujets, par exemple l'acouphène

2. Besoin de communication accrue, ACA
   - Envoi mensuel d'un « message du président de l'ACA » par voie de bulletin électronique
   - Envoi régulier de publipostage électronique aux membres sur divers sujets pertinents, y compris sur les ACC, le CIPH, le logiciel de la classification nationale des professions, ainsi que l'envoi de multiples mises à jour en matière de frais et de financement
   - Augmentation du nombre de publications de notre magazine officiel *Canadian Hearing Report* de 4 à 6 publications par année
   - Ajout d'une page Facebook sur notre site Web permettant la communication, le réseautage et le mentorat parmi les membres

3. Besoin d'une meilleure collaboration et coopération avec les parties prenantes, ACA
   - Associations professionnelles
   - Organismes de réglementation et d'attribution de permis
   - Universités canadiennes
   - Gouvernement et tiers payant

4. Besoin d'une administration et d'une gestion des ressources rentables, ACA
   - Mise à jour et mise à niveau du manuel des procédures et des politiques de la commission et du personnel
   - Mise en place d'une équipe contractuelle pour œuvrer dans les domaines de la gestion de conférence, de l'administration, de la compatibilité, de la commercialisation et de la TI/site Web.
   - Développement planifié d'une augmentation progressive des frais, selon les résultats des enquêtes menées auprès des membres

5. Besoin de nouveaux avantages et services de qualité pour les membres, ACA
   - Possibilité accrue d'apprentissage, par exemple le 1er séminaire printanier annuel de l'ACA en 2010 à Richmond C.-B., et le prochain, qui sera à Moncton, N.-B., en avril 2011
   - Régimes d'assurances à prix exclusifs pour les membres de l'ACA, par exemple une assurance responsabilité, logement et véhicule, assurance-maladie complémentaire, bureau, vie, et soins dentaires
   - Publications gratuites, comme notre magazine *Canadian Hearing Report*
   - Réduction tarifaire pour la conférence de l'ACA, notre séminaire printanier sur l'audiologie, et inscription à la Société internationale de l'audiologie

- Services en ligne permettant à l'ACA de suivre les unités de formation continue; proposition de webinaires; enregistrement des présentations qui ont lieu lors des conférences et des séminaires; vente de ces enregistrements auprès des membres qui n'ont pas pu participer à ces événements.

À propos de la liste de « points à améliorer » de l'an dernier :

- Notre site Web avait besoin d'être complètement remanié et devait contenir un contenu nouveau afin d'atteindre nos objectifs, soit introduire des produits en ligne et augmenter le nombre de membres... et même s'il s'agit d'une étape en cours d'exécution, les objectifs sont atteints!
- Nous avions besoin d'améliorer l'accès et de favoriser le réseautage pour les membres à travers le Canada…et grâce à Facebook, c'est réussi!
- Les problèmes rencontrés dans notre nouveau système de gestion de base de données, surtout en matière de renouvellement des membres et des inscriptions aux conférences, devaient être réglés... et la plupart le sont!
- Nous avions également besoin d'un acheteur-média plus significatif et complet qu'avant pour nos fournisseurs/fabricants en intégrant des commandites de conférence, et des tables d'exposition, à partir des ventes de publicité dans le magazine et d'autres possibilités mutuellement favorables. Nous travaillons sur tous ces points, croyez-moi!

Une étape a été particulièrement motivante l'an dernier : la soumission réussie auprès de la Société internationale d'audiologie pour coprésenter le congrès d'octobre 2016 de la Société internationale d'audiologie, lequel aura lieu à Vancouver, C.-B., avec l'Association canadienne des orthophonistes et audiologistes (ACOA). Je tiens à souligner les efforts et l'aide de Tourism Vancouver lors de la soumission de notre candidature, et je remercie Zofia Wald-Mroz, membre de longue date de l'ACA et de l'ACOA, d'avoir présenté notre candidature au conseil d'administration de la Société internationale d'audiologie en mars dernier à San Paolo, Brésil.

Je m'en voudrais de ne pas souligner l'importante contribution des personnes suivantes :

Susan Knight, Kathryn Knight, Jeremy Avery et Jeff Tate de notre équipe de commercialisation
Denis St. Michel, Webmestre de l'ACA
Teresa Gamble, conseillère technique et soutien du site
Kim McFadden, adjointe à l'administration, ACA
John Kelley et Nick Tsiourlis, comptables, ACA
David Shaw et Megan Goddard, gestionnaires de conférence, ACA

De plus, je tiens à remercier sincèrement la présidente Carri Johnson et les autres membres du conseil d'administration de l'ACA pour leur soutien depuis mon arrivée, soit depuis près de 2 ans.

Merci de votre appui continu pour l'ACA que vous démontrez par votre grande participation à notre conférence annuelle et à notre salon professionnel. Erica Wong et Patty Van Hoof, nos coprésidentes de conférence, ainsi que tous les membres bénévoles accomplis de notre comité de planification, ont effectué la tâche remarquable de passer « de la parole aux actes », et méritent d'être applaudis pour leur travail ardu.

En dernier lieu, je suis heureux de bientôt rencontrer beaucoup de nos membres professionnels à travers le pays et de travailler avec eux, car il s'agit pour moi d'une grande occasion.

Cordialement,

Tom McFadden
Directeur général
Académie canadienne d'audiologie

No Deaf People at the Centre of the Earth?

By Marshall Chasin, AuD

Tim Bressmann, PhD, of the Graduate Department of Speech-Language Pathology at the University of Toronto recently pointed out this passage from Jules Verne's *Journey to the Centre Of The Earth*. This is from an exchange between the narrator and his uncle, Professor Von Hardwigg, in chapter 22, where they talk about the increase in atmospheric pressure in the depth[1]:

"I should fancy almost that I should experience a certain amount of satisfaction in making a plunge into this dense atmosphere. Have you taken note of how wonderfully sound is propagated?"

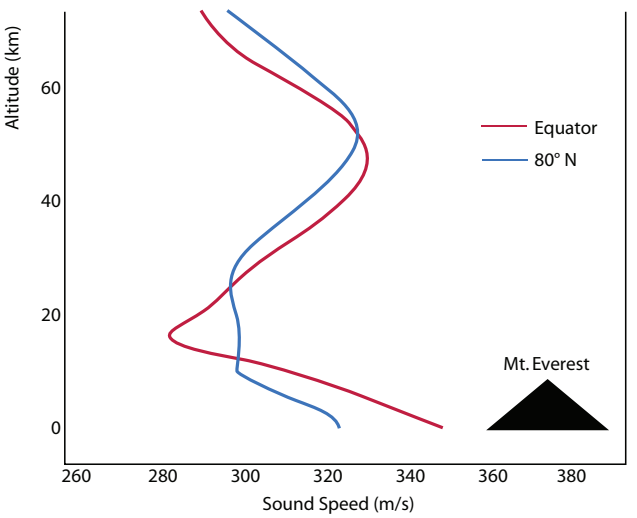
"Of course I have. There can be no doubt that a journey into the interior of the earth would be an excellent cure for deafness."

Despite having a wonderful name, was the professor correct? He has made the implicit assumption that since the speed of sound is related to the density of air, then the density should vary proportionately with depth (or conversely, with altitude). That is, the deeper (or higher) one goes the speed of sound (and therefore its intelligibility) changes uniformly – with higher altitudes having a slower speed than a lower one.

The figure the speed of sound (m/sec) at sea level and it varies between 322 m/sec and 344 m/sec depending on where on the surface of the earth you are. If you live on the equator then the speed of sound is faster (344 m/sec) than if you live near the North Pole (322 m/sec). This appears to decrease almost uniformly (but at different rates) until about 18 km above sea level where the speed of sound near the equator is now slower than for those more frigid speakers. However, above this, the speed increases again and by 50 km altitude it's very close to sea level. And only above this does it appear to slow down again until the atmosphere is very thin.

The same can probably be said for journeying to the centre of the earth by Professor Von Hardwigg. It may become denser but this may not be a uniform factor. It could be that an optimal location is 10 km below the surface but that 15 km below is worse, or the other way around. In short, Professor Von Hardwigg doesn't really know what he is talking about and there is some evidence that he probably flunked his speech science class. Perhaps he should have sat in on Professor Higgins' phonetics classes with Eliza Doolittle in *My Fair Lady*?

And of course the speed of sound only defines the formant frequencies, with the velocity term in the numerator of the equations. There are formant intensity sequalae for varying sound velocities but I would presume that had Jules Verne written a correct passage we would not have enjoyed his work as much.



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The Use of Long Range Acoustic Devices: Sonic Cannons

By Marshall Chasin, AuD, MSc, Reg. CASLPO, Aud(C), Doctor of Audiology,
Coordinator of Research, Canadian Hearing Society

Source report provided as part of a deposition to the Ontario Superior Court of Justice between the Corporation of the Canadian Civil Liberties Association et al. vs. Toronto Police Service and Ontario Provincial Police regarding Long Range Acoustic Devices (LRADs) also know as Sonic Cannons

Preamble which was not part of the initial report:

This report was intended for the lay individuals (lawyers, other interested parties, expert witnesses, and the judge) who would be responsible in a court of law in the determination of whether amplified sound should be used as a crowd dispersion tool during the G20 meeting in Toronto in June 2010. The information set out in this report is based on the physics of acoustics and no amount of engineering can be used to alter basic acoustical laws. For example, lower frequency sounds (around 250–500 Hz) which possess long wavelengths cannot be aimed. This has everything to do with the respective wavelengths and nothing to do with the technology of the amplifying device. In some cases, the data from the manufacturer was erroneous by its omission of data. For example, data concerning the beam width (presumably at the –3 dB point) was given as +/– 15 degrees. That is, the sound pressure level was down 3 dB at +/– 15 degrees off of the centre relative to the centre of the amplifying device. This was given at 3.5 kHz. This sounds quite impressive, however, it should be noted that this same amplified sound would have an effective beam width of almost 360 degrees for lower frequencies. The operator of this device would be at significant risk for hearing loss from the lower frequency components of his or her own voice.

