Journal of
The Association of Hearing Instrument Practitioners of Ontario

Signal

Winter/2013 • Edition 96

The Link between Diabetes and Hearing Loss

Musical Ear Syndrome Part II

Publication Mail Agreement #40612637

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The Association of Hearing Instrument Practitioners of Ontario

Gateway Plaza, 55 Mary Street West, Suite 211,
Lindsay, ON K9V 5Z6
Tel: 705-328-0907 | Toll Free: 1-888-745-2447
Fax: 705-878-4110 | www.helpmehear.ca

Editor-in-Chief
Lisa Simmonds Taylor

Contributing Writers
Donald F. Austin, Neil Bauman, Stephen A. Fausti,
Susan Griest, Daniel McDermott, Garnett P. McMillan,
Dawn Konrad-Martin, John Niekraszewicz, Vivienne Saba Gesa,
Lisa Simmonds Taylor, Joanne Sproule

Editorial Advisory
Vivienne Saba-Gesa
Joanne Sproule

Managing Editor
Scott Bryant

Art Director/Design
Andrea Brierley
abrierley@allegrahamilton.com

Circulation Coordinator
Brenda Robinson
brobinson@andrewjohnpublishing.com

Accounting
Susan McClung

Group Publisher
John D. Birkby
jbirkby@andrewjohnpublishing.com

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The mission of the Association of Hearing Instrument Practitioners of Ontario is to represent and guide its members in their practice which include, the testing, selecting and fitting, and dispensing hearing instruments and associated devices in the best interest of the hard of hearing, and may include the removal of cerumen from the external ear canal. Membership is available to hearing instrument practitioners or to those who have an interest in the hearing instrument profession.

Signal is the official journal of AHIP, the professional association of Hearing Instrument Practitioners of Ontario, incorporated in 1988 for the purpose of ensuring quality care for the hard of hearing. *Signal* presents technical and trade information to assist hearing instrument practitioners to better serve the hard of hearing.

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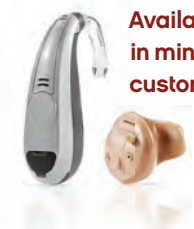

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The Association of Hearing Instrument Practitioners of Ontario
Gateway Plaza, 55 Mary Street West,
Suite 211, Lindsay, ON K9V 5Z6
T: 705.328.0907 • TF: 1.888.745.2447
F: 705.878.4110 • office@ahip.ca
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To My Fellow Colleagues:

Another year has come and gone and I would like to wish you and your families all the best health, happiness and success in 2013.

By now you would have received a membership e-mail detailing AHIP's efforts on your behalf in 2012. AHIP has always been committed to professionally representing you at all times. Our relations with the Ontario government, VAC, WSIB, CASLPO, and others has always been and will always be to represent you and the profession in a respectful yet persistent manner.

Let us not forget how we came to be where we are today. Years of dedicated, passionate and committed voluntary board of directors who have paved the way for our future. They fought to educate and change the unchangeable! Never giving up their mission to represent our profession in the eyes of ALL! United they stood and united they succeeded. Never forget who you are!

A highly qualified, educated, loyal, caring, dedicated, committed, and passionate hearing instrument specialist who has been providing professional services to the hard of hearing in Ontario every day for decades and for many more decades to come!

Speaking of decades, AHIP's Annual Symposium is fast approaching! The past, present and future of our profession unite to attend educational seminars learning about the newest in technology and most important, to attend the Annual General Meeting! You asked, we listened! This year's Symposium will be slightly different; no seminars on Saturday and more on Wednesday, a Job Fair and a change in the way we present at the AGM! I'm So Excited!!! Trust me; you are going to appreciate the changes!

Speaking of changes, AHIP has embarked on a different approach to our marketing/public relations initiatives to better promote and serve you! Recently, in November 2012 we attended the Canadian Family Medicine Forum in Toronto at which over 3000 family physicians were in attendance. Representing hearing instrument specialists, AHIP was ready, highly respected and welcomed by all! Using our new Educational Marketing tool (created by AHIP) family physicians embraced our presence and appreciated the information provided to them for their patients. As members of AHIP, you too can utilize this new marketing tool for your patients and physicians in your community to promote your expertise.

We are hearing instrument specialists! We strive to improve the quality of life for our patient's every day! Be proud of who you are and the gifts you posses! I am proud to be the president of such a wonderful group of professionals! I'm looking forward to seeing you all at Symposium in May 2013.

Vivienne Saba-Gesa, H.I.S.
AHIP President

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Dear Members,

I hope all have had a great holiday and are looking forward to a happy and prosperous New Year! At this time of year a substantial amount of administrative time is spent on year end membership activities for those who wish to maintain AHIP membership in good standing.

What does it mean to maintain AHIP membership in good standing?

1. Pay annual membership dues.
2. Ensure the required annual continuing education hours are achieved.
3. (New) Provide proof of liability insurance.
4. Hold no outstanding grievances.

What does maintaining AHIP membership in good standing do?

Maintaining AHIP membership in good standing allows you to do the following:

- Ensure the public that you have met all educational and continuing education requirements of the profession; abide by your Code of Professional Conduct and adhere to quality, established Standards of Practice.
- Ensure the public that any complaint will be heard by a formal complaints process.
- Function under the Assistive Devices Program.
- Provide services to all government and third party insurers by confirmation of AHIP membership in good standing.
- Have a strong and united voice in all government and private relations with respect to regulation, policy and fees.
- Help ensure strong and effective formal education now and for generations to come.
- Benefit from united public relation efforts which include the AHIP website, Signal, marketing campaigns and material, public and professional education.
- Ensure, for your protection, that you have sufficient professional liability insurance.
- Have access to group insurance plans and other programs.

With your continued membership support and dedication to our profession the Hard of Hearing of Ontario will continue to be professionally served now and in the future.

Respectfully Submitted,

Joanne Sproule
Executive Director

Greetings Members,

Some of the goodies you will find within, Symposium 2013 news and registration form. Check it out, the schedule has changed and they have added a job fair. AHIP hosted a booth at the 2012 Family Medicine Forum in Toronto and we were a hit! Our booth design was one of the top three and the counselling tool we distributed was accepted with great interest. We have included the materials that were distributed. If you are interested in getting your hands on this material contact the AHIP office regarding availability and cost. AHIP plans to continue to develop materials and attend conferences in order to raise awareness within the medical community of the importance of treating hearing loss.

"Did You Hear" topics include cricket ears and genetic links to hearing loss. John Niekraszewicz is back with his financial advice column. The articles included for your continued learning pleasure are Musical Ear Syndrome Part II and the relationship between diabetes and hearing loss.

Happy reading and all the best for 2013!

