

**Hear4Tomorrow (previously Hear Today,  
Hear Tomorrow):**

**A school curriculum based hearing health  
programme**

**[Hear4tomorrow.nal.gov.au](http://Hear4tomorrow.nal.gov.au)**

**Prepared for the Office of Hearing Services  
Department of Health and Ageing**

Prepared by Irene Addison and Megan Gilliver  
**National Acoustic Laboratories**

November 2012

## **Preface**

The study presented in this report was conducted by the National Acoustic Laboratories (NAL) for the Commonwealth Department of Health and Aging (Office of Hearing Services, Hearing Loss Prevention Program). The overall aim of the project was to reduce the prevalence of noise-induced hearing loss in young people by promoting awareness of excessive sound exposure and educating primary school students on ways to minimise potential hazards to hearing health.

## **The Hear4Tomorrow (H4T) Research Team**

Dr Megan Gilliver, Research Psychologist

Dr Warwick Williams, Senior Research Engineer

Mrs Irene Addison, Education Officer (Departed Programme April 2012)

Samantha Youn, Project Officer (September – November 2012)

## **Acknowledgments**

The Hear4Tomorrow team acknowledges the invaluable support of a number of individuals and organisations who have assisted with the development of the H4T programme.

A number of National Acoustic Laboratories and Australian Hearing staff have provided assistance and input into the progress of the project. The team thanks Samantha Harkus (AH) for her contributions to work conducted with Indigenous schools and communities. The team also appreciates the assistance provided by NAL colleagues, particularly Technical Support Office, Greg Stewart and NAL Prevention team members: Dr Elizabeth Beach and Senior Audiologist, Lyndal Carter.

The programme would not be possible without the support and assistance of various education organisations. The NSW department of Education provided useful insights and feedback about the development of the programme, especially in the area of Health programme development. In addition, we thank the teachers and schools who provided feedback or participated in the evaluation of the programme for their time and support

The assistance received from a number of hearing health professionals and groups is noted within this document. Each provided valuable advice for the programme. The H4T team particularly acknowledges the generous support provided by Professor William (Billy) Martin and the rest of the Dangerous Decibels team. The Dangerous Decibels programme remains a model of high quality hearing health education for school students, and we are grateful for their encouragement and their willingness to share their knowledge and make their materials accessible as part of the H4T programme.

Finally, the team also acknowledges the financial support provided by the Commonwealth Department of Health and Ageing through their Hearing Loss Prevention Program, without which this programme would not have been created.

## Executive Summary

Increasingly there has been concern in the media and by hearing researchers that young people, (including school aged children) are being exposed to sounds which may be damaging to their hearing. As hearing loss is cumulative over the lifetime, early damage due to noise may often not be apparent until later years, leaving young people unaware that they may be risking their hearing health. Hearing loss prevention activities are therefore needed from an early age to raise awareness of the risk posed by noise and to promote positive hearing health habits. The Hear4Tomorrow (H4T) project undertook to fill this need.

The aim of the H4T programme was to develop a comprehensive educational programme which could be presented to children in primary schools and provide students with knowledge and skills to make informed decisions about their hearing health. General in nature, but able to be adapted to meet to the needs and experiences of different communities, the final programme was designed as an early intervention approach that could be seen as a base for any subsequent hearing health messages in later years (e.g. high school programs relating to MP3 use in young teenagