DEAFNESS FORUM AUSTRALIA

oneinsix

18 OCT 2023

More than a Companion.

It's Safe Work Month, so let's protect our hearing at work.

Hearing Care and Healthy Ageing.

It's Safe Work Month so let's protect our hearing at work.

Prolonged exposure to loud noise at work, or sudden exposure to an intensely loud sound, can cause hearing loss.

Many types of hearing loss can be prevented by limiting exposure to loud noise and using hearing protection. Getting your hearing checked regularly can help you keep on top of your hearing health.

People who work in loud environments are at a higher risk of hearing loss, including musicians and sound technicians, farmers, miners, military personnel, hospitality and construction workers.

Preventing noise-induced hearing loss.

Limit your exposure – avoid long periods of exposure to loud noise from heavy machinery and power tools. Take listening breaks.

Protect your hearing – wear hearing protection equipment when loud noise is unavoidable, such as earplugs and earmuffs.

Be aware of the noise levels around you – use the noise risk calculator on the National Acoustic Laboratories website. Smart devices like phones and watches can also detect and warn you about exposure to noise.

Employer obligations.

Safe Work Australia Noise Regulations provide information about suitable noise exposure for workers.

Employers are required to assess noise levels in the workplace, monitor the hearing health of exposed workers, and provide personal protective equipment.

You can find more information about employer obligations at safeworkaustralia.gov.au

To help raise awareness of occupational noise induced hearing loss, Hearing Australia released a suite of resources called 'The Prevention Toolkit'. The Toolkit includes factsheets, posters, infographics, and social media content.

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Dogs Don’t Have a Sixth Sense, Just Incredible Hearing.

It’s pretty obvious that dogs have more powerful noses than humans, but how well can they hear?

By Stephanie Gibeault for American Kennel Club.

The truth of the matter is that, for some sounds, a dog’s hearing is really hundreds of times better than ours, whereas for other sounds, dogs and humans have sound sensitivities that are very much the same.

Where dogs really shine is with higher-pitched sounds. The average adult human cannot hear sounds above 20,000 Hertz (Hz), although young children can hear higher. Hertz is a measure of the frequency of a sound, and the higher the frequency, the higher pitched the sound. Dogs, on the other hand, can hear sounds as high as 47,000 to 65,000 Hz. These are sounds far too high-pitched for us.

In addition, at high frequencies dogs can detect much softer sounds than we can. The loudness or intensity of a sound is measured in decibels (dB) with zero dB being the average intensity of a sound that can just barely be heard by a young human. So, sounds too quiet for humans to hear are given a negative decibel rating.

When sounds are between 3,000 and 12,000 Hz in frequency, dogs’ ears are far more sensitive than ours. They can hear those sounds when they are between -5 dB and -15 dB on average. That means dogs can hear sounds that are not loud enough for our ears. For sounds above 12,000 Hz, dogs’ ears have sensitivity so much higher than humans that a comparison would be pointless.

Wired for Prey.

It is thanks to their predatory heritage that dogs can hear high-pitched sounds so well. Wolves, dogs’ ancestors, prey on small rodents, so the ability to hear the tiny animals’ squeaks is important for survival. Humans, who evolved to cooperate with other humans, have ears that are tuned to the pitch of the human voice.

This sensitivity to higher-pitched sounds likely explains several phenomena involving dogs. Rather than having ESP, dogs may predict earthquakes using their highly sensitive ears. And their ability to predict somebody’s arrival at your door is likely due to their ability to detect the sound of a car before you can hear it, rather than any sixth sense. Finally, dogs can be so distressed by everyday noises, like a vacuum cleaner or power drill, because they sound louder to dogs than to humans. And dogs can hear high-pitched noises from these devices that we can’t detect.

When it comes to the remaining detectable frequency range, dogs and humans can both hear these sounds, and the sensitivity of our ears

is about the same. But human ears have a maximum sensitivity of 2,000 Hz. Not coincidentally, that frequency is right in the middle of the range of human speech. On the other hand, dogs have a maximum sensitivity of 8,000 Hz, better suited to hearing their prey.

Dogs also have an amazing ability to detect tiny differences between frequencies. Coren explains that they can hear "the difference between the musical note C and another note that differs by one-eighth of the distance between that C note and C sharp." On the other hand, we can locate sounds better than dogs. Humans can tell the difference between two sounds that differ in location by an angle of only one degree, whereas dogs need eight degrees of separation.