Lisa Simmonds Taylor, BA, H.I.S.
AHIP Secretary, Editor-in-Chief

Researchers See Cricket Ears As Model for Better Hearing Aids

Though we have known for a long time that the cricket's *auditory system* is complex, scientists have never quite understood the inner connections of that system. A new discovery by researchers at the University of Bristol and the University of Lincoln reveals that cricket ears, while physically structured differently, actually function extremely similar to human ears. What's even more exciting, is that scholars expect this new information to lead to technological advancement in the medical field, especially pertaining to assisted hearing devices.

In the new study, published in the November 16 issue of the US journal *Science*, researchers reveal the discovery of a microscopic organ that acts as a "middle ear" for the crickets.

The cricket version "relies on a system of mechanical levers, a sort of microscopic see-saw formed by its eardrum that makes the link to the inner ear," the researchers explained in a statement.

"The ears of this bush cricket are teaching us that complex hearing mechanisms can take place in very small ears. As such we are learning how evolution has come up with very small, efficient and sophisticated microphones," said Daniel Robert of University of Bristol in England, one of the study's lead authors.

James Windmill, from the Centre for Ultrasonic Engineering in the University of Strathclyde, also in England, explained that the insect mechanisms could perhaps be incorporated into a variety of technologies to help humans, "including hearing aids, biomedical imaging systems for hospitals, and ultrasonic non-destructive evaluation to assess the structural integrity of buildings and bridges."

Robert says that we can learn to replicate these miniature microphones that nature has designed. By closely studying the tiny cricket ear mechanisms, bio-engineers may be able to dramatically improve hearing aids, medical imaging, and many other technologies in the near future.

Researchers Identify Genetic Cause for Type of Deafness

By Mika Ono

A team led by scientists from The Scripps Research Institute has discovered a genetic cause of progressive hearing loss. The findings will help scientists better understand the nature of age-related decline in hearing and may lead to new therapies to prevent or treat the condition. The findings were published in an online issue of the *American Journal of Human Genetics*, a publication of Cell Press.

"It is thought that mutations in several hundred genes can lead to deafness," said team leader Ulrich Mueller, a professor in the Department of Cell Biology and member of the Skaggs Institute for Chemical Biology at Scripps Research. "However, for many forms of deafness, we don't know what effects the genes have. In this new research, we have linked a previously uncharacterized gene to deafness, first in mice and then in humans."

The team found that the gene responsible for the hearing loss—called *Loxhd1*—is necessary for maintaining proper functioning hair cells in the inner ear. Mutations in *Loxhd1* lead to degradation of the hair cells and a disruption of the process that enables hearing.

Tracking Down a New Gene

In the new study, members of the Mueller lab used a technique called forward genetics in their quest to better understand the genetic basis of hearing and hearing loss.

In forward genetics, scientists make mutations at random in germ cells, screen the resulting models for physical characteristics of interest (in this case hearing impairment), then amplify these traits through the breeding of several generations. The gene responsible for the trait is then identified through positional cloning.

In this case, the scientists were able to generate a new mouse line with hearing impairment that they called *samba* and then clone the gene responsible, *Loxhd1*, which had never before been associated with deficits in hearing. When the mice inherited two copies of the mutated gene, they were profoundly deaf shortly after birth.

The scientists' next task was to determine why.

Normally, "hair cells" or stereocilia in the inner ear respond to fluid motion or fluid pressure changes caused by sound waves that enter the outer ear, travel down the ear canal into the middle ear, then strike the eardrum, which vibrates and moves a set of delicate bones that communicate with the inner ear. There, the movement of the stereocilia transmits signals to sensory neurons, sending signals to the brain and eventually resulting in hearing

The scientists found that mutations in the *Loxhd1* gene did not appear to affect the initial development of the stereocilia. However, these mutations did impair the function and maintenance of these essential structures, eventually leading to their degradation and to hearing loss.

But one essential question remained—was there a parallel gene in humans that also caused hearing impairment?

To find out, the Mueller lab reached out to

Professor Richard J. H. Smith, the Sterba Hearing Research Professor at Carver College of Medicine, Iowa State University. Smith had been spearheading an effort to collect DNA samples from deaf families for years, and had hundreds of groups of samples in which to search for *Loxhd1*. Indeed, when the analysis was completed, the team found that mutations in the *Loxhd1* gene were present in some of these families with hearing loss.

Clues to Age-Related Deafness

This is the third hearing-related gene that the Mueller lab has discovered, and one he is particularly excited about.

"In humans, the prevailing difficulty is progressive hearing loss," he said. "As you age, you lose your hearing slowly. Since this mutation can lead to progressive hearing loss, it provides us with more information on the genetic underpinnings of this condition and gives us clues as to how it might be corrected."

Mueller's lab is currently investigating the possibility that a therapeutic drug could be effective in reversing the molecular problems that result from the defective gene.

The first authors of the paper, "*Mutations in LOXHD1"*, an evolutionarily conserved stereociliary protein, disrupt hair cell function in mice and cause progressive hearing loss in humans," are Nicolas Grillet and Martin Schwander of Scripps Research.

In addition to Mueller, Smith, Grillet, and Schwander, authors of the paper include: Michael S. Hildebrand of the University of Iowa City; Anna Sczaniecka, Anand Kolatkar, and Peter Kuhn of Scripps Research; Janice Velasco of the Translational Genomics Research Institute; Jennifer A. Webster, Kimia Kahrizi, and Hossein Najmabadi of the University of Social Welfare and Rehabilitation, Iran; William J. Kimberling of the Boys Town National Research Hospital; Dietrich Stephan of the Genome Institute of the Novartis Research Foundation, Arizona Alzheimer's Consortium and Banner Alzheimer's Institute; Melanie Bahlo of The Walter and Eliza Hall Institute of Medical Research, Australia; and Tim Wiltshire and Lisa M. Tarantino of the University of North Carolina, Chapel Hill.

For more information,
see http://www.cell.com/AJHG/abstract/S0002-9297(09)00336-X.
http://www.scripps.edu/newsandviews/e_20090914/mueller.html
Pa

Pain Relievers Increase Hearing Loss Risk

Researchers have found that women who took ibuprofen or acetaminophen two or more days per week had an increased risk of hearing loss. There was no association between aspirin use and hearing loss.

Headache? Back pain? At the first sign of pain, you might reach for a pain-relieving medicine to sooth your bodily woes. Analgesics are the most frequently employed medications in the United States and are commonly used to treat a variety of medical conditions. But although popping a pill may make the pain go away, it may also do some damage to your ears.

According to a study by researchers at Harvard-affiliated Brigham and Women's Hospital (BWH), women who took ibuprofen or acetaminophen two or more days per week had an increased risk of hearing loss. The more often a woman took either of these medications, the higher her risk for hearing loss. Also, the link between these medicines and hearing loss tended to be greater in women younger than 50 years old, especially for those who took ibuprofen six or seven days per week. There was no association between aspirin use and hearing loss. The study was published in the Sept. 15 issue of the *American Journal of Epidemiology*.