On Friday June 25, 2010, the Ontario Superior Court of Justice ruled that these devices should not be used in their high frequency dispersion alarm mode, since they pose a real risk for hearing loss. The judge ruled that it could be used as a loudspeaker; however, despite the fact that the sound pressure levels at the officer's ear of their own voice could potentially create a hearing loss.

This has been published in *Canadian Hearing Report* both for its content as well as to demonstrate the type and level of deposition that our colleagues may make in the future if they ever choose to perform as an expert witness.

REPORT

Three Types of Sonic Cannons

Long Range Acoustic Devices or LRADs is a trade name of a common manufacturer of sonic cannons. From a number of manufacturers, these have had three incarnations over the years. The first implementation uses very low frequency sounds (essentially in the octave below the lowest note on a piano keyboard) that have a significant vibro-tactile, or "whole body" response. This has been well studied in the literature and can result in nausea, a feeling of fullness in the chest, and even heart fluctuations. The literature indicates that the sound level and dose is below that which may cause hearing loss and this is understandable given the human ear's poor sensitivity to very low frequency sound. However, very low frequency (also called subsonic or infrasonic) intense sound is not practical because low frequency sound is non-directional. This means that the user of the very low frequency sound cannon is as much subject to the deleterious effects of the sound as the person or people that the cannon is aimed at. Simply stated, very low frequency sound cannot be "aimed."

The second implementation of sonic cannons is to use them to emit sound

in the ultrasonic range (above the range of hearing of most healthy adults) and these intense, very high frequency sound sources are actually in wide spread use and is marketed under trade names such as the "Mosquito." They emit sounds that are above the hearing range of a typical adult but not above the range of a teenager with good hearing. Retailers at shopping malls and variety stores frequently use this to dissuade teenagers from hanging around the entrance to the store. The teenagers feeling discomfort move away while more mature consumers (with larger wallets) are not affected by this sound. They are also sold for use on vehicles in rural areas, in order to minimize the chances of a collision with moose and other large wildlife. Ultrasound has also been well studied in the literature and there is no known deleterious effect on hearing, and it is a rarely audible for most adults over the age of 25.

However, the third and most common implementation of a sound cannon, especially for crowd control and dispersion, is in the mid- to high-frequency region. These sounds are quite audible to a wide range of people of different ages and hearing abilities (essentially the right hand side of the piano keyboard). Unlike infrasound, this higher frequency intense sound is quite directional, and the directionality increases as a function of frequency. This makes such a high frequency sonic cannon a more effective choice for those who use it in the sense that the operator will receive a less intense level of the stimuli being emitted from the cannon. That is, the cannon can be aimed. However, these same intense frequencies can be damaging to the person or people "down wind" of the sonic cannon. At 1,000 Hz and above, sound tends to become quite directional, but at the same time, the sound pressure that reaches the human ear is more audible. (In the very low frequency region most of the sound energy hits the eardrum and bounces back, thereby not reaching the auditory system of the individual. This is not the case for the mid and higher frequency regions.)

If the sonic cannon hardware is to be used as a loudspeaker there is a very real risk of hearing loss for the operator because speech has significant low frequency sound energy (vowels and other sonorants) and the levels of his own voice may be extremely intense (because of the lack of directionality) at the level of his own ear. The operator should be cautioned to wear appropriate hearing protection and to limit the use of the sound cannon.

Hearing and Hearing Loss

The human ear is a complex organ that is made up of three distinct parts – the outer ear terminating at the eardrum, the middle ear (with the three tiny bones or ossicles), and the inner ear (made up of both the hearing sensory organ (cochlea) and the balance organ (the vestibular system). Intense sounds can rupture the eardrum that mediates sound from the outer to the middle ears. This is quite rare but depending on the nature and physical makeup of the intense sound wave this is possible. More common however would be damage to the cochlea and its associated structures.

The cochlea is roughly the size of the tip of your baby finger and is filled with two distinct types of fluid. Immersed in the fluid are 15,000 nerve endings, or hair cells, which transmit sound energy neurologically to the brain and also to receive feedback from the higher neurological structures. The chemistry of the cochlea is extremely complex and much of our hearing is accomplished based on microscopic flow of molecular ions such as potassium and sodium.[1] Intense noise can disrupt the chemistry leading to hair cell death by processes called necrosis and apoptosis. Hearing loss from both necrosis and apoptosis may not show up immediately and may not be realized until years later. Intense noise has also been shown to disrupt the mechanics of the cochlea and again, this disruption may not show up until years later.[3–5]

If a person were to be subjected to very intense noise, or even more moderate levels of noise (such as a dial tone) for a significant amount of time, permanent hearing loss would occur.

The tools that are used to assess hearing loss by an audiologist are admittedly blunt. The most ubiquitous of the measuring tools is called the audiogram. An audiogram is performed in a very quiet sound treated "audiometric room" and is a measure of the quietest sound that a person can hear across a wide range of test frequencies from about the middle of the piano keyboard (250 Hz) to an octave above the top note on the piano (8,000 Hz). Reductions in the sensitivity of hearing in the audiogram are termed "hearing loss." However, recent research indicates that by the time that a hearing loss is measured on an audiogram, a significant amount of cochlear damage has already occurred. Another clinical test that has been available since the late 1980s is called "otoacoustic emission testing" and this assesses the function of the cochlea (whereas the audiogram assesses the acuity). Reduced function of the cochlea typically shows up long before any loss is observed on the audiogram.[5]

Historically it was thought that once a person had been removed from a noisy location that had been implicated in hearing loss, such as a factory, there would be no more hearing loss associated with that prior environment. Indeed, many provincial worker's safety and insurance boards have that enshrined in their hearing loss prevention policies. However more recent research has indicated that hearing loss can continue to deteriorate due to the prior noise despite the fact that the individual is no longer exposed. Kujawa and Liberman state that "Data suggest that pathologic … change sinitiated by early noise exposure render the inner ears significantly more vulnerable to aging."[3] This has also been shown in the central auditory system where inhibitory changes in the dorsal cochlear nucleus decreased neural function in older experimental mice as a result of previous exposure when the mice were younger.[6] The cochlea, once subjected to a significant amount of noise or other ototoxic mechanism, is damaged and despite the fact that we do not yet fully understand the cochlear pathology of hearing loss from noise, it is known that the long term effects of noise do not cease upon removal from the noise source.

The important corollary is that if a person is subjected to an intense, potentially traumatic noise source and no hearing loss is measured initially on an audiogram, it does not follow that hearing loss resulting from this traumatic noise source will not rear its ugly head in years to come. Kujawa and Liberman state "Results suggest that noise-induced damage to the ear has progressive consequences that are considerably more widespread than are revealed by conventional threshold testing. This primary neurodegeneration should add to difficulties hearing in noisy environments, and could contribute to tinnitus, hyper-acusis, and other perceptual anomalies commonly associated with inner ear damage."[4]

It is clear from the recent animal studies that significant noise exposure while young, may have significant cochlear and central auditory ramifications when older despite being exposed only when younger. Use of sonic cannons, as well as being in the proximity of other very intense noise sources can have a deleterious effect on the long term hearing status of exposed individuals. This potentially includes both the operator of the sonic cannon as well as those whom the noise is aimed towards.

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Educating Our Patients – And Ourselves about the New No-Mercury-Added Batteries

By Gary Friedman

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About the Author

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In late 2009, I learned that I belonged to a group of hearing health care professionals who had absolutely no idea that zinc-air batteries had approximately 1% mercury in them. I have been working in our industry since 1980, when battery packages read "mercury batteries." When zinc-air batteries became available, I mistakenly assumed they contained no mercury. But, since discovering my ignorance in this matter, I have begun to see advertisements in our professional journals for "mercury-free batteries."

That inspired me to take an online continuing education course from one of the battery manufacturers. I also made phone calls to hearing aid companies and battery manufacturers.

Now, with the goal of sharing some of my experiences with my colleagues so as to assist them in the transition to these batteries, I have prepared the following summary of what I've been doing with my patients in terms of batter education.

PREPARING TO TRANSITION

Battery manufacturers have published literature stating that no mercury will be added to batteries after June 2011. That gives us nearly one more year to learn how these "mercury-free batteries" work in hearing aids. Actually, the term "mercury-free batteries' is a misnomer, as there are traces of mercury eve in hearing aid batteries to which no mercury is added.

Phone conversations with representatives of both hearing aid and battery manufacturers revealed one serious question or problem: The mercury-free batteries may be causing the low-battery warning in hearing aids to be tripped far early than necessary.
Further conversations with representatives of both battery suppliers and hearing aid manufacturers revealed that size 10 batteries in high-end digital hearing instruments were the most likely to cause false low-battery warnings to occur.

A representative of one batter manufacturer explained that the power levels used are different from those used with batteries containing mercury, and a voltage drop can cause a false warning. I was unable to get solid answers as to how often the warning might be tripped.

Naturally, I became concerned about potential complaints from hearing aid users. When I discovered that some local pharmacies were advertising mercury-free batteries, I knew it was time to provide patient education. Accordingly, I decided to speak with hearing aid wearers about this transition.