Testing a Dog's Hearing.

Researchers know what humans can hear because they can ask their test subjects, but how do they know what dogs can hear? Early studies involved training dogs to press a lever under a speaker when they heard a sound. Today, a dog's hearing capabilities can be tested without the dog having to do a thing. The Brainstem Auditory Evoked Response (BAER) hearing test is as simple as placing electrodes on a dog's head and earphones in his ears. Sounds are played through the earphones, and if the brain shows electrical activity, the dog is considered to have heard the sound. The test doesn't hurt the dog and only takes a short amount of time.

Deafness in Dogs.

By George M. Strain, School of Veterinary Medicine, Louisiana State University.

Deafness may be present at birth (congenital) or acquired as a result of infection, trauma, or degeneration of the cochlea (the organ of hearing).

Deafness present at birth can be inherited or result from toxic or viral damage to the developing unborn puppy. Merle (also known as dapple, merle is irregular blotches of fur set on a lighter background) and white coat colours are associated with deafness at birth in dogs and other animals. Dog breeds commonly affected include the Dalmatian, Bull Terrier, Australian Heeler and English Cocker Spaniel.

Diagnosis of deafness requires careful observation. The response to touch, smell, and objects that can be seen must be differentiated from the response to sound. In young animals or in animals kept in groups, deafness may be difficult to detect, because the individual being evaluated will follow the response of others in the group. If the animal is observed on its own, after an age when responses to sound are predictable (about 3 to 4 weeks for dogs), then the deafness may be detected.

The primary sign is failure to respond to a sound, for example, failure of noise to awaken a sleeping dog, or failure to alert to the source of a sound. Other signs include unusual behaviour such as excessive barking, hyperactivity, confusion when given vocal commands, and lack of ear movement. An animal that has gradually become deaf, as in old age, may become unresponsive to the surroundings and refuse to answer the owner's call.

Deafness due to blockage of the external ear canal usually responds to appropriate surgical or medical treatment. This deafness is usually not complete. Deafness due to bacterial infections of the middle and inner ear may respond to antibiotic treatment. If deafness is due to persistent intense noise or trauma, recovery is unlikely. Recovery from deafness caused by drugs that are toxic to the ear is rare.

Deaf dogs do not appear to experience pain or discomfort. However, caring for a dog that is deaf in both ears requires more dedication than owning a hearing dog. These dogs are more likely to be startled, which can lead to biting. They are also less protected from certain dangers, such as motor vehicles.

A New Way to Experience Music.

By Sam Nichols & Sam Carmody for Sunday Extra

26-year-old Lauren Fox attended a music festival wearing a haptic vest, a wearable device that transmits different sounds as vibrations on the skin. It was a connection to music she'd never had before.

"It's fantastic that you can feel each individual instrument," she says. "You can feel the whole body pumping. It's really difficult to explain."

Haptic technology is not new; since the 1990s, it's been used as a tool for interpreting sound. But in recent years, technological advancements have resulted in a wave of haptic devices, creating new ways for people to experience sound.

"Within the last five years, because having Auslan interpreters at events is becoming more prevalent ... more events are accessible to us. But now having the haptic vest as well, it makes it far more accessible than it was," she says. "It's such a connection, and it really puts us Deaf audience members on an equal footing with the hearing audience."

More accessible and inclusive

Haptic technology provides users with physical stimuli, like vibration or motion. The tactile feedback provides an experience that can be immersive or more realistic. Through haptic feedback, our brains can create patterns that connect certain vibrations at different locations of our bodies with a specific sound. Innovations in haptic technology, partially driven by tech industries, have helped make compact and accessible devices available for the public.

The technology is increasingly being used with live performances. Earlier this year, the accessible festival Ability Fest made haptic devices available to those attending its Melbourne-based event.

"People love this, the amazing amount of detail they can get out of the vibrations of the vest," says Kylie Davies, the director of creative production company The Newmarket Collective, which began supplying haptic vests to various Australian events this year.

Hearing Care and Healthy Ageing.

Ageing is a complex journey, marked by changes in physical, psychological, and social aspects of life.

Successful ageing is characterised by high functioning in three domains - physical, mental, and social health. Ageing brings both losses, such as declines in mobility, hearing, vision, and memory, and gains, including expertise, knowledge, wisdom, and mood regulation. The concept of healthy ageing emphasises the ability to respond to life's challenges and changes.