Read the whole article at:
http://news.harvard.edu/gazette/story/2012/09/pain-relievers-increase-hearing-loss-risk/

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Symposium 2013

This year symposium will run from Wednesday to Friday. Registration starts at noon Wednesday with the first class beginning at 2:45pm. There will be no breakfast or classes on Saturday. A job fair is being added to the agenda (see below)

For Hotel Reservations - AHIP Rates
Fallsview Resort Hotel 1-888-325-5788 (request AHIP rate)
Niagara Falls Hilton - 1-866-873-9829
Group Reservations - code AHIP

Sign on to helpmehear.ca as a member for links to make reservations on line.

ASSOCIATION OF HEARING INSTRUMENT PRACTITIONERS OF ONTARIO

AHIP JOB FAIR

WHERE: **Symposium 2013 – Niagara Falls Hilton Hotel**

WHEN: **Thursday, May 2, 2013 (6:00 pm to 8:00 pm)**

WHAT: **Exhibitor's Tables -$300** (includes piped & draped) space is limited

WHY: **This Job Fair is a must for those just entering the profession. It is also for Hearing Aid Clinics considering Internship positions and wanting to hire enthusiastic Practitioners.**

HOW: AHIP is providing members the perfect opportunity to browse the current employment market while attending Symposium.
Our members will be able to meet prospective employers and make valuable comparisons between clinic offerings.

Hearing Aid Clinics (large and small), can provide their best features and will have the advantage of a personal pre-interview selection in the casual "trade show" environment.

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Symposium 2013

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REGISTRATION FORM

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☐	A.H.I.P. MEMBER *(includes one non transferrable gala ticket)*……	$260*	/	$360
☐	NON-MEMBER *(includes one non transferrable gala ticket)* ……	$290*	/	$390
☐	FRIDAY NIGHT GALA - EXTRA TICKET *each* ……	$125		

Name(s) on Gala ticket(s) to read: _____

****There are no exceptions to early bird rates****

NAME: _____

COMPANY/OFFICE: _____

ADDRESS: _____

CITY: _____ **POSTAL CODE:** _____

PHONE (B) :_____ **(H):**_____

E-MAIL ADDRESS: _____

REGISTRANTS SIGNATURE: _____ **Date**_____

In signing this registration form I understand and hereby give my consent to the Association of Hearing Instrument Practitioners of Ontario for the use of my name as written above, or images taken while at the AHIP Symposium, which may be used by the organization for publication either/or on the organizations website, Signal magazine or such purposes as the organization considers appropriate.

☐ Check here if you have dietary restrictions & list them _____
(deadline for submission to AHIP office – **April 15, 2013**)

☐ Are you planning on attending the gala dinner? YES / NO (**please!** circle one)

NOTE: - REFUNDS WILL NOT BE ISSUED AFTER MARCH 31st, 2013

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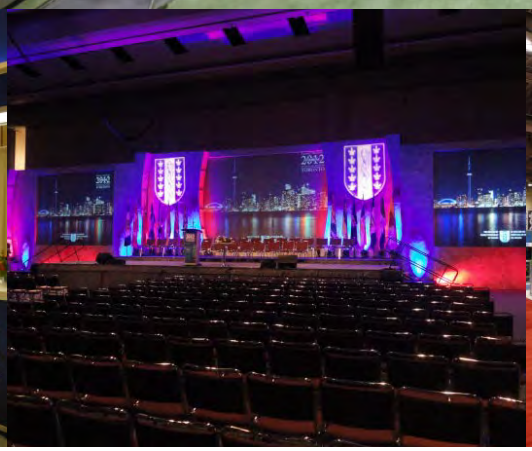

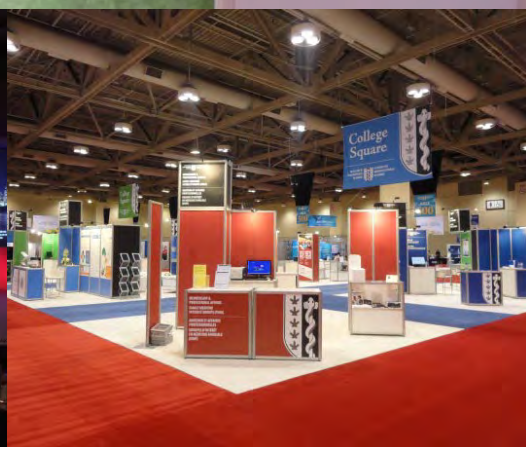

The Family Medicine Forum (FMF) took place on November 15 to 17 in Toronto and AHIP was there. FMF is the premier family medicine conference in Canada. FMF 2012 combined the annual scientific assemblies of the College of Family Physicians of Canada, the Ontario College of Family Physicians (OCFP) and the annual workshops of the CFPC's Sections of Teachers and Researchers. AHIP was also proud to sponsor Toronto ENT Dr. Rick Fox's session called Common External and Middle Ear Problems.

The following four pages features the materials that AHIP designed and distributed at the FMF.