Initially, I chose a few patients to serve as sources of feedback on their new mercury-free batteries. |But now I'm

inviting all my hearing aid patients to contact me about their experience with these batteries.

From December 2009 through February 2010, the first 3 months in which I asked patients to report their experiences with the new batteries, I confessed to them that I had no idea that there was mercury in zinc-air batteries. For some reason, starting out with this admission of ignorance seemed to spur interest in my patients, perhaps because they like it when the "professional" admits to not knowing it all.

Then I laid out the discussion to come by telling them I would explain the changes and offer practical solutions. The first suggestion was for the hearing aid user not to toss dead zinc-air batteries into the garbage in order to keep them out of the landfills. Many of our patients are environmentally conscious.

The average time I spent on my battery counseling was 4 to 5 minutes per patient. I shared the following with them:

1. The manufacturers say the mercury-free batteries will have the same battery life as the older types.
2. The retail cost of mercury-free batteries should be only slightly more than what you have been paying for batteries with mercury.
3. Batteries with mercury will not be manufactured after June 2011.
4. The low-battery warning may falsely go off after only a day or two of use in a hearing aid.
5. We can consider removing the low-battery warning from hearing aids altogether, especially since many patients become aware that a battery is used up and needs replacing when the hearing aid stops working properly. However, patients with milder hearing losses may not always realize when their hearing aid has quit working and so may want to keep the low-battery warning.
6. Some hearing aids may issue a false early warning and others may not with the mercury-free batteries. In other words, we're all going to be on a learning curve for a while.

Dispensers and battery manufacturers alike are extremely interested in how patients perceive the performance of the mercury-free batteries. We all want feedback to improve the transition.

PATIENT RESPONSES

Many of my patients asked to by the mercury-free batteries to test them out. As a result, I've received numerous phone calls, but not one patient reported that the low-battery warning had come on mistakenly. That is encouraging. Maybe this is not really a problem.

But if it is a problem, it is one we will all need solved as soon as possible. It's not much of a stretch to anticipate irritated patients walking into our offices and expecting free packs of batteries because they threw out new ones after 2 days.

Almost every patient who replied seemed genuinely interested and appreciative of this educational experience in my office. Change is threatening to some of our patients, but I feel that encouraging them to share their battery experiences helps them feel less threatened and, in a sense, part of the "research team."

I think it is also important for us to share information with battery manufacturers and hearing aid companies as we learn more about this important shift in battery technology.

GLOSSARY OF HEARING AID BATTERY TERMS

Gassing: Gassing is a phenomenon that occurs during the electrolytic process that would otherwise corrode the battery.

Mercury-oxide: Also known as a mercuric-oxide battery. Due to the content of mercury, and the resulting environmental concerns, the sale of mercury batteries is banned in many countries. Both ANSI and IEC have withdrawn standards for mercury batteries. Mercury batteries were made in button types for watches, hearing aids, and calculators, and in larger forms for other applications.

NEMA (National Electrical Manufacturers Association): The organization that countered a legislated mercury ban on button cell batteries with a proposed date of June 30, 2011 for companies to voluntarily remove the substance.

Silver-oxide: Also know as silver-zinc batteries, silver-oxide batteries have a long life and very high energy/weight ration, but a prohibitive cost for most applications due to the high price of silver.

Zinc-air: These are electrochemical batteries powered by the oxidation of zinc with oxygen from the air. These batteries have high energy densities and are relatively inexpensive to produce. They are used in hearing aids and in experimental electric vehicles.

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Bisgaard N, Vlaming M, and Dahlquist M. Standard Audiograms for the IEC 60118-15 Measurement Procedure. *Trends in Amplification* 2010:14(2)113–120.

By Marshall Chasin, AuD, MSc, Reg. CASLPO

This issue of "Spotlight on Science" is a review of an excellent article in *Trends in Amplification* which discusses a new approach – the use of "standard audiograms" and the reporting of hearing instrument specification data which may more closely and correctly represent the function of advanced hearing aid features.

The development of "standard audiograms" is a European-led approach to improve the ability of hearing aid test standards to assess the types of processing found in more modern hearing aids. In North America, the ANSI S3.22 (2003) hearing aid standard is in use, and in Europe, the IEC 60118-0 (1983) standard is in use. There are many similarities and differences between the two standards but both were initially implemented based on older hearing aid technology and are not capable of assessing the function of many of the newer hearing aid innovations. Many hearing aid manufacturers have a special "test program" which essentially disables many of the functions such that consistent (but not necessarily valid) results can be obtained.

Since 2004, the European Hearing Instrument Manufacturers Association (EHIMA) has been working on a speech-based measurement standard and work was carried out by a working group called "International Standards for Measuring Advanced Digital Hearing Aids" or ISMADHA, for those who like acronyms. The idea is that the hearing aid can be set using the manufacturer's own software with the features enabled, using either the patient's own audiogram or using a "standard audiogram" chosen by the manufacturer.

Historically the first approach, suggested by the Nordic Cooperation on Disability (NSH), used five "standard audiograms" for the following sensori-neural hearing losses: mild, moderate, severe, profound, and a precipitous sloping loss. Early research, however, indicated that these five standard audiograms only covered about a quarter (26%) of 15,000 audiograms that were in a database. Subsequently a larger number of "standard audiograms" were constructed in hopes of being better able to cover the wide range of those who require amplification.

TEN STANDARD AUDIOGRAMS

Ten standard audiograms were derived and these included seven that had a flat or moderately sloping configuration and ranged from near normal hearing (N1) to a profound loss (N7). Specifically there were N1: very mild; N2: Mild; N3: Moderate; N4: Moderately-severe; N5: Severe; N6: Severe to Profound; and N7: Profound. In addition, there were three "sloping" standard audiograms (S1, S2, and S3). These three sloping audiograms had slopes ranging from 30-40 dB/octave in their steepest area and differed by the degree of loss with S1 being the most mild and S3 being the most significant.

If one frequency is allowed outside of the standard audiogram by ±10 dB, then these 10 audiograms would account for 46% of the hearing losses found in large data bases. This is an improvement over the 26% with only five standard audiograms.

The intention of this 10 standard audiogram approach would be to have the manufacturer select an audiogram that is within the standard operating

range of a particular hearing instrument and then choose two adjacent audiograms that may represent the limits of function for that particular hearing aid. For example, if the hearing aid is question was a non-occluding behind the ear type, then audiogram N2 could be selected but also N1 and N3 could also be used to assess the "limits" of the fitting range. In addition, one of the sloping audiograms would also be selected such as S2. An advantage of this approach would be to restrict the number of audiograms that could be selected in order to avoid an unrealistic "optimized" set of results that could be published on a specification sheet.

Finally, if a particular hearing instrument was not intended for one of the 10 standardized audiograms, another audiogram could be selected but this would have to be specifically stated on the specification sheet.

To date, this approach has not yet been adopted, but this is expected to become the standard both in Europe and North America in the not too distant future.

FROM THE CLASSROOM

Critical Review: Do Elderly Hearing Aid Users Perform Better on Speech Recognition in Noise Tests when Fitted Monaurally or Binaurally?

By Ashley Blay, MCISc (AUD) Candidate, University of Western Ontario: School of Communication Sciences and Disorders

Binaural listening is known to improve speech understanding, sound localization, quality and ease of listening. Improvements are a result of binaural summation, redundancy, squelch, and head diffraction effects. Thus, bilateral hearing aid fitting has been an accepted clinical practice for patients with hearing loss. However, some individuals may not benefit from bilateral hearing aid fittings. These patients may experience binaural interference. Binaural interference occurs when conflicting information presented to the two ears my cause aided binaural performance to be worse than aided monaural performance. The objective of this critical review is to examine if elderly hearing aid users perform better on speech recognition in noise tasks when fitted with amplification monaurally or binaurally.

Results of a computerized database search as well as relevant reference list search yielded the following study designs: two within group (repeated measures) studies and three single subject "n-of-1" studies. All of the reviewed studies compared monaural and binaural aided performance on speech recognition in noise tests for adult patients with bilateral, symmetrical hearing loss. Within group studies by Walden and Walden[1] and Henkin et al.[2] provided a high level of evidence, which showed that the majority of patients in both studies performed better on speech recognition in background noise tests while using unilateral amplification to

the better ear compared to bilateral amplification. This suggests binaural interference occurred. Interestingly, both studies also reported many patients had better performance with the poorer unilateral aided ear condition than binaurally aided condition. Single subject studies by Carter et al.,[3] Chmiel et al.,[4] and Jerger et al.[5] also provided examples of similar results indicating better performance on speech in noise tasks when monaurally aided as opposed to bilaterally suggesting binaural interference.

All three single subject studies must be interpreted with caution because they represent individuals who experience better speech understanding in noise when monaurally aided but do not represent the entire population of elderly patients with hearing impairments. Research by Walden et al.[1] and Henkin et al.[2] provided larger sample size studies that showed similar significant results of binaural interference during speech recognition in noise. Further studies with larger samples sizes may be conducted to determine better generalizability of this phenomenon. Future research may aim to determine at what age binaural interference has a significant effect on speech understanding in noise in the hearing impaired population. Research may also be directed to determine what percentage of different age populations experience binaural interference and possible causes of binaural interference.