The much-anticipated results of the Ageing and Cognitive Health Evaluation in Elders (ACHIEVE) study were unveiled at the Alzheimer's Association International Conference in July. Its findings have far-reaching implications for hearing care and healthy ageing. The study addresses critical questions about who benefits from hearing care to reduce dementia risk, what type of care is effective, and when it is most beneficial. These results also raise new questions about where and how hearing care should be provided.

Hearing loss rarely exists in isolation and often intersects with other age-related declines. Integrated person-centred care for older adults must consider how health conditions interact with hearing loss, affecting healthy ageing and everyday functioning.

ACHIEVE Study Methodology.

The ACHIEVE study recruited English-speaking participants aged 70-84 with untreated hearing loss and no substantial cognitive impairment. Participants were divided into two groups. One group, a hearing intervention group received hearing aids and training, while the control group received health education on chronic disease prevention. Both groups had regular follow-up sessions for three years.

Key Findings of the Study.

Who Benefits: Self-reported hearing-related communication functioning significantly improved in the hearing intervention group, shifting from problematic to normal levels. In contrast, the control group's communication problems worsened over three years.

When Timing Matters: Hearing intervention resulted in high hearing aid adoption rates and improved self-reported hearing-related communication.

The benefits of hearing intervention for reducing cognitive decline were more pronounced in those at higher risk of dementia. Whether hearing intervention provides long-term benefits for lower-risk individuals remains to be seen.

Future Research and Implications for Practice.

Future research will explore whether hearing intervention impacts the incidence of dementia, providing insights into preventing new cases.

These results underscore the importance of hearing intervention as part of integrated person-centred care for older adults. Audiologists should collaborate with other health professionals to address the complex health needs of older individuals.

Ultimately, hearing care should be viewed as a crucial component of healthy ageing, promoting wellbeing and enhancing the quality of life for older adults. As the ACHIEVE study suggests, hearing intervention may play a significant role in reducing cognitive decline and improving overall health outcomes in our ageing population.

Wrist replacement surgery gives Auslan-user back her 'voice'.

By Sarah Richards for ABC News.

Tracy Howlett uses Auslan to communicate. But it all became "debilitating and painful" after she was diagnosed with rheumatoid arthritis.

Standard surgery for rheumatoid arthritis would create further limitations on Tracy's ability to communicate. So, Queensland hand surgeons performed "unconventional" wrist replacement surgery so she can regain her "voice".

The Gold Coast resident predominantly uses sign language to communicate.

"Auslan is my first language; it's part of who I am," she said.

But signing became "debilitating" after she was diagnosed with rheumatoid arthritis in her 30s.

"I couldn't raise my arms. It was the worst pain I had ever felt," Ms Howlett said. "I would cry a lot."

As Ms Howlett's condition continued to worsen, she feared she wouldn't be able to use Auslan again.

"When my hands started to become disfigured from the rheumatoid arthritis, it became more difficult for my friends to understand my signing. I could only sign with one hand. It was a really isolating time."

It wasn't until Ms Howlett was in her 50s that she would have life-changing surgery to relieve her pain and bring back her "voice."

"I was nervous about the surgery and if it would help me, but I knew it was my only hope," she said.

But Ms Howlett's surgery wasn't the typical method used to treat rheumatoid arthritis.

Communication at the forefront.

Dr David Graham, who performed Tracy's surgery at the Gold Coast University Hospital, said, "Routinely for that sort of deformity, we would undertake a total wrist fusion, so stiffening the whole wrist."

"She could have had that surgery, but the issue would be that she would have a stiff wrist, which would affect her ability to use Auslan."

Instead, Dr Graham and his team undertook a total wrist replacement.

"We have replaced all the little joints in the wrist to give her motion but also pain relief," he said.

"That gives her motion in terms of flexion-extension, so the up and down movement, but also she gets a little bit of side-to-side movement."

He said he believed it was the first time this type of surgery had been performed with "communication at the forefront of our considerations".

Most women contract Cytomegalovirus unknowingly before reaching child-bearing age.

Researchers have shown for the first time that mothers are much less likely to transmit a common virus known to cause miscarriages and birth defects if they are exposed to the virus before they become pregnant.