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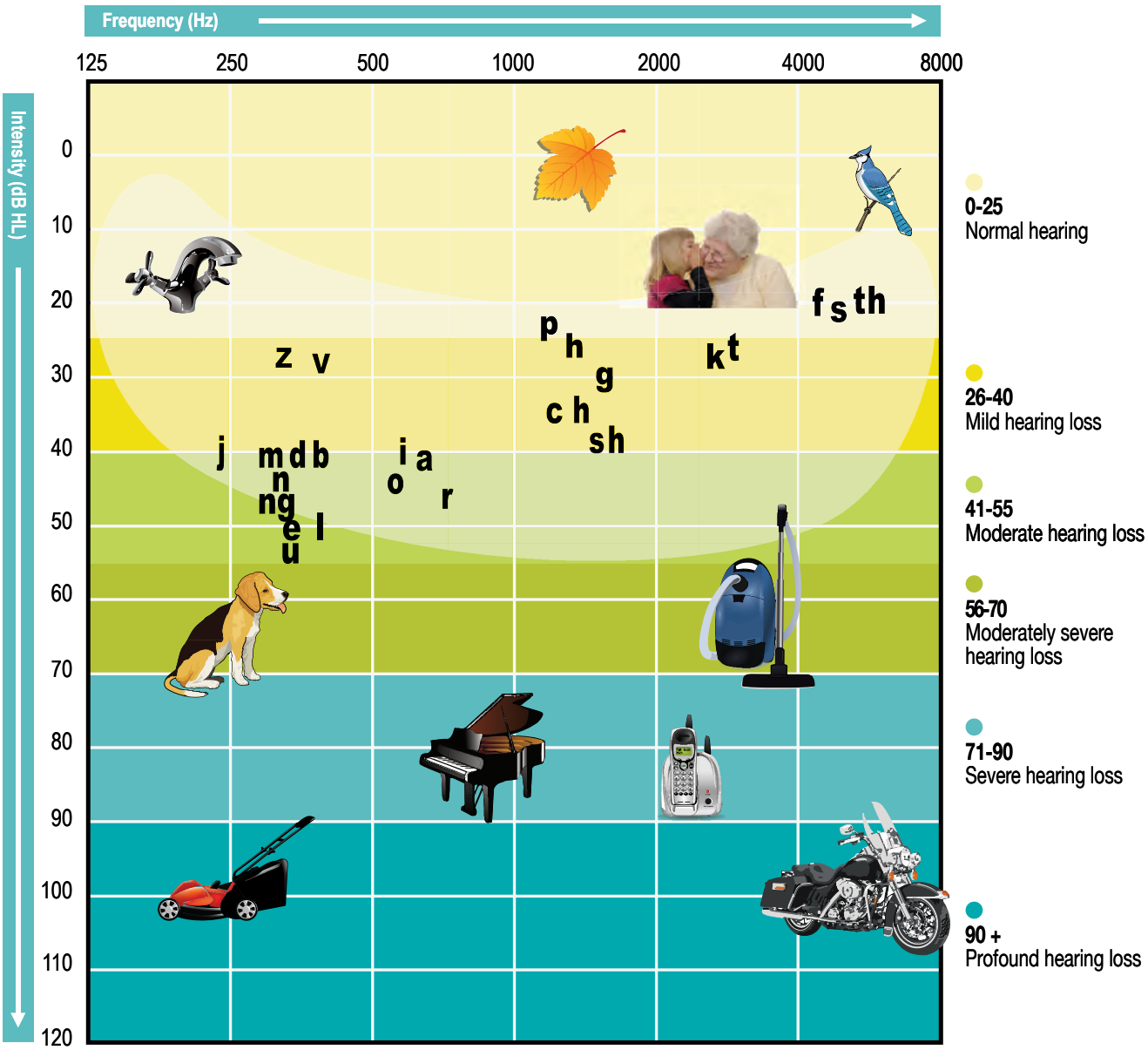

The Association of Hearing Instrument Practitioners of Ontario

Referral to Physician

The patient/client **must** be referred to a physician, for medical clearance in each of the following instances: (Ontario Medical Association – Red Flag List)

- Asymmetric sensorineural hearing loss (>10 dB PTA and/or discrimination score difference >12%)
- History of injury to ear or head
- History of weakness of face.
- Prior history of ear surgery, excluding myringotomy.
- History of drainage from the ear within the previous 90 days.
- History of dizziness or vertigo.
- Pain or discomfort in the ear in prior one month.
- A significant change in hearing within the previous 90 days. (>10 dB or 12% change in discrimination score)
- Audiometric air-bone gap equal to or greater than 15 decibels at 500 Hz, 1000 Hz and 2000 Hz.
- Age of 18 years or younger.
- Visible deformity of the ear. (Including perforation of the tympanic membrane)
- Unilateral tinnitus.
- History of hearing loss in the family (other than age-related).
- History of exposure to ototoxic drugs.
- History of meningitis.
- Suspicion of exaggerated hearing loss.
- Any person that the hearing health care professional feels should be seen by a physician.
- History of exposure to loud noise.
- Excessive cerumen (wax) or a foreign body in the ear canal.

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The Association of Hearing Instrument Practitioners of Ontario

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Hearing Loss Facts

Hearing Health Care Services Provided

Hearing assessments

Programming and fitting of hearing instruments

Counseling

Service, maintenance and repair of hearing instruments

Hearing aid batteries

Hearing protection and swim plugs

Assistive Listening Devices (e.g. for television/telephone listening)

When to Recommend a Screening

Adults over the age of 65

History of long term noise exposure

Sudden hearing loss in one or both ears

Tinnitus

Children with chronic ear infections or delayed speech

History of associated health conditions or medications

The most common causes of acquired hearing loss are:

- Aging
- Noise exposure

70% of Canadians over the age of 70 will have significant hearing loss.

Changes in hearing due to aging or noise exposure can emerge as early as 50.

Symptoms of hearing loss:

- Difficulty hearing in noise
- Everyone is mumbling
- Constantly asking people to repeat themselves
- Turning up the TV

Untreated hearing loss can lead to:

- Social isolation
- Anxiety
- Depression
- Relationship breakdown

Benefits of treating hearing loss:

- Stimulates the hearing mechanisms preventing auditory deprivation and atrophy
- Maintains or improves patients speech recognition/understanding
- Improves ability to communicate reducing anxiety and increasing self-confidence
- Reduces risk of social isolation, depression
- Better relationships with loved ones
- Improves overall quality of life

There is a higher prevalence of hearing loss with other chronic health conditions such as:

- Diabetes
- Chronic kidney disease
- Cardiovascular disease
- Dementia

Medications that can cause hearing loss include:

- aminoglycoside antibiotics
- antineoplastic
- anti-inflammatory (non-steroidal)
- antimalarial
- chemotherapy
- diuretics

The Association of Hearing Instrument Practitioners of Ontario

Hearing Instrument Specialists Love Your Ears

LOVE your ears

Approximately 3 million Canadians suffer from hearing loss - That's 1 out of 10 people!

Hearing loss is an invisible disability that affects anyone from all ages and all walks of life. It is common but often ignored by the Hard-of-Hearing individual until the effects of untreated hearing loss impacts not only themselves but also everyone around them.

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- Fitting & Dispensing
- Ear Impressions
- Counseling
- Earwax Removal

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- Workplace Safety & Insurance Board
- Veterans Affairs Canada

All major health insurance carriers

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Good and Bad Insurance

By John Niekraszewicz

No one likes to buy insurance. Unfortunately, we cannot escape owning insurance. Many of us have car, boat, house, cottage, professional liability, medical, dental, travel, critical illness, and life insurance. If you add up the total amount of money spent on insurance each and every year, you will be in for a rude awakening. And most of this insurance coverage is paid for using after-tax dollars. No wonder no one likes insurance.

However, when you are forced to make an insurance claim, this is the time that you wished you had purchased the maximum amount of insurance that you are allowed. As long your claim is paid.

Canada's consumer watchdog – *CBC Marketplace* – aired an episode in 2008 titled "In Denial," which interviewed families who bought bank-offered mortgage insurance, only to have their claims denied when they became sick or died. I discussed this topic with another financial advisor I had met at an industry conference and I'll never forget the story he told me.

A few years ago, Jim had taken on new clients, Bob and Mary, who wanted to consolidate their investments and get better prepared for retirement, which was still at least 10 years away. When Jim reviewed their contingency plan, he noticed that Bob and Mary still had a need for life insurance but all they owned was bank mortgage insurance. After explaining the differences between the two types of insurance it was agreed that life insurance should be applied for and be medically underwritten. The main driver for this decision was the realization that with mortgage insurance any claim would only eliminate their mortgage. Cash would also be needed to pay off all other debts, replace lost income from work, and be available to use at their discretion.