Overall, the research suggests that a subgroup of patients with hearing loss may understand speech in noise better when using one hearing aid as opposed to two. This may be a result of binaural interference and is clinically relevant in order to provide appropriate amplification strategies for such patients. Across studies, results were either correlated with age or reported from single cases of older listeners, indicating that older patients may be more likely to have binaural interference. The exact likelihood per age is not yet known. Similar results were found by Henkin et al.[2] who used Hebrew word lists and non-English speaking patients, as all other studies reviewed which used North American, English speaking patients. Similar results were also found across different speech recognition in noise tests that were reviewed indicating that this phenomenon can occur across different languages, places and different speech recognition in noise tests. Thus, results may generalize well to real world situations. The cause of such binaural interference is still unknown, however. Therefore, there is no way of determining which patients will experience problems with binaural amplification when listening in noise before they are prescribed amplification. These results suggest that patients with binaural amplification may find it helpful to only wear one hearing aid when they have difficulty listening in noisy environments with two hearing aids. Further evaluation of different amplification strategies by Carter et al.[3] revealed that certain programs may be more helpful for an individual than others. In clinical practice this would require the clinician and patient to experiment with different strategies to determine which is most helpful for speech understanding in noise. Carter et al.[3] also examined speech recognition in noise with FM systems and found this to be the only successful binaural amplification strategy. Improved SNR offered by the FM system may eliminate interference from the poorer ear. Thus, FM system may be a necessary strategy for patients who experience binaural interference when listening in noisy environments. This evidence may also be beneficial for patients who reject their hearing aids in noisy environments. Speech recognition testing in noise comparing monaural and binaural amplification conditions may be beneficial to perform in clinical practice for patients who are having difficulty with amplification in noise. These tests may help the clinician determine whether the patient is experiencing binaural interference and if different amplification strategies should be employed such as monaural amplification in noisy listening environments or the use of FM systems.

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The ABC's of School Services for Children with Auditory Disorders in Ontario

By Pamela Millett, PhD, Reg. CASLPO and Debbie Ross, MA, Reg. CASLPO

About the Authors

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Yoshinaga-Itano once noted that universal newborn hearing screening "begins as a part of the medical/health system but outcome is dependent upon the educational system."[1] Collaborations between clinics and classrooms are crucial to ensure that a student's learning potential is maximized. However, as audiology has its own alphabet soup of terminology with terms such as RECD (Real-Ear-to-Coupler Difference), DPOAE (Distortion Product Otoacoustic Emissions), and ABR (Auditory Brainstem Response), so does education with IPRC (Identification Placement and Review Committee), SIP (Special Incidence Portion), and SEA (Specialized Equipment Amount) for example; and this sometimes creating obstacles to good communication between systems. This article will describe types of school services available for students with hearing loss and other auditory disorders in Ontario, how students qualify for services, what types of audiological information are most useful for school staff, and suggest ways to facilitate communication between clinic and classroom.

WHAT SERVICES ARE AVAILABLE FOR STUDENTS WITH HEARING LOSS?

While some services and models of service delivery in today's schools have remained relatively the same over the years, others have undergone significant changes both in philosophical underpinnings and in administration. Twenty years ago, congregated or self-contained classes were probably the most common placement for those with severe to profound hearing loss; today, many school boards offer no congregated classes for students with any type of learning exceptionality. While 20 years ago, it was the case that many teachers of the deaf and hard of hearing (TDHH) worked in congregated classes or provincial schools for the deaf, the majority of TDHH today work as itinerant teachers, supporting students in their home schools across the school board. This philosophical shift towards full inclusion of students with all disabilities is reflected in Regulation 181, enacted in 1998, requiring that the first consideration regarding placement for student with special needs be placement in a regular class with appropriate supports, when such placement meets the student's needs and is in accordance with parents' wishes.[2] The Ontario Ministry of Education commitment to a philosophy of full inclusion is clearly seen in the policy document "Education for All: The Report of the Expert Panel on Literacy and Numeracy Instruction for Students with Special Education Needs, Kindergarten to Grade 6," available on the Ontario Ministry of Education website, and well worth reading for its practical strategies and tips for both parents and educators.[3]

When describing services available to students, it is important to distinguish between educational placement (i.e., where the student is physically located) and support services (i.e., which people and types of technology are provided to the student). Educational placements can range from complete integration in a student's home school, to most of the school day spent with a regular classroom and some time in a special hearing resource centre, to a congregated class with little or no integration into a

classroom with hearing peers. The Ontario Ministry of Education describes six types of placements for students with exceptionalities:

- **Regular class with indirect support** where the student is placed in a regular class for the entire day, and the TDHH provides consultative services.
- **A regular class with resource assistance** where the student is placed in a regular class for most or all of the day and receives specialized instruction, individually or in a small group, within the regular classroom from a qualified special education teacher.
- **A regular class with withdrawal assistance** where the student is placed in a regular class and receives instruction outside the classroom, for less than 50% of the school day, from a qualified special education teacher.
- **A special education class with partial integration** where the student is placed by in a special education class for at least 50% of the school day, but is integrated with a regular class for at least one instructional period daily.
- **A full-time special education class** for the entire school day.
- **Full-time placement** in a provincial school.

In a general sense, educational placement is related to the level of support required; typically, a student who requires minimal support will be fully integrated and one who requires a high level of support will be less integrated. However, if (as is increasingly common), there are no congregated classes for students who are deaf and hard of hearing in a particular school board, it is possible for a student who requires a very high level of support to be integrated most of the time because there are no choices for a specialized placement. It is important to realize that, given that hearing loss is the second lowest incidence disability in the education system in Ontario (slightly higher than blind/low vision), it is not always possible for a school board to offer every type of educational placement in a student's community or indeed, sometimes not within the board as a whole.

Congregated class placements for students with hearing loss can take the form that many of us are more familiar with, that of a small class of similar aged students with hearing loss taught by a TDHH, often with one or more educational assistants. However, increasingly more common is the model of the hearing resource room, which might be thought of as a kind of "home room" for students of various ages, grade levels, and degrees of hearing loss. Hearing resource rooms (sometimes referred to as hearing centres or hearing resource centres) are not available in all schools, but can be created in a school where such a model makes sense based on a number of students with hearing loss within transportation distance. The school housing the hearing resource centre becomes the home school for students from other geographical regions of the city. The hearing resource centre, then, does not function as a traditional congregated class, but it does provide a much higher level of support than the student would receive in his/her home school (where he/she may be the only student with hearing loss).

Support services describe people and technology available to students with hearing loss, and are related, although not always directly tied to, class placement. The highest level of support available is for students requiring the equivalent of more than two full-time support staff. This highest level of support (termed the special incidence portion) requires formal identification of the student through a formal process mandated by Identification, Placement and Review Committees (IPRC), and is applicable to a very small number of students with hearing loss. Special education services for the majority of students with special needs are funded through money allocated to each school board by the Ministry of Education which is not student specific. The exception to this model is funding for assistive technology, which is accessed through the Specialized Equipment Amount grant for students based on individual needs (described in more detail below under funding for FM systems).

Previously in Ontario, there has been a prerequisite with respect to degree of hearing loss and percentage of the school day taught by a TDHH, to formally qualify for direct teaching support services. This is no longer the case, however, and services by a TDHH are determined according to individual student needs by the school board. This could include direct teaching or tutoring by a TDHH on a regular weekly basis, occasional monitoring a few times a year, or any service level in between. Many students who do not require direct teaching are still supported by a TDHH as a "monitor" student. This level of services ensures that a TDHH will monitor the student's progress on a regular basis, in-service school staff about hearing loss, monitor and check classroom amplification and provide strategies and information but not provide any direct assessment or teaching.

Many students who require some type of classroom amplification, but are otherwise doing well, receive support from a TDHH only for technology. For example, a student with a unilateral hearing loss, chronic otitis media, or auditory processing disorder may have a personal FM system or sound field amplification system in his/her classroom, and a TDHH would be responsible for evaluating the need for a system, ordering and often setting up the system, in servicing classroom teachers and monitoring/ troubleshooting the equipment for the remainder of the school year. However, this level of monitor service would not include educational assessment, direct teaching,

withdrawal, or tutoring.

It should be noted, however, that the information provided in the article with reference to eligibility for, and provision of, any supports, services, programs and assistive technology refers to students in the public school system (public or Catholic), and not to private schools, which fall outside of the mandate of the Ministry of Education.

HOW DO STUDENTS WITH HEARING LOSS QUALIFY FOR SUPPORT SERVICES?

Where intensive support services are required, the determination regarding this level of service is made by an Identification, Placement and Review Committee (IPRC). Prior to calling an IPRC meeting, the student's needs, goals, and strategies must be identified. By law, when a student is formally identified under the IPRC process, an Individual Education Plan (IEP) must be developed, and all documentation of the student's educational needs must be available. Development of the IEP is done in consultation with the parents or guardians, and parents/guardians also attend the IPRC and consent to the recommendations. The document "The Individual Education Plan: A Resource Guide," published by, and available on, the Ontario Ministry of Education website describes the components and development of an IEP, including a sample template.[4] It is important to note that most school boards in Ontario do not use the sample template provided by the Ministry of Education but have developed their own; however, much the same information is included.

Building collaborative relationships between parents and school staff is always a primary goal; however, a formal appeals process is available where disagreements arise regarding placement or programming recommendations.

In most school boards, the majority of students with hearing loss receive support services without being formally identified through the IPRC process. In many schools, IEPs are completed, and services provided even if a student has not been formally identified with a learning exceptionality through the IPRC process. In this case, the IEP serves as a way to identify and document accommodations that will be helpful for the student. A scenario where a child has an IEP, but has not been formally identified, is commonly seen for students who need accommodations to their program to assist with learning, but otherwise use and are evaluated on, the same curriculum and course content as the other students in the classroom.