Cytomegalovirus (CMV) is a common herpesvirus that most women contract unknowingly before reaching child-bearing age. It's usually harmless except during pregnancy when, if passed on to the developing fetus, it is a leading cause of miscarriage and birth defects, including cerebral palsy and hearing loss.

Researchers have long known that the risk for complications is particularly high for women infected by CMV for the first time during pregnancy, but they haven't fully understood why those who already carry the virus are less vulnerable.

The study at Tulane University, a comprehensive research institution in New Orleans USA, reveals how pre-existing immunity to CMV effectively limits its transmission during pregnancy and protects against associated birth defects. The study pinpoints the specific immune mechanisms responsible for that protection.

Researchers used a nonhuman primate model that closely mirrors human CMV infection and transmission. They observed that when pregnant mothers were initially infected with CMV during the first trimester, all of them transmitted the virus to their offspring, resulting in a high rate of miscarriage.

However, when nonhuman primates previously infected with CMV were reinfected during their pregnancies, their offspring were protected. The robust immune response observed in mothers upon reinfection resulted in only one out of five mothers passing the virus through the placenta, with no adverse health outcomes for any of the infants.

The findings show that if a mother already has CMV immunity before becoming pregnant, her immune system can effectively protect her baby from congenital CMV transmission if she is reinfected during pregnancy.

This research could have highly significant implications for the development of a CMV vaccine to prevent infections in pregnant women, particularly in areas with a high prevalence of CMV.

From Medical Life Sciences News

Hard-of-hearing dogs can be much noisier because they aren't aware of the volume of their bark.

By Dr Anne Quain for The Canberra Times.

There is an established link between hearing loss and increased risk of dementia in people. A similar association in dogs has been found.

Hearing loss is common in dogs, particularly those older than eight. It tends to impact middle to high frequencies more than low frequencies.

Some owners report their hard-of-hearing dogs are much noisier. They may not be aware of the volume of their bark.

To explore a possible relationship between hearing loss and cognitive decline in dogs, researchers performed tests on dogs, and asked owners to assess their dog's quality of life.

The researchers found that dogs with hearing loss had poorer performance in cognitive tests evaluating their attention and working memory. They also had higher owner-reported cognitive decline scores.

The researchers found that the quality of the dog-owner interactions was negatively impacted by the dog's hearing loss.

Previous studies have found that dogs respond differently depending on the tone of their owner's voice.

Hearing loss may alter what dogs hear, or prevent them from hearing altogether, which can lead to confusion or frustration for the owner.

Hearing loss isn't all bad. Dogs with noise phobias may benefit from it.

For now, there's no cure for hearing loss in dogs.

Keeping dogs mentally alert by providing appropriate regular exercise and mental stimulation is likely to be helpful. Some dogs also readily respond to visual cues like hand signals.

Middle ear implants have been used experimentally in dogs, and did improve hearing, but these aren't commercially available.

Dogs don't tolerate hearing aids - yet. Designing hearing aids that are comfortable for dogs will be tricky, as there is so much breed variation in canine ear anatomy. The design of well-tolerated, inexpensive, effective hearing aids for dogs in the future may help reduce the progression of canine cognitive decline.

It may also help enhance our relationships with senior dogs.

Spending time with dogs does wonders for our wellbeing. Owning a dog is good for us physically and emotionally. Dogs make us happier and healthier. Dogs can be there for you even when people can't. They offer unconditional love, emotional support, and constant cuddles that help stave off social isolation.

Libby Harricks
MEMORIAL ORATION

Professor Jim Patrick AO will present the 2023 Libby Harricks Memorial Oration in December.

Prof Patrick, Chief Scientist, Professor Emeritus, Cochlear is a world authority on cochlear implants and one of the engineers who pioneered this hearing technology.

A premium Deafness Forum Australia event, this year's oration will be presented in partnership with Cochlear Ltd.

Cochlear®
Hear now. And always

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Since it began in 1999, the Libby Harricks Memorial Oration series has featured distinguished speakers from around the world and gained international recognition for its exceptional presentations. The series is an annual event that serves as a tribute to the memory of the first President of Deafness Forum Australia, carrying forward Libby Harrick's commitment to raising awareness of issues related to hearing loss.

https://www.deafnessforum.org.au/events/libby-harricks-memorial-oration/

Have a say about Australian aviation.

The Australian Government has started a public discussion to shape Australia's aviation future.