Bob and Mary qualified for the life insurance and agreed that they would cancel the mortgage insurance since the new policy would take care of their financial needs. At their next meeting, Jim reviewed their annual mortgage statement and noticed that the bank was still charging Bob and Mary for mortgage insurance. Before they had a chance to cancel the mortgage insurance, Bob died in a snowmobiling accident. After producing a copy of the death certificate, the life insurance policy claim was paid by the life insurance company with no questions asked. But, the bank requested an autopsy be performed prior to paying the mortgage insurance claim.

Jim said that at the time he thought Bob and Mary were financially fortunate not to have cancelled their mortgage insurance. But this is where his story got interesting. During their application process for mortgage insurance, Bob and Mary were asked only a few questions and no medical tests were required. But if a claim were to be made, this is when the underwriting would be performed. This practice is known as post-claim underwriting and is a fundamental difference between life insurance and bank offered mortgage insurance. It was this difference that resulted in the bank denying Mary's mortgage insurance claim.

During the post-claim underwriting process, the autopsy revealed that Bob had a blood/alcohol level that was below the legal limit, but was higher than the bank's acceptable limit as described in the mortgage insurance contract. This was the reason the bank used to justify denying the claim.

Looking back, it is easy to see why many Canadians purchase insurance that is not suitable or updated to meet their current needs, myself included. My wife and I were so excited when we bought our first home that we signed up for the mortgage insurance offered by the nice bank person. Our intention was to replace it with life insurance, but it was a whole year later and after we received our annual bank statement that we took action.

Mistake number two. My university alumni association offered an easy way to apply and obtain life insurance without any detailed questionnaire or medical tests, so we went this route. Better than nothing. It was years later when I looked at the fine print and realized that if we made a claim it could be denied. This is because the policy said we had to notify the insurance company if our medical history had changed. This didn't seem right.

So I decided to follow my own advice, reviewed our contingency plan, arranged for a nurse to come to our house for tests, and obtained proper medically underwritten life insurance.

When it comes to insurance, I encourage you to spend the time reading your annual statements. What may have started out as good insurance can easily become bad insurance. And by taking action not only will you be better prepared for life's twists and turns but you may also find some extra money to save for your early retirement.

John Niekraszewicz (Nick-ra-shev-itch) BMath, FCSI, CFP, FMA, is the certified financial planner responsible for the AHIP Health & Dental Benefits Plan provided by JVK Life & Wealth Insurance Group. John is also the principal of JVK Life & Wealth Advisory Group, a firm providing investment, retirement, tax & estate planning. John welcomes your questions and can be reached at john.niekraszewicz@jvkgroup.com or 1-800-767-5933.

The Link between Diabetes and Hearing Loss

By Daniel McDermott, Dawn Konrad-Martin, Donald F. Austin, Susan Griest, Garnett P. McMillan and Stephen A. Fausti

Diabetes mellitus is a metabolic disease that causes microvascular and neurologic complications and affects one in five veterans receiving care at the Veterans Administration (VA). Our research shows a link between diabetes and hearing loss and auditory brainstem function and suggests that patients with diabetes should be screened for hearing loss.

Understanding Diabetes

To understand why diabetes may affect hearing, it helps to understand how the body regulates blood sugar levels. Cells in the body require energy in the form of a simple sugar, glucose. The digestive tract breaks down the carbohydrates consumed into glucose, which is then absorbed into the bloodstream through the walls of the intestines. Once in the bloodstream, glucose is available as a cellular energy source. A flood of glucose is available after a meal, but this surge wanes in the hours between meals with no food intake. The body must manage these periods of feast and famine to maintain a stable level of glucose in the bloodstream.

When the body is functioning normally, the hormone insulin is released from the pancreas into the bloodstream at the start of the digestive process. Insulin helps move the glucose from the bloodstream into cells, where it is used as fuel in the near term. Insulin also helps move excess glucose into the liver, where it is stored for later use in the form of glycogen. As cells deplete their glucose supply, they restock by absorbing glucose from the bloodstream until that source runs low. Then a second hormone, glucagon, is released by the pancreas and stimulates the liver to release stored glucose (glycogen) into the bloodstream.

This system regulates blood sugar, keeping the blood sugar level in a healthy, narrow range. In patients with diabetes, however, the level of glucose in the bloodstream can fluctuate widely, with elevated levels immediately following large meals and dangerously low levels after periods without food.

This lack of control may be due to absence of insulin production by the pancreas (Type I diabetes) or inability to produce enough insulin (Type II diabetes). Type II is often accompanied by insulin resistance (i.e., the body does not respond to its presence effectively), further exacerbating the problem. According to the American Diabetes Association, more than 90% of patients with diabetes have type II.

Low blood-sugar levels are an immediate threat to those with diabetes and can lead to confusion, loss of consciousness, and seizures. High blood-sugar levels are not an immediate danger, but if not controlled, can damage eyes, kidneys, and blood vessels and can impair the functioning of nerve pathways. Although less well-studied, damage from diabetes to blood vessels and nerves that could impact hearing has been suspected (Hirose, 2008).

Diabetes and Hearing Loss

Accumulating evidence points to a link between diabetes and hearing loss. In a recent study, Bainbridge et al. (2008) examined hearing data from 5,140 individuals who took part in the National Health and Nutrition Examination Survey between 1999 and 2004. Prevalence of hearing loss was 15% for participants without diabetes, but more than double for those with diabetes.

A recent study at the VA National Center for Rehabilitative Auditory Research (NCRAR) investigated a possible link between diabetes severity and hearing (Austin et al., 2009). A variety of severity measures were used, including whether or not insulin was needed. Bilateral pure-tone threshold results were obtained from the 302 participants (n = 604 ears).

Figure 1 shows the estimated diabetes-related hearing impairment across a broad range of frequencies for three age groups. The heavy solid line in each panel represents the modeled difference of mean thresholds