One of the criteria that differentiates the level of support services required by, and available to, students, is the concept of the need for accommodated versus modified programs. The difference between *accommodations* and *modifications* is an important one in education, and must be clearly differentiated in an IEP. Accommodations are the simplest changes – these include strategies such as preferential seating, use of a laptop for tests, use of an FM system, etc. If a student's IEP contains only accommodations, he/she is receiving the same educational program as the other students in the class, with the addition of helpful strategies or technology. Modifications to a student's program mean that the content of the curriculum has been changed to a certain extent. This might mean alternate tests or assignments; for example, a student in grade 6 who is working at a grade 3 reading level with grade 3 reading materials.

There is a third type of change, an *alternate curriculum*, which is simply a curriculum which is different from what is specified in the Ontario curriculum. A simple example of this might be a program for speech articulation. For some students, such as those in a Life Skills program for students with developmental delays, the entire curriculum may be designated as alternate. An IEP for a student who is functioning at grade level in mathematics, significantly below grade level in reading, and also receives speech therapy for articulation errors, then, might list accommodations for mathematics, modifications to the reading curriculum, and an alternate curriculum for speech articulation (since speech articulation is not a standard part of the Ontario education curriculum for all students).

Information is also specified in the IEP regarding accommodations and exemptions for large scale provincial testing, commonly known as EQAO (Education Quality and Accountability Office) testing. This province-wide, standardized testing is administered to students in grades 3 and 6 for reading, writing, and mathematics; in grade 9 for mathematics; and in grade 10 for literacy. The ministry document "Guide for Accommodations, Special Provisions and Exemptions" provides guidelines for determining where accommodations or exemptions may be appropriate, or are allowed, for province wide testing.[5]

WHAT SERVICES ARE AVAILABLE FOR STUDENTS WITH AUDITORY NEUROPATHY SPECTRUM DISORDER?

Auditory Neuropathy Spectrum Disorder (ANSD) has not been defined or included separately in the categories of exceptionalities by the Ministry of Education; however, in practice, students with ANSD are typically seen by TDHH for the same services as for students with conductive or sensor-ineural hearing loss. If the pure tone audiogram shows no hearing loss (as is the case for some students with ANSD), provision of services by a TDHH is discussed by the hearing department on an individual basis.

WHAT SERVICES ARE AVAILABLE FOR STUDENTS WITH AUDITORY PROCESSING DISORDERS?

Auditory processing disorders are not included in any category of exceptionality by the Ministry of

Education, and therefore no funding is available for direct education support services. An identification of an auditory processing disorder does not qualify a student for additional support services other than those available at the individual school level for any student experiencing difficulty. General special education services may include assessment, tutoring and monitoring by the school special education teacher, often referred to as the SERT (Special Education Resource Teacher). These services are available based on students needs, however, not as a result of an identification of auditory processing disorder. Eligibility for assistive technology such as FM systems falls under the criteria outlined below for Specialized Equipment Amount funding.

WHAT IF I SEE A NEWLY IDENTIFIED STUDENT AND AM NOT SURE WHAT SUPPORTS OR SERVICES ARE AVAILABLE OR NEEDED?

Writing a letter or sending a report to the hearing department of the school board will typically ensure that a TDHH can begin the process of conducting a consultation to determine what services or technology would be helpful, with parent/caregiver consent. For example, a student with recurrent otitis media and associated hearing loss will not qualify for direct service from a TDHH; however, the TDHH can explain the effects of the hearing loss for school staff, suggest teaching strategies, consider classroom amplification, and monitor the student's progress as needed.

HOW CAN I SUPPORT PARENTS AND STUDENTS AS A CLINICAL AUDIOLOGIST?

The information and language in a clinical audiological report is often unfamiliar to school staff, so recommendations in a report will be most likely to be implemented if they are clear and written in layman's terms. School staff may contact the hearing department of the school board for assistance, but do not necessarily always do so. However, if the report is sent (or cc'd) to the hearing department, with parent/caregiver consent, it will be reviewed and appropriate action initiated (such as a documented follow-up phone call to the school). Parents/guardians can sometimes be reluctant to allow audiological reports to be shared with school staff, and of course, parent/guardian wishes must always be respected; however, it is important for parents to know that school staff are best enabled to provide the best educational program when they are kept informed, and when collaborative relationships are present.

If the report is for a student who is already receiving services from the Hearing Department, the report will be provided to the student's TDHH. The TDHH will then review the report, go over any new information in the report with school staff, and ensure that a copy is placed in the Ontario Student Record (OSR). If the report is for a newly identified student, typically a TDHH will contact the school to follow-up. This follow-up may include a school visit, meeting with school staff, completion of observation checklists by the classroom teacher(s), meeting with parents or students, direct observation or assessment of the student and review of the OSR.

The OSR is a file kept for every student in the province which contains material such as report cards, assessment results, and IEPs. Your audiological report sent to the school will be filed in the student's OSR; however, ensuring that your report is also sent to the hearing department (again, with parent/guardian consent), or addressed to a specific person at the school, will ensure that it is reviewed and appropriate action taken before filing.

HOW DOES A STUDENT QUALIFY FOR PURCHASE OF AN FM SYSTEM IN ONTARIO?

The Specialized Equipment Amount (SEA) grant provides funding for any assistive technology required for learning in the classroom for any student in the public school system which costs more than $800. Students do not need to be identified under the IPRC process, nor do they need to have a hearing loss; however, they do need a formal recommendation for the technology based on an assessment from an appropriately qualified professional, as well as the existence of an IEP. The purpose of the funding is to "provide students with accommodations that are directly required and essential to access the Ontario curriculum," and school boards have discretion over accepting private assessments."[6] However, while the funding procedure for technology such as FM systems may be relatively straightforward, the questions of who will determine the need for an FM system; who will determine the most appropriate make, model, and accessories for that student's ongoing and changing learning needs; who will fit and verify the FM system; who will in-service staff and students; who will be responsible for ongoing troubleshooting and repair; and who will monitor use of the equipment on an ongoing basis require much care, consideration, and thought.

WHERE CAN I FIND MORE INFORMATION ABOUT EDUCATION PROGRAMS AND SERVICES IN ONTARIO?

The Ministry of Education publishes a large number of documents for teachers, administrators, and parents on many topics related to special education. One of the most important recent publications referred to previously is "Education for All," which includes a clear description of the terminology used in special education, comprehensive information about a variety of types of assistive technology, and a vast array of practical and comprehensive teaching and learning strategies.

As audiologists, we frequently work with children and families who are new immigrants to Canada or for whom English is not the first language, and face

these challenges in addition to the challenges of hearing loss. Three recent documents provide useful information for teachers and parents. *English Language Learners / ESL and ELD Programs and Services: Policies and Procedures for Ontario Elementary and Secondary Schools, Kindergarten to Grade 12* outlines programs and services available to students at all grade levels.[7] The documents *Supporting English Language Learners: A Practical Guide for Ontario Educators Grades 1 to 8*,[8] and *Supporting English Language Learners with Limited Prior Schooling*[9] provide info-rmation and strategies for working with students and families, particularly for students who may have received limited or no formal education prior to coming to Ontario.

Of course, developing the most effective and appropriate education plan for students with special needs can be complicated and sometimes disagreements may arise. The ministry document *Shared Solutions - A Guide to Preventing and Resolving Conflicts Regarding Programs and Services for Students with Special Education Needs*, outlines the roles and responsibilities of all of the stakeholders in educational programs, and describes both potential sources of conflict, and strategies for resolution.[10] The section on the Ontario Ministry of Education website entitled "Resolving Identification or Placement Issues: Procedures for Parents/Guardians" describes the legal process which is followed when there is disagreement among stakeholders

WHAT CAN WE DO TO HELP STUDENTS WITH AUDITORY DISORDERS?

1. **Communication and collaboration**. The most important and effective action we can take is to ensure good communication and collaboration between parents, clinicians and school staff. For example, when new hearing aids are being considered, good communication will ensure that the new hearing aids have been programmed appropriately for the FM system being used at school and that the appropriate new audio shoes have been purchased by the school board, so that the school FM system is ready for use on the first day that the child arrives with new aids. Good communication and collaboration ensure that parents have a clear understanding of the services and programs being provided at the school level and are able to describe these accurately to the student's clinical audiologist, so that appropriate clinical recommendations can be made and realistically implemented.
2. **Advocacy for educational audiology services.** There are currently only a very small number of educational audiologists working in school boards in Ontario (and indeed, across Canada), an even smaller number of whom are employed full time by school boards. Given the increasing complexity of hearing technology, the move towards full mainstreaming (and its concomitant academic and listening demands) and the changing nature of the population of students who are deaf and hard of hearing, educational audiologists play a crucial role for students with auditory disorders. However, the unique role of the educational audiologist is often misunderstood by educators and administrators, who often comment that if teachers of the deaf and hard of hearing are employed, there is no need for an educational audiologist. Support to advocate for audiologists in schools from other audiologists and speech-language pathologists would help achieve our goal of providing the best possible services for children with auditory disorders and their families.

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Bad Assumptions about Hearing Protection

By Brad K. Witt, MA, CCC-A

About the Author

Brad Witt is the director of hearing conservation at Sperian Hearing Protection in San Diego, CA. He has a BS in communication disorders from Brigham Young University, and an MA in audiology from Northwestern University. For 14 years, he managed a hearing conservation practice in California, providing OSHA-standard services at 175 locations. He has served as president of the National Hearing Conservation Association (NHCA), and in his present position, manages the acoustical Laboratory at Howard Leight, and provides training to professional groups in all aspects of hearing conservation. His 150+ hearing conservation seminars in behalf of Sperian Hearing Protection the past three years have been presented in 15 countries. He can be contacted at: bwitt@sperianprotection.com.