What is called the *Green Paper* marks an important stage in developing the Aviation White Paper, which will set the policy direction for the aviation sector out to 2050.

The *Green Paper* includes a chapter on Disability Access (chapter 3.3). The chapter outlines a range of known barriers to travel experienced by people with disability and seeks feedback on ways to address them.

Public consultation is open until 30 November.

Further information, including ways to have your say, is available here.

Early this year, the Disability Royal Commission called for airlines and airports to improve the treatment of passengers with disabilities.

The Australian Airports Association's chief executive James Goodwin said that the industry was working to fix these issues, having launched a number of initiatives.

Qantas and Jetstar said in a joint statement that they are "working hard to improve the experience for customers with accessibility needs." Virgin said, "we know how important it is to ensure we make airline travel inclusive and accessible for all our guests."

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10,000 stories:

Disability Royal Commission.

The Royal Commission into Violence, Abuse, Neglect, and Exploitation of People with Disability published its final report.

4.5 Years

32 Public Hearings

17,824 Phone Enquiries

7,944 Submissions

Final report released on
29 September 2023

222 recommendations across **12 volumes**

The report is based on 10,000 stories from people who have experienced violence, neglect, and abuse. Many of these stories will never see justice.

222 Recommendations

- **Around 40%** fall within the direct responsibility of the Commonwealth.
- **Around 35%** fall within shared responsibility or interest of the Commonwealth, states and territories.
- **Around 25%** fall within the direct responsibility of states and territories.

1. Executive Summary and Recommendations: A 356-page summary. Jump to page 193 for direct recommendations.

2. Volume 1 - Voice of people with disability: Narratives from those who shared their experiences.

3. Volume 2 - About the Royal Commission: Details about the DRC's formation, the participants, and its processes.

4. Volume 3 - Nature and extent of violence, abuse, neglect and exploitation: Descriptions of the types of violence and abuse of people with disability.

5. Volume 4 - Realising the human rights of people with disability: Suggestions for legal frameworks to uphold the rights of people with disability.

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6. Volume 5 - Governing for inclusion: Strategies to prevent abuse and promote inclusivity.

7. Volume 6 - Enabling autonomy and access: Ways to support autonomy and access for individuals.

8. Volume 7 - Inclusive education, employment and housing: Inclusivity challenges in education, employment, and housing.

9. Volume 8 - Criminal justice and people with disability.

10. Volume 9 - First Nations People with disability.

11. Volume 10 - Disability Services.

12. Volume 11 - Independent oversight and complaints mechanisms.

13. Volume 12 - Beyond the Royal Commission.

What the Royal Commission told us

- **55 per cent** of people with disability aged between 18 to 64 have been **physically or sexually abused since the age of 15**. This is significantly higher than the 38 per cent of adults without disability in that age group.
- **Life trajectories and life outcomes** of people with disability can be significantly influenced by violence, abuse, neglect and exploitation.
- An estimated **400 deaths each year of people with disability aged 20** or above are **considered potentially avoidable.**
- **47 per cent of people with disability who are at the working-age are not in the labour force**, a rate that has not substantially changed in 25 years.
- **72 per cent of women with psychological or intellectual disability** have experienced violence or abuse since the age of 15.
- The Royal Commission has identified that violence against, and abuse, neglect or exploitation of people with disability **is estimated to cost the Australian economy at least $46 billion annually.**

From It's time to Listen by Evie Naufal and Jessica Quilty and materials provided by Royal Commission Task Force.

The Government did not react to any of the individual recommendations, instead announcing a taskforce to respond to the royal commission next year.

The inquiry has recommended phasing out segregated education and so-called special schools by 2051, segregated employment by 2034, and group homes by 2038.

The inquiry also recommended:

- Establishing a new complaints mechanism
- Changing guardianship legislation
- Creating a national disability commission
- Changing laws around sterilisation
- Improving accessibility to information and interpreters
- Reforming the way the justice system interacts with people with disability
- Increasing culturally-safe supports for First Nations people and removing barriers to the NDIS in remote communities.

DEAFNESS FORUM AUSTRALIA

The Annual General Meeting of the members of Deafness Forum Australia will be held online via Zoom on Thursday 30 November 2023 at 2pm AEDT, 1.30pm ACDT, 11am AWST.