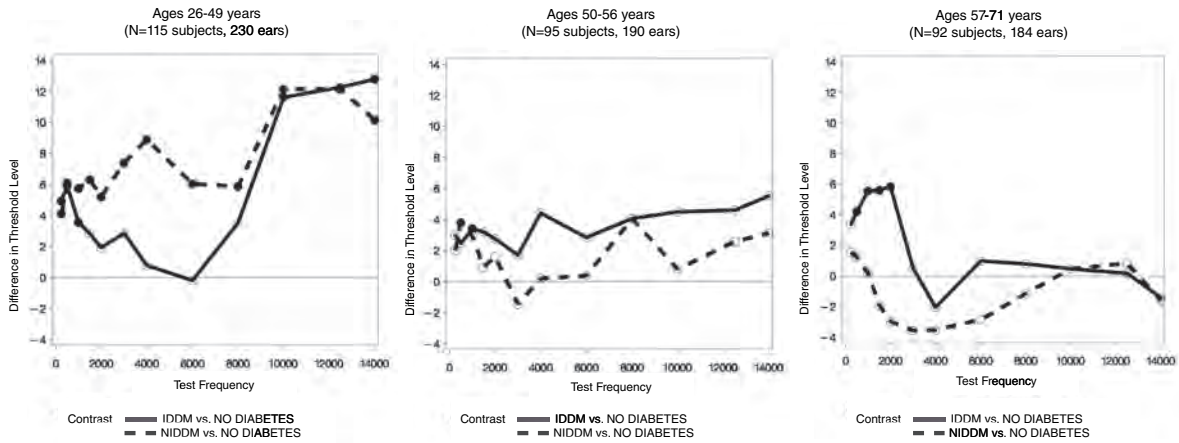

Figure 1. Modeled differences in mean pure tone thresholds between subjects with and without diabetes, plotted by frequency for three age groups. The two curves are for subjects with diabetes who use insulin to manage their diabetes (insulin-dependent diabetes mellitus, IDDM), or do not use insulin (non-insulin-dependent diabetes mellitus, NIDDM). Positive values correspond to worse hearing among those with diabetes. Filled circles indicate differences that are statistically significantly different from zero at the 0.05 test level. Empty circles indicate differences that are not significantly different from zero.

[Austin, D. F., Konrad-Martin, D., Griest, S., McMillan, G. P., McDermott, D., & Fausti, S. (2009). Diabetes-related changes in hearing. *Laryngoscope, 119*(9), a publication of The Triological Society, Inc.]

(in dB) between insulin-dependent subjects with diabetes and subjects without diabetes. The dashed line shows the threshold difference between non-insulin- dependent subjects with diabetes and subjects without diabetes. Positive values on each panel indicate that hearing is worse among subjects with diabetes compared with control subjects. Filled circles indicate that the difference is statistically significant after adjusting for correlations among ears and test frequencies. Open circles indicate that the difference is not statistically significant.

For insulin-dependent subjects, there was a significant effect of diabetes on hearing at some of the lower (speech) frequencies, even among older patients. However, the greatest effect of diabetes was for subjects under age 50 and at frequencies greater than 8 kHz, which are not routinely tested in the clinic. These younger subjects showed poorer thresholds, whether or not they used insulin. These results suggest that patients with diabetes—especially those who are younger—should be routinely screened for hearing loss. A protocol that includes extended high-frequency testing may provide additional sensitivity to diabetes-related changes in hearing.

A number of recent studies have reported changes in central auditory processing associated with diabetes (Diaz de Leon-Morales et al., 2005). At NCRAR, auditory brainstem responses (ABRs) were examined in the same subjects that provided hearing results described above (Konrad-Martin et al., 2009). Group differences were found among subjects under age 50. For these younger subjects, ABRs adjusted for hearing at 3 kHz revealed abnormal central conduction times among subjects with insulin-dependent diabetes, but ABRs were normal in subjects with diabetes who did not require insulin. Thus, diabetes appears to affect hearing and brainstem function, and these effects appear somewhat independent.

Central auditory deficits can affect the ability to understand spoken language even when hearing is relatively normal. NCRAR is conducting further analyses to explore whether these same subjects with diabetes have difficulties understanding speech in noise or at a challenging rate. By specifically identifying the nature of the hearing problem, strategies for rehabilitation may be optimized.

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About the Authors

Daniel McDermott, MS, CCC-A, is a research audiologist at the VA Rehabilitation Research and Development's National Center for Rehabilitative Auditory Research (NCRAR) at the Portland VA Medical Center in Oregon. Contact him at daniel.mcdermott@va.gov.

Dawn Konrad-Martin, PhD, CCC-A, is an investigator at the NCRAR and assistant professor in the Department of Otolaryngology, Head and Neck Surgery, Oregon Health & Science University School of Medicine. Contact her at dawn.martin@va.gov.

Donald F. Austin, MD, MPH, is a research investigator at NCRAR and professor emeritus at the Department of Public Health and Preventive Medicine, Oregon Health & Science University School of Medicine. Contact him at donald.austin2@va.gov.

Susan Griest, MPH, is a biostatistician at the NCRAR and in the Department of Otolaryngology, Head and Neck Surgery, Oregon Health & Science University School of Medicine. Contact her at griests@ohsu.edu.

Garnett P. McMillan, PhD, is a biostatistician at NCRAR. Contact him at garnett.mcmillan@va.gov.

Stephen A. Fausti, PhD, CCC-A, is director of the NCRAR at the Portland VA Medical Center and professor in the Department of Otolaryngology, Head and Neck Surgery, Oregon Health & Science University School of Medicine. Contact him at stephen.fausti@va.gov.

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Musical Ear Syndrome

Part II: The Phantom Voices, Ethereal Music & Other Spooky Sounds Many Hard of Hearing People Secretly Experience

By Neil Bauman, PhD

Some Characteristics of People with Musical Ear Syndrome

Not everyone hears phantom sounds. Following are some of the characteristics common to many of the people who do experience Musical Ear Syndrome.

Often the Person Is Older

About two-thirds of the people with MES are older than 50. About one-third are older than 70. Only about one-third of the people experiencing MES are younger than 50.

Generally the Person Has Some Degree of Hearing Loss

Since MES is apparently often caused by lack of auditory stimulation, it stands to reason that many people with MES have some degree of hearing loss. Surprisingly, about a third of the people with MES report normal hearing. Just over half of the people experiencing MES, report either mild or moderate hearing losses. Interestingly enough, people with more severe hearing losses don't appear to have MES more frequently than their numbers warrant.

More Commonly Reported in Women than in Men

For some reason, typically three times as many women as men report hearing MES sounds. This does not necessarily mean that more women than men experience Musical Ear Syndrome (although it is quite likely that they do). It may just mean that more women than men are willing to speak up and seek help.

Commonly the Person is Anxious/Worried, Stressed or Depressed

Notice how anxiety, worry and stress play an important

role in the occurrence of Musical Ear Syndrome. It seems that often people going through anxious experiences and stressful situations such as the death of a spouse or some sickness or problems in their family experience MES much more commonly than people whose lives are moving along smoothly. The same is true for depression. One out of five people experiencing MES admits to being depressed when their MES started.

More Often than Not, the Person Also Has Tinnitus

Before their Musical Ear Syndrome appeared, most people had pre-existing tinnitus. This is particularly true of those that are hard of hearing. It is probably not true for those whose MES is caused by background sounds. Such people typically have normal, or near-normal, hearing.

Often the MES Sounds Seem to Come from a Certain Direction

When the phantom sounds you hear appear to have directionality—that is, they appear to come from a definite direction, thus acting like real sounds—it is most difficult to believe that those sounds are truly phantom. More than one third of the people experiencing MES report that their MES sounds have directionality.