Any good proof is based upon assumptions: if the assumptions are good, the proof is valid. If the assumptions are bad, then the proof is worthless, or as writer Angelo Donghia puts it, "Assumption is the mother of screw-up."[1]

In the world of personal protective equipment, bad assumptions are hazardous and often injurious. Unfortunately, despite 25 years of solid regulation, some persistent bad assumptions are very widespread in Hearing Conservation Programs (HCPs). Here are six of the most common bad assumptions about hearing protection for noise-exposed workers. Perpetuated unchecked, these assumptions torpedo an otherwise healthy Hearing Conservation Program, and leave the door open for hearing loss among workers exposed to hazardous noise.

ASSUMPTION 1: HEARING PROTECTION IS SELF-EXPLANATORY

Assuming that proper use of hearing protection is fairly intuitive ("just put it in your ear..."), many safety managers provide little or no training in how to use protection properly. Or they generously assume that workers will read the manufacturer's instructions on the packaging.

A comprehensive study of HCPs in United Kingdom revealed that when hearing conservation training had been provided by posters or leaflets, less than half of the "trained" workers could recall the content.[2] But repeated studies show that the most effective use of hearing protection comes after one-on-one training. Large group training in hearing protection seems to have little effect in proper usage; only individual training can be linked to high attenuation results.

For proper fit of earplugs, the fitting steps are not complicated. A simple three step process conveys the essence of a proper fit for foam earplugs: Roll, Pull, Hold. *Roll* down a foam earplug into a small crease-free cylinder, *pull* the outer ear up and back to open the ear canal, insert the earplug, and *hold* in place while it expands.

For proper fit of earmuffs, move aside any thick hair, and seat the earmuff so that it encloses the entire ear. Avoid safety glasses with thick temple bars at the frames. For safety eyewear or prescription glasses with a thin frame (a width of 2 mm or less at the temples where the earmuff cushion meets the frame), eyewear causes no significant decline in attenuation. But safety eyewear with wider frames causes noticeable gaps in the cushion seal, resulting in a loss of attenuation of 5–10 dB in some cases. (For additional information, see "Earmuffs & Safety

The ideal hearing protector should not block all sound but rather reduce hazardous noise levels while still allowing a worker to hear the sounds that are critical to the job.

Eyewear," a technical bulletin posted on the Howard Leight website).[3]

User-friendly instructions showing how to properly wear and care for hearing protectors are found in free training materials available from the Howard Leight website (www.howardleight.com). "How to fit" posters and a down-loadable PowerPoint presentation can be useful supplements in your own hearing conservation training.

ASSUMPTION 2: ANY EARPLUG IN THE EAR IS BLOCKING SOME NOISE

It simply isn't true. An earplug just sitting in the bowl of the outer ear, without sealing the ear canal, is simply nice ear decor – but it is offering little protection from noise. In fact, attenuation measurements show that a poorly fit earplug often creates a resonance cavity in the ear canal, actually increasing the noise level by a few decibels (similar to cupping your hand around your ear to hear better). This is problematic for a safety manager who is trying to judge compliance visually. He/she might assume that any earplug that can be seen in a worker's ear must be doing some good, and focus more on the workers who are wearing no protection at all. In reality, a poorly-fit earplug offers no protection, just like the worker with no earplug.

Here is one visual cue of a proper earplug fit: when viewing yourself in a mirror straight ahead (or when looking at a co-worker face-to-face), a poorly-fit earplug is clearly visible protruding from the ear canal, while a properly-fit earplug is hardly visible.

For the user, a good self-test of proper fit of earplugs is easily performed. Prior to inserting your earplugs, press the palms of your hands tightly against your ears, and say some words out loud. Your own voice sounds louder and deeper when your ears are covered. Now insert your earplugs, and repeat that voice check. If the earplugs are properly fit, there will be very little difference in the sound of your voice when you cover and uncover your ears with your hands.

ASSUMPTION 3: AN EARPLUG HALFWAY IN THE EAR BLOCKS ABOUT HALF THE NOISE

It seems plausible that if a well-fit earplug blocks 30 dB of noise, then a half-fit earplug must block 15 dB of noise. Unfortunately, the math of hearing protection does not work that way. Instead, a half-fit earplug is often providing 0 dB of attenuation.

Workers in noise levels of 85–95 dB (close to the OSHA Permissible Exposure Limit of 90 dB time-weighted average) are routinely offered earplugs with Noise Reduction Ratings of 30 dB or more. When worn properly, that 30 dB hearing protector can make the worker feel isolated – unable to hear warning signals, co-workers, machine maintenance sounds, or communication radios.

To hear critical sounds, workers will sometimes remove their earplugs about halfway, assuming they are still adequately protected. But in noise attenuation, any small channel or leak allows the noise to enter, and the protection quickly deteriorates from "all" to "none." How do we protect a worker who does not need 30 dB of protection? Use hearing protectors with lower Noise Reduction Ratings (NRR). When used properly, a lower-attenuating earplug will provide protection without sacrificing communication ability.

In a series of research studies designed to find out why workers do not use their earplugs more consistently, NIOSH[4] reports that the predominant reasons are inability to communicate ("I can't hear my co-workers talking to me"), and interference with job performance ("I can't hear the maintenance sounds from my machine, or warning signals"). The ideal hearing protector should not block all sound (overprotection), but rather reduce hazardous noise levels while still allowing a worker to hear the sounds that are critical to the job: co-workers, warning signals, and equipment maintenance sounds.

While there is no magic valve in hearing protectors that lets "good" sound in and keeps "bad" sound out, there are some hearing protectors that

are more speech-friendly than others. These "uniform attenuation" hearing protectors attenuate all frequencies fairly equally, meaning speech and warning signals will sound more natural, rather than inaudible or distorted. Many users of uniform attenuation earplugs, for example, report they can still hear what they need to hear for their job performance.

ASSUMPTION 4: CUT THE NRR IN HALF TO PREDICT REAL-WORLD PROTECTION

Since the EPA promulgated its Noise Reduction Rating (NRR) on all hearing protector packaging since 1974, many studies have shown that attenuation achieved in the real-world is sometimes far below the laboratory NRR. There are a number of good reasons for this difference: users in the real world might not receive proper training, or might adjust their hearing protectors for comfort rather than protection, or they may intentionally compromise the fit in order to hear co-workers and machine noises more clearly.

A 50% de-rating method, defined by OSHA to determine feasibility of engineering controls, is often mis-applied to try to predict real-world protection for workers in a hearing conservation program. Such de-rating is arbitrary and usually wrong!

Using a fit-testing system for earplugs, we visited eight industrial sites and measured real-world attenuation of 100 workers using earplugs from a variety of manufacturers. Workers were instructed to fit their earplugs just the same as they usually do. A Personal Attenuation Rating (PAR) was then measured on each ear. The PAR results showed that one-third of the workers achieved attenuation slightly higher than the published NRR, one-third of workers showed attenuation within 5 dB below the published NRR, and about one-third showed significantly lower attenuation (anywhere from 0 to 25 dB).

Recognizing this disparity between real-world and laboratory results, the EPA has announced its intention to update the NRR in the near future. Instead of a single-number attenuation rating (31 dB, for example), the new NRR label will likely show a two-number range of measured attenuation for a given earplug (18–29 dB, for example). The lower number indicates the expected attenuation for groups of workers with little or no training, while the higher number represents the expected attenuation for groups of workers with some individual training in hearing protector fitting.

Most experts agree that the new NRR range will provide a more realistic indicator to safety managers of how hearing protectors operate in the real world, but the new NRR still will not predict exactly how much protection an individual workers achieves. That would require individual fit testing, described below.

ASSUMPTION 5: THERE'S NO WAY TO MEASURE REAL ATTENUATION ON A WORKER WEARING EARPLUGS

There definitely are several methods of measuring real-world attenuation on workers wearing earplugs.[5] Instead of relying upon the population estimates of the NRR, a safety manager can now measure each worker's protection level. While each method of fit-testing has its own merits, one of the most popular methods is called VeriPRO. And as the name implies, it *verifies the protection* achieved by a worker wearing earplugs.

In the VeriPRO method, employees are given a special hearing test without

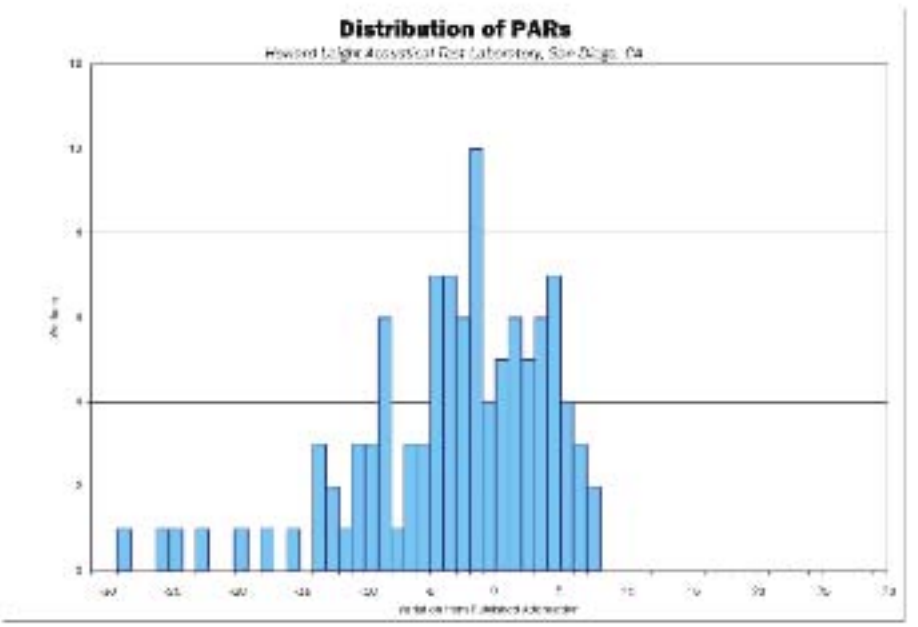

Figure 1. Distribution of Personal Attenuation Ratings

Instead of relying upon the population estimates of the NRR, a safety manager can now measure each worker's Personal Attenuation Rating (PAR).

their earplugs, and then repeat the test while wearing their right earplug, followed by their left earplug. The difference in the results of these three special hearing tests is a measurement of how much protection is being offered by the earplugs, *just as they were fit by the worker*. VeriPRO works with any earplug from any manufacturer, and a quiet test booth is not required to administer the test (it can be administered in a lunchroom or office).