Members will be asked to vote to:

- accept the minutes of the last AGM
- accept the annual report, auditor's report and annual financial statements
- appoint and pay an auditor
- consider updates to the Constitution
- elect directors.

The agenda and meeting papers will be emailed to members. Email us if you want to learn more at info@deafnessforum.org.au.

More than a Companion.

Rosanna McClifty (left) with Luna and her trainer, Mary Knight from Lions Hearing Dogs Australia.

Hearing dogs give their owners the opportunity to become more independent and have even saved lives.

Hearing dogs trained by Lions Hearing Dogs Australia alert their owners to sounds in the home by touching the owner with a paw - things like knocks on the door, a baby crying or the phone ringing. Hearing dogs alert their owners to life-saving sounds like smoke alarms.

Hearing dog recipient, Rosanna McClifty had just 17 months with her dog, a Papillion X Chihuahua called Luna before tragedy struck. Rosanna shares her heartwarming and heartbreaking story about her life with Luna and the special bond between them.

How did Luna, come into your life?

Rosanna: I met with an audiologist in Canberra for new aids, and he suggested a dog as well as aids. I had not known anything about this organisation that trains dogs for deaf people.

My home and yard had to comply with the standards set by Lions Hearing Dogs Australia. A trainer flew from Adelaide to deliver Luna to me.

What was Luna trained to do?

Luna would touch my leg to alert me to a phone ringing, door chime and knock, the microwave oven, alarm clock and smoke alarm. There is also the Go Get command my husband gives to Luna to get me should he have an accident as I would be unable to hear him calling.

You tragically lost Luna recently.

Luna was bitten by a Red Belly Black snake. She was taken to the hospital, given anti-venom, and numerous other drugs, but subsequently lost her fight when she had a cardiac arrest.

Luna was more than a hearing dog to me she was my constant companion 24/7. She went everywhere with me to work, nursing home, line dancing, exercises, Lions Club meetings, restaurants, clubs, hospitals. She had the same rights as a guide dog.

We both had a lot of respect and love for each other, even though she was a working dog there were times she was just a beautiful normal dog. When my husband was away Luna filled the void so then I could relax and sleep easier knowing she would alert me to any sound she needed to, especially the smoke alarm.

Luna was an excellent dog and we built a special bond that went far beyond what she was trained to do. The sense of security and devotion Luna gave me made me feel safe, secure and independent.

About Lions Hearing Dogs Australia.

Lions Hearing Dogs is a not-for-profit organisation that provides hearing dogs and training to hearing-impaired people throughout Australia. Hearing dogs come in different shapes and sizes. They are selected from dog rescue organisations and show the characteristics needed to become a reliable hearing dog.

Alcohol and other drugs, disability and overrepresentation in the criminal justice system.

Online event, Wednesday 25 October.

This webinar will highlight and explore innovative and collaborative responses to the range of intersecting issues contributing to the overrepresentation of particular population groups in the criminal justice system, including people with disability, Aboriginal and Torres Strait Islander peoples and people who use alcohol and other drugs.

Program, 1.00pm to 2.45pm Sydney time:

- **New Responses in Corrections:** a program to assess people at Canberra's Alexander Maconochie Centre for cognitive disability; and a one-on-one intensive case management pilot for a group of Aboriginal and Torres Strait Islander detainees.
- **From the Inside Out:** peer lead through-care that's community and family centred.
- **Fetal Alcohol Spectrum Disorder** and the criminal justice system.
- **Australian FASD Indigenous Framework**: Aboriginal Healing-Informed and Strengths-Based Ways of Knowing, Being and Doing.
- **Hey, Hear Me Out!:** Voices of Deaf and Hard of Hearing Mob on challenges at the interface of the NDIS, AOD services and the justice system.
- **Disability inclusive models of care** in the AOD treatment service sector.
- **Open forum with speakers and audience participation** discussing the presentations and mechanisms for forging new collaborations and pathways to achieve better health and social outcomes for people with complex and intersecting needs.

Register here by 24 October.

The Ear's Evolutionary Glitches.

The human ear is an amazing and complex system. It has two roles, hearing and balance.

The mechanical part of hearing is related to the normal movement of the eardrum, and the three bones in our middle ear that carry the sound vibrations to the inner ear.

In the inner ear, the sound waves are transformed into electric impulses that are sent to the brain, allowing us to hear. In contrast, birds and reptiles only have one little ear bone and no empty middle ear space. The human ear evolved this middle air-filled space to provide room for the three inner ear bones, and this evolved from ancestors with a much simpler ear anatomy.