Generally Become Aware Their Sounds Are Phantom

Fortunately, most people who experience MES, as time passes, typically figure out that these sounds are not real. For example, one elderly lady who "knew" she was hearing a radio station realized that radio stations don't play the same song over and over and over again endlessly. So, if the music she is hearing repeats endlessly, she knows it's all in her head.

A man who heard phantom sounds while in bed had a different way of determining whether what he was hearing was real or phantom. He simply put the pillow over his ears. If he could still hear the sound just as loud, he knew it was in his head. However, if the pillow cut out the sound, he knew it was real. That worked for him.

Unfortunately, about one in five or one in six of the people experiencing MES cannot tell that the sounds they are hearing are truly phantom. These people are typically well up in their 80s. Even when caregivers explain to them that these sounds are not real, they refuse to believe it, and often become angry at the person who's trying to tell them otherwise. In my experience, it is almost impossible to help such people. The best I can do is to explain clearly to their children or caregivers what is happening so that they can understand what their parent is going through.

May Appear to Act Irrationally

The good news is that most people soon come to realize the MES sounds they are hearing are phantom and thus don't respond to them as though they are real. However, numbers of people, especially those up in their 80s and 90s, don't seem to be able to separate their phantom sounds from real sounds. As a result, they continue to act as though what they are hearing is real. This gives rise to some bizarre, and often what appears to be irrational behavior. Don't let that throw you. Although people with MES may have what appears to be bizarre behavior, if you put yourself in their shoes, you'll quickly realize that they are behaving sanely and rationally based on what their senses are telling them is true, even though the sounds they are "hearing" are indeed phantom.

Unfortunately, because of their apparently irrational behavior, too often, doctors and caregivers (which includes family members) have quickly written such people off as being "nuts" and treat them as such, when in reality, they are simply being fooled by their MES. Here are some examples.

An 82-year-old hard of hearing widow began hearing noises on the second floor of her house. To her it sounded like a homeless person was living there. She heard him come into the house, usually at night, walk up the stairs and move things around upstairs. She never saw him, or spoke to him.

A few times she even summoned the courage to climb the stairs and see what was going on. She never found anything out of place, and there was never any signs of the stranger.

To try to stop this, she changed the locks on her house, not just once, but twice. Also, on two occasions, she

called the police. The police thoroughly searched the house and grounds without finding any evidence of an intruder.

You see, in this case she heard certain sounds and made a rational decision based on their being real. These sounds had moving directionality—walking up the stairs, moving around upstairs, etc. Thus she acted prudently (as far as she was concerned) in changing the locks and calling the police, but to outsiders, her actions seemed a bit nuts.

Here's another example. A concerned neighbor explained, "We have a neighbor in our condo who has been fairly deaf for many years. He is about 80 now. In recent years, he is hearing music, which he attributes to neighbors next door, who he feels are "against him" and play music all night. No one else in the condo has ever heard such music. It is quite quiet here at night. He has enlisted the help of paralegals and others, demanding that the "music" stop. Our condo board is beside itself, as his threats become more aggressive. He is making everyone's life miserable."

This man also hears "real" music and "knows" exactly where it is coming from—that neighbor next door. So he does the rational thing and tries to get the Condo board to stop it, and when they don't, he enlists the help of a paralegal. To everyone else, he is acting irrational, but, because this music is so real, has directionality, and the people won't stop being inconsiderate, he is taking legal action.

In these above stories you now can see that what appears at first glance to be irrational thinking and behavior is rooted in the firm belief that these phantom sounds are real. Unless, or until, a person realizes that their brains are playing tricks on them, they will continue on in their apparently bizarre behavior.

And while we are on this subject, you've all heard stories of people who supposedly hear radio stations through their dental fillings, haven't you? These stories have been around for a long time now. I remember my dad telling me such stories more than 50 years ago.

In spite of the many reports of radio broadcasts being received through dental fillings, I'm not aware of a single proven case. I now know that what people thought were their fillings picking up radio stations is in reality Musical Ear Syndrome. Tooth fillings don't receive radio signals. People came up with this explanation in their desperate search for a rational explanation for the strange phantom radio-like sounds they were "hearing"—so they wouldn't have to admit they were crazy.

Three Reasons Why MES Sounds Make You Believe They Are Real

Here are three reasons why Musical Ear Syndrome can completely trick people into believing that the phantom sounds they hear are real.

1. The Sounds Can Seem Absolutely Real

As far as you are concerned, you are hearing them with your ears—so no way could they be phantom sounds. Therefore, you treat them as real sounds until, hopefully, you realize your brain is fooling you (yet again).

2. Often the Sounds Have Directionality

They are not just "in your head", but you "know" they are coming from a certain location—the house next door, the apartment below you (or above you), etc. Therefore, you have no reason to believe they are not real sounds.

3. These Sounds Are Sometimes Accompanied By Tactile Sensations

Some people actually feel the appropriate tactile sensation that would accompany the real sound. For example, you might also "feel" the floor vibrating from all the racket downstairs. Here are a couple of stories of a person not only hearing sounds, but also feeling them too.

Carolyn explained, "Late at night when I don't have my hearing aids on, I am absolutely sure that there are trucks and bulldozers working just outside my bedroom window late at night when it is quiet. We are the only ones living on our little country lane. There's no traffic of any kind outside my bedroom windows. I feel the vibrations too. I thought I was going off the deep end."

Since our minds associate certain sensations with

certain sounds, it automatically adds them in—thus heightening the illusion that there is something real going on when nothing is happening. In Carolyn's case, you can't have a bulldozer working right outside your house without it rumbling and shaking the ground as it works—so she both "hears" it and "feels" the house shaking.

Sometimes our minds make up totally illogical explanations to try to fit what we hear and feel into our reality.

Angela related, "My 90-year-old father-in-law has been hard of hearing for some time, and it is getting progressively worse. The geriatric psychiatrist tested him and found no dementia. He mainly hears loud music when alone in his apartment, oftentimes in the middle of the night. He thinks the landlady knows exactly when he lays down to sleep, and that is when she turns the music all the way up.

Unfortunately, he has taken to knocking on the downstairs landlady's door (at 3 A.M.) telling her to turn the music down. We have been with him a few times when he heard the music—none of us heard anything. Now get this, he also believes she has a vibrating device or machine that makes his floor vibrate."

Feeling the floor vibrate when you hear phantom sounds coming from below you is not as strange as you might think. Several people have told me they experience vibrations along with their MES. When two of your five senses begin telling you the same thing, it's very difficult to believe these sensations are all phantom.

Six Common Triggers of Musical Ear Syndrome

Exactly what causes MES is still a mystery, but there are a number of things that seem to trigger MES.

1. Anxiety/Stress/Worry

People that are anxious or stressed are much more likely to experience MES than those who are calm and laid-back.