Some workers in the hearing conservation program may achieve a poor fit with the earplugs they are using. In these cases, there are two good options to improve protection: (1) VeriPRO offers short training videos showing the proper fitting techniques for nearly every style of earplug. Workers typically show an immediate improvement in attenuation when they are retested after watching the short training video. (2) Perhaps a different earplug should be tried. In a field study of real-world fit, many workers received 20–30 decibels more protection simply by trying a different earplug.[6]

Using a fit-test method like VeriPRO to verify attenuation, a safety manager can document exactly how much protection a worker receives with a given earplug. The result is a Personal Attenuation Rating (PAR). But that PAR is specific only to that earplug, that worker, and that particular fit. Fit-testing might not be feasible for some employers to administer on every noise-exposed worker in the facility, but it is certainly feasible for new hires, or workers demonstrating a significant threshold shift in their audiometric testing. OSHA regulations require these workers to be retrained and refit with appropriate hearing protection, and the fit-test systems available now allow employers to accomplish that very effectively.

ASSUMPTION 6: THERE'S NO WAY TO MEASURE THE NOISE DOSE OF A WORKER UNDER THE HEARING PROTECTORS THROUGHOUT THEIR WORKDAY

Ideally, the best way to know if a worker is protected from hazardous noise is to take a noise dosimetry measurement *under* the hearing protectors – that is, place a microphone at the eardrum. This concept of in-ear dosimetry is now available in a product called QuietDose.

Noise dosimetry is typically measured by clipping a microphone on the collar of a noise-exposed worker. The dosimeter samples the noise levels throughout the day, and accurately gives a reading at end of shift showing the noise dose of the worker for that day. A dose over 100% exceeds OSHA's Permissible Exposure Limit of 90 dB for 8 hours, while a noise dose of 50% is defined by OSHA to be the Action Level at which hearing conservation measures are implemented. But such ambient dosimetry measurements tell us nothing about the noise level reaching the eardrum under the hearing protectors.

QuietDose uses dual miniature microphones, each inserted under the earplug or earmuff, to measure the noise dose at the eardrum. If a worker has a proper fit of the hearing protectors, the noise dose will be safe – under 50% for the workshift. But if the worker has an inadequate fit, or removes the protectors repeatedly in high noise, the resulting noise dose at the end of the workshift will be excessive. This immediate feedback gives the worker (and safety manager) the critical information to make immediate corrections. In a typical hearing conservation program, it takes

several years of audiometric testing to ascertain whether a worker has lost hearing due to workplace noise. But using in-ear dosimetry, any worker can know immediately and precisely whether hazardous noise levels are reaching the eardrum. And if we can stop the noise exposure at the eardrum, we have stopped the hearing loss.

Bad assumptions sink many well-intentioned safety initiatives. But avoiding these simple bad assumptions about hearing protection helps a hearing conservation program stay on solid ground, and do just what it is designed to do: prevent noise-induced hearing loss.

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Answer to Audiology Time Machine

The top man on the very far left is Neil Walton who is a regional rep with Bernafon Canada in Vancouver; to his left is Monica Pozer who is chief audiologist with Island Hearing Services in Victoria. The man lying across the middle is the late Harold Janzen; and the fellow with the beard and blue shirt at the bottom right is CHR's own editor-in-chief Marshall Chasin.

Hearing Protection Devices: Out With the NRR and In With a Double Rating?

By Alberto Behar, PEng, CIH

About the Author

Alberto Behar, PEng, CIH, is with the Institute of Biomaterials and Biomedical Engineering, University of Toronto.

QUESTION: WHICH CHARACTERISTICS OF A HEARING PROTECTOR ARE THE MOST IMPORTANT?

There are two: comfort and attenuation. The first is obvious: the more comfortable a protector is, the more likely it is to be worn. Unfortunately, at present there is no standard for its measurement. Attenuation is the difference between the sound level outside and inside the ear. The higher it is, the better protected the ear since the sound level reaching the tympanic membrane is lower.

QUESTION: WHY DO WE MEASURE THE ATTENUATION OF A HEARING PROTECTOR DEVICE (HPD)?

Answer: To calculate the noise level of the protected ear (i.e., the effective level the ear is exposed to once the HPD is in place). For all practical purposes, if we know the noise level of the environment the person is in, and if this level exceeds the safety limits, we would like to reduce this level by providing him with a HPD that can reduce the level to below this limit, so we need to have a measure of this attenuation.

That is what the Noise Reduction Rating or NRR was supposed to tell us. The NRR is obtained by calculations, using results from attenuation measurements performed in a laboratory setting, using trained subjects and following the procedures in the ANSI S.19-1974 Standard.[1] It does offer a very easy method for the calculation: (a) Measure the noise level in dBC; (b) Subtract the NRR of the HPD; (c) The result is the sound level of the protected ear in dBA. If you couldn't measure the noise in dBC, but in dBA, you had simply to add 7 dB to the above mentioned difference.

For example, if the ambient noise level is 100 dBC, and if the acceptable limit is 85 dBA, then you would have to look for a HPD with an NRR of 100 – 85 = 15 dB or greater. And if you measured your noise in dBA and it is 98, then the NRR will be 98-85+7 = 20 dB.

Unfortunately, numerous studies had shown that the results using the NRR and the above calculation were overly optimistic and did not match the real-life situations at all. That was the reason for OSHA to recommend a de-rating of 50% of the NRR. NIOSH, for its part, recommended a selective de-rating: 25% for muffs, 50% for formable earplugs, and 70% for all other plugs. Further studies have shown that there is no firm ground for recommending any de-rating schemes.[2]

The problem was not really the NRR measurement per se, but the way measurements of the attenuation were performed. This is the reason why, as a result of multiple studies, a new method ("B") was developed and included in the current ANSI standard.[3] It requires "naïve" subjects that have no previous

experience in using HPDs Also, they do not get assistance from the technician in charge of the test. The subjects have to fit the HPDs following the instructions on the package. This situation is much more in line with the way users behave. Therefore, the results of the measurements are closer to those obtained in real-life situations.

However, even having a reliable method for the measurement, there was still the need for guidance on how to use the results of the measurement.

Here is what is new in that respect:
ANSI has just issued a new standard, the ANSI S12.68-2007.[4] Produced by the Working Group 11 of the Accredited Standard Committee S12 (Noise), this is the first ANSI Standard that provides a method for the calculation of the noise level of the protected ear.

The really revolutionary concept in this standard is the introduction of a double rating for the same HPD indicating two levels of attenuation that can be obtained by different groups of users.

It is a well-known fact that different individuals obtain different attenuation using the same HPD. This is due mainly to the quality of the fit they can achieve: better fit results in an improved seal between the HPD and the ear of the user and consequently in a higher attenuation. The fit is a combined effect of several causes such as an easier donning process, training and motivation of the user, paying attention when donning, etc. It has been proven that real-life attenuation is higher in workplaces with an effective hearing conservation program, where users are constantly motivated and trained. On the other hand, in places where HPDs are just handed out without proper training and motivation, the observed attenuations are significantly lower.

One draw-back of the today's NRR (obtained either using Method "A" or "B") is that it does not show explicitly the variation of the attenuation among individual users. This is not exactly true: the standard deviation among the results is used for the calculation of the NRR. The larger the variation, smaller is the NRR. However, by only knowing the NRR one does not know separately the attenuation and the standard deviation.

That is when the idea of using a dual rating came into place. As per the new ANSI S12.68-2007 standard, the attenuation and standard deviation data from measurements performed using either Method "A" or "B" are used to calculate the so called Noise Level Reduction Statistics (NRS) – an estimate that is similar to the NRR.

There are two NRSs: NRS_A and NRS_G. They are obtained using two different calculation procedures (analytical and graphical) one more complex than the other, that they yield similar results. The user does not have to calculate them: this is done by the manufacturer who will have them printed on the package (in the same way as the NRR is printed now).

Each of the NRSs can be calculated for a different percentage of the protected population, and this percentage appears as a subscript of the NRS. As an example, the NRS calculated for the 20th percentile of the population (this indicates that 20% of the population will achieve or exceed the $NRS_{A,20}$ value. $NRS_{A,80}$, will be met or exceeded by 80% of the protected population) using the analytical method is indicated as $NRS_{A,20}$. This is the attenuation that will be achieved or exceeded by highly motivated and trained individuals.