The first evolutionary glitch is the development of the Eustachian tube – which connects the middle ear to the nose and throat and thus the outside, ensuring pressure equalisation and the clearance of secretions.

The Eustachian tube is made up of cartilage surrounded by soft muscle tissue. In children it is short, floppy, horizontal and functions poorly, leading to negative pressure in the middle ear and a build-up of fluid causing glue ear.

The maturation of the tube and its function is a gradual process during growth, which explains the high prevalence of glue ear in young children.

The second evolutionary glitch is caused by how the middle ear was created in the first place. Research in mice shows that the lining of the middle ear comes from two different types of tissues that were in the ear before the space opened: "endoderm cells" that are covered in cilia (hairs) and "neural crest" cells that are not. The lack of hairs in parts of the middle ear means they are less efficient at cleaning, leaving it susceptible to fluid accumulation and infections.

The third evolutionary glitch is related to the lack of maturity in the child's immune system against viruses and bacteria. Young children are exposed to many infections during the first years of life, typically from two to four years. Each infection leads to excessive mucus production in the upper airways and accumulation of liquid behind the eardrum causing glue ear.

How glue ear develops.

Because glue ear does spontaneously fix itself – most countries' clinical guidelines recommend waiting three months before any intervention. The most common form of intervention after this period is grommet surgery.

Long-term follow-up studies after grommet insertion show a high rate of recurrence of glue

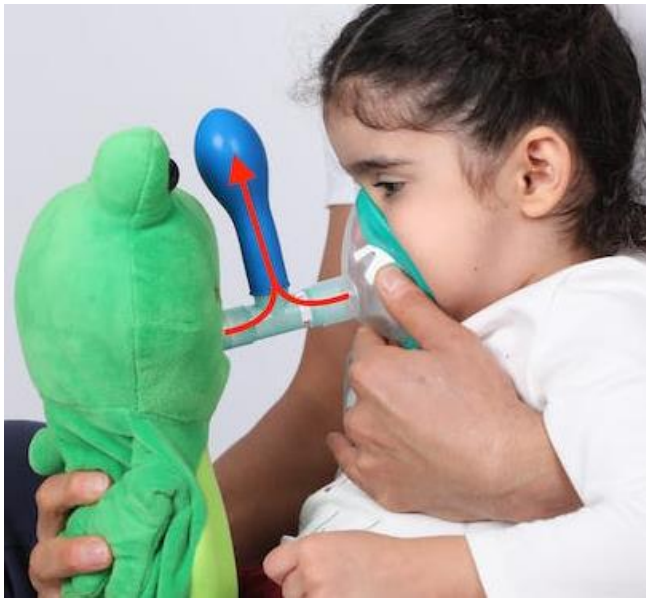
ear, increased risk of a permanently perforated eardrum, and a high chance of hearing loss in the higher frequencies in later life.

Auto-inflation.

There are, of course, alternatives to surgery, such as auto-inflation.

Auto-inflation dates back to the 17th century when Italian anatomist Antonio Valsalva described the Eustachian tube and the act of holding the nose and mouth closed and forcing air into the middle ear to remove negative pressure in the ear – something that adults do when flying or diving.

Several auto-inflation devices to treat glue ear in children were developed including the nasal balloon, first introduced in 1968 by Professor Hunt-Williams. All the devices focused on autoinflation by nose, which is efficient in adults but difficult to perform in children. So there is no consensus about the effectiveness of auto-inflation, and grommet surgery remains the most common surgery performed on children.



The new generation of auto-inflation device to treat glue ear. Dr. Armin Moniri, CC BY

The new generation of devices has a face mask that is used to cover the nose and mouth of a child. The mask is connected to a tube with a balloon on one end and a one-way valve on the other that allows air to enter.

The child can breathe in without resistance and every time they breathe out it inflates the balloon a little bit more, increasing the pressure and helping to open the Eustachian tube to balance the pressure and help ventilate the fluid out of the middle ear.

The new generation devices, which look like a toy, allow children as young as one year to be treated for chronic glue ear, with up to 80% of patients getting significant relief from the symptoms.

From The Conversation.

Know someone who deserves their own copy of One in Six?

Let us know via hello@deafnessforum.org.au