2. Depression

As is the case with tinnitus, Musical Ear Syndrome is more common in people with depression. Treating their depression can cause the phantom sounds to fade away on their own.

3. Constant Background Noise

Sometimes, constant background noise blends in and begins to take on a musical quality. This can happen whether you have a hearing loss or not. I think this is one of the common triggers of MES in people with normal hearing.

Bethany explained, "My mom is hard of hearing. Recently on a trip to Arizona with my dad she commented to dad when they arrived at their hotel that she really enjoyed the music on the plane. Dad said there was no music on the plane. On the return trip, mom started hearing the music again and told dad to listen. He said, nope, no music. But mom continued to enjoy it until the plane landed."

I've determined that one common theme with hearing people is that many times their MES sounds are triggered by a fan in the house. For example, a man with normal hearing explained, "I hear music only when a noise is going on in my environment. For example, if I'm hearing the air conditioner outside the window or the furnace fan, I hear an orchestra, or sometimes just a song. When the triggering noise turns off, the music stops."

A hearing woman explained, "I only hear MES sounds when the furnace fan is running and I am in bed and the house is quiet. They go when the furnace or air conditioning fan quits running".

4. Brain Abnormalities

Auditory hallucinations can result from seizures such as temporal lobe epilepsy. Musical hallucinations may be triggered by unruptured intracranial aneurysms, or may be associated with dorsal pontine lesions. They may also be triggered by pockets of infection in your brain such as is caused by Lyme disease.

5. Drugs

Most people know that some "recreational" drugs such as alcohol, lysergic acid diethylamide (LSD), marijuana (Pot), methamphetamines (meth) and other recreational drugs can cause auditory hallucinations, but it never crosses the minds of most people that

some of the prescription drugs they are taking can also cause such phantom sounds. Furthermore, elderly people tend to take more and more medications as they age. Unfortunately, numerous drugs can cause auditory hallucinations.

Gail explained, "My father has a profound hearing loss that may be getting worse. He was recently placed on Terazosin. Since starting the medication he hears “music” even when his hearing aids are out."

Note: Terazosin (and more than 360 other drugs and substances that can cause hallucinations) are listed in Appendix 2 in the back of my book *Phantom Voices, Ethereal Music & Other Spooky Sounds*.

6. Hearing Loss

Hearing loss is a very commonly associated with Musical Ear Syndrome. This is because with increasing hearing loss, the brain no longer hears what it used to hear, and it sometimes decides to make up for this lack with music of its own. Doctors call this sensory deprivation.

Seven Steps to Work Through When Helping People with Musical Ear Syndrome

Now comes the important part—what can you do about your Musical Ear Syndrome? Very briefly, here are a number of things you can do to help yourself manage your auditory hallucinations so they have less of an impact on your life.

1. Seek Competent Medical Attention to Rule Out Brain Disorders and Other Medical Conditions

There is a very small chance that you may have a brain tumor or other brain abnormality that is causing your Musical Ear Syndrome. It is good to be checked out by a neurologist to be sure there are no physical brain problems. You may decide to have MRIs, CT scans or EEGs. Knowing there is nothing physically wrong "upstairs" will give you a large sense of relief.

2. Learn About Musical Ear Syndrome

Learning all you can about what you are dealing with takes much of the anxiety away. Thus, you are better able to cope with your MES. Furthermore, once you know what MES is, you often will feel an enormous sense of relief. With that sense of relief, often a surprising thing happens. Your Musical Ear Syndrome goes away on its own, or tends to fade more into the background. Many times this is all it takes.

3. Convince Your Brain of the Falseness of Your Musical Ear Syndrome Sounds

When you know your brain is playing tricks on you, do whatever it takes to convince your brain—and you can put an end to some of these phantom sounds.

Remember the man that heard music at night—he put the pillow over his ears. If the sound volume dropped, he knew it was real music. If it stayed at the same volume, he knew it was all in his head.

4. Reduce Your Anxiety Level

Very often, just learning about Musical Ear Syndrome is enough to reduce your anxiety over the strange sounds you are hearing. That is why it is so important to have good information available like this article. If you are anxious about other things, get your anxiety under control and your MES may also fade away. The same is true for depression.

5. Rule Out Drugs

If your MES began soon after you began taking a new drug or after you changed the dose on an existing drug, that may be the cause. Changing to a different drug or reducing the dose to its original level may let your MES fade away.

6. Enrich Your Environment with Real Sounds

Musical Ear Syndrome thrives when your brain doesn’t get adequate auditory stimulation. This often happens if you have a hearing loss and consequently don’t hear the common everyday environmental sounds that keep your auditory neurons happy.

Since hearing loss and aging often go hand in hand, this is why MES is so common among elderly, hard of hearing people. In addition, often elderly people live in quiet environments, and may live alone after the death of a spouse, thus exacerbating the lack of auditory stimulation.

Therefore, if you have Musical Ear Syndrome, surround yourself with real sounds. Give your brain real sounds to listen to all the time. If you are hard of hearing, wear

your hearing aids so you can hear something—then your brain can focus on those real sounds and quit producing its own phantom sounds.

7. Become Socially Active

Because of their hearing losses, hard of hearing people tend to withdraw from social situations and thus do not have much social interaction. This just further compounds their world of silence.

Becoming socially active does a number of things. First, it goes a long ways towards keeping your mind from focusing on your phantom music. Second, your brain now has scintillating conversations to focus on. Third, increased socialization helps lift the depression and sense of isolation you may be feeling that so often makes your Musical Ear Syndrome worse.

There you have it. This has been a brief overview of Musical Ear Syndrome, several causes and a number of ways to help overcome it. However, if you are hard of hearing and have Musical Ear Syndrome, look on the bright side. Hearing phantom music isn't always all bad. As Sheila says, "I shall miss it if it ever fades away." I mean, where else can you hear beautiful music without wearing hearing aids, assistive devices, iPods, headphones or other paraphernalia?

(An abbreviated version of this article titled "Musical Ear Syndrome" was published in the Winter 2004 edition of *Hearing Health* magazine, pp 16-19.)

If you desire to know more about Musical Ear Syndrome, get your copy of *Phantom Voices, Ethereal Music & Other Spooky Sounds* now. In it, Dr. Neil relates the fascinating accounts of hundreds of people who have Musical Ear syndrome. You will discover what causes these auditory hallucinations, and more importantly, what you can do to reduce or eliminate them. An added bonus—you also get a list of the 368 drugs and other substances known to cause such hallucinations.

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- **Ear-to-ear communication** — The Verso hearing instruments work together as a team, sending signals back and forth, sharing data and analyzing the environment.
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- **Binaural Environmental Optimizer™ II** — The Verso hearing devices work together to analyze and accurately classify the listening environment, and sychronize the volume and noise reduction settings.
- **Synchronized push button** and **synchronized volume control** — make volume and program changes easy for patients.
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