On the other hand, the NRS calculated for the 80th percentile of the population using the graphic method is indicated as $NRS_{G,80}$. This will be the protection achieved or exceeded by most users. The 20th percentile value will always be higher than the 80th percentile one. The main advantages of the "two-numbers approach" are that:

1. It shows the range of attenuation to be obtained by different users,
2. It diverts the attention of the buyer from the tendency to purchase the HPD with the highest NRR value,
3. It uses the ambient noise level measured in dBA for the calculation of the noise level of the protected ear, instead of the dBC as with the NRR,
4. It draws attention to the possibility of over-protection (the danger of too much protection that makes them uncomfortable and hampers the ability to hear danger or warning signal).

USE OF THE NRS

The effective A-weighted sound pressure level L'_{Ax} of the protected ear (for protection performance x percent) is computed as:
$L'_{Ax} = L_A - NRS_{Ax}$,
Where L_A is the time-weighted average noise level (in dBA) the person is exposed to.
As an example, if L_A at a given location is 95dBA, and the values of the HPD are NRS_{A80} = 19 dB and NRS_{A20} = 27, then the sound level in dBA of the protected ear will be L'_{A80} = 95 – 19 = 76 dBA (for most users), and L'_{A20} = 95 – 27 = 68 dBA (for few motivated proficient users).

Right now the EPA is in the process of

revising its hearing protector device-labelling rule. It is expected that this revision will be done within one year and starting in 2011, there may already be HPDs with the two values of NRS on their packaging.

IMPACT OF THE DOUBLE RATING IN CANADA

The Canadian standard that deals with hearing protectors is the CSA Z94.2-02.[5] The standard specifies that the measurement of the attenuation should be done following the ANSI standard S12.6-1997 (R2002) referred to above. It also specifies three different ways for the selection of the HPDs, using the results of the attenuation measurements. They are:

1. **Classes A, B and C.** Its use is recommended for $L_{EX, 8\,hr}$ of < 105 dBA, =<95 dBA and =< 90 dBA respectively. Basically, the user has to measure the $L_{EX, 8\,hr}$ in the workplace and then choose the HPD on the basis of its Class, that is printed on the protector's case.
2. **SNR(SF_{84}) Grades 1 through 4**. The name stands for Single Number Rating, Subject Fit 84th Percentile. Its use is recommended for $L_{EX, 8\,hr}$ of < 105 dBA, =< 100 dBA, =<95 dBA and =< 90 dBA for the Grades 1. 2, 3, and 4 respectively.
3. **Octave Band Computation.** This is a straightforward calculation, subtracting the attenuation values from the octave band values of the ambient noise level.

The above classifications methods didn't gain much popularity for two reasons: (1) The only information available to users remained the NRR, since its use is compulsory in the USA- the country with the largest market, and (2) The potential users are more familiar with the NRR.

If and when EPA institutes the dual rating NRS system, manufacturers will have to label their products accordingly. Canadian users will have to be informed about the meaning and the usage of this system, since only the NRS values will be available to them.

At that time (or even before) most likely the Canadian standard CSA Z94.2 will be revised accordingly and the new classification will be included in the text. Another avenue will be the adoption of the ANSI S12.68-2007, something that may simplify the entire process. In any event, parts of CSA Z94.2 that contain important information regarding the care and use of the protectors should be updated and kept because of practical implications.

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Editor's note: An earlier version of this article appeared in Volume 3, Issue 2 of Canadian Hearing Report. With the impending decision by the Environmental Protection Agency (EPA) in the United States to request a new hearing protection labelling standard this updated article is quite timely (Please see page 45 of this issue for more information).

Comments to Comments…

By Alberto Behar, PEng, CIH

The USA Occupational Safety and Health Administration has initiated a public input process to revise and update the 29 CFR 1910.95, "Occupational noise exposure," hearing conservation amendment, published some 30 years ago.

The National Hearing Conservation Association (NHCA), a vibrant association dedicated to the prevention of hearing loss due to noise in all sects of the society, in the person of their president (presently past-president) Dr. Richard Neitzel has taken the gauntlet and presented a list of 6 topics where OSHA should take an action.

The present article is to comment on NHCA's comments from the Canadian perspective (Comments in shaded paragraphs). It should be noted, that in Canada, contrary to the USA, occupational health and safety is mandated by provincial legislations, with the exception of railroads and air traffic that are federal issues.

SCOPE OF PROBLEM AS PER THE NHCA

By Richard Neitzel, PhD, CIH, President HHCA

Despite the passage of OSHA's hearing conservation amendment nearly 30 years ago, high noise exposures continue to occur in US workplaces. Noise is one of the most common occupational exposures in the US; in 2009, the US National Institute for Occupational Safety and Health (NIOSH) estimated that approximately 22 million US workers were exposed to hazardous levels of noise. Noise-induced hearing loss (NIHL), a completely, 100% preventable disease, is among the top US occupational illnesses, affecting about 10 million Americans. According to the US Bureau of Labor Statistics (BLS), NIHL had the highest incidence of any occupational illness among manufacturing workers in 2008. Noise exposure also has effects beyond NIHL, including impaired performance and increased risk of accidents, and has also been linked to stress, hypertension, ischemic heart disease, and other diseases. Unfortunately, despite the high prevalence of noise exposures, the high incidence of NIHL, and the potential health and productivity-related effects of workplace noise, little OSHA enforcement activity has taken place in recent years. For example, in 2008, less than 2% of citations issued in high noise industries were for excessive noise exposure.

With very few differences, the above paragraph applies to our Canadian reality. NIHL is also the most prevalent occupational hazard, one that many people talk about but do very little to prevent it. Not to mention the other indirect effects of excessive exposure, such as increasing risk of accidents, reduced productivity, and other stress-related consequences.

ACTIONS OSHA SHOULD TAKE

Below are 6 actions that OSHA should take to better protect the hearing health of American workers.

(1) Withdraw the 1983 administrative policy allowing hearing protectors in lieu of engineering controls for full-shift exposures <100 dBA. OSHA should start enforcing the original language of the noise exposure regulation; that is, that are engineering controls needed for full-shift exposures > 90 dBA. The 1983 policy is baseless, and represents a major change instituted outside of public notice and comment rules. The legality of this administrative policy is highly questionable.

Use of hearing protector devices (HPD) in lieu of engineering noise controls should not be accepted at all. Granted, there are situations where controls are not feasible, but the decision on what to do should not be taken before a study could demonstrate that the only way of reducing the exposure is by using the HPD. But even in those cases it is a well known fact that HPDs are effective only when issued as a part of a hearing conservation program

(2) Issue a proposed hearing conservation regulation for construction workers, who are not effectively covered by the existing construction noise exposure regulation (29 CFR 1926.52). This rulemaking process was begun in 2004, but progress appears to have ceased. OSHA should restart the process and issue a proposed regulation based on the recently-passed ANSI/ASSE consensus standard, A10.46-2007, "Hearing Loss Prevention in Construction and Demolition Workers."

We don't have this problem, since the existing legislation regarding occupational noise exposure does not make difference between different occupations.

(3) Begin the rulemaking process for workers in high noise industries not covered by any noise regulation. Workers in the agriculture, oil and gas drilling and servicing, shipbuilding, and services industries are currently not covered by any noise exposure regulation, despite the documented potential for high noise exposure in each of these industries.

As above, in theory a worker is a worker and as such he has to be protected. However, it is a fact that the "conventional" occupational activities (such as those in the industry are better monitored as for instance agricultural workers).

(4) Begin the rulemaking process to revise the Permissible Exposure Limit (PEL) to 85 dBA and the Exchange Rate (ER) to 3 dB. The existing OSHA noise exposure regulation is not in line with current scientific evidence, and needs to be updated to include a lower PEL and a more protective 3 dB ER, which will better account for variable and impulse/impact noise exposures. If a simultaneous update of the PEL and ER is too complicated, OSHA should alter the ER first, as this change will have a larger effect on workers' exposures.

The issue of the 3 dB exchange rate has been resolved in all Canadian provinces with the exception of Quebec, and the Northwest Territories where they still cling to the antediluvian 5 dB. 85 dBA PEL is adopted across Canada, with the exception of the Province of Quebec where the PEL 90 dBA is still in use.

(5) Continue to support stakeholders via alliances, outreach activities, and enhanced Internet resources. The NHCA-NIOSH-OSHA Alliance has been highly effective, and has already produced a best practices document and a toolbox training program. OSHA should increase the resources available on its website, and, in particular, use the website to broadly disseminate information on noise reduction strategies to both OSHA compliance/consultation officers (who often lack training in this area) and to the public.

Although this is a clearly USA issue, we Canadians benefit greatly from the advances achieved by NIOSH as well as from the information available from the three institutions: NHCA, NIOSH and OSHA.

(6) Make changes to 1910.95 appendices. OSHA should immediately make changes to the non-mandatory 1910.95 appendices. Specifically, OSHA should add a new non-mandatory appendix J recommending an 85 dBA/3 dB exposure limit until the PEL is revised, and should update the age tables in non-mandatory appendix F to use current National Health and Nutrition Examination Survey (NHANES) data and to go beyond age

60. Mandatory appendix B on hearing protector attenuation methods will also need to be updated to reflect impending changes by the US Environmental Protection Agency (EPA).

Finally, current ANSI standards should be referenced in the appendices and throughout the regulation.

Again, this is a recommendation specific to the American legislation. However the bottom-line is universal: (a) Make the 85 dBA/3 dB mandatory and (b)Reference all current H&S standard in the legislation.

Summary
The old saying states that "nothing is new under the sun." In our case, we should say that few problems (and solutions) are specific to a particular country. Most of the problems and solutions presented by the NHCA could easily be applied to Canada's provincial and federal legislation. That makes them actual and universal.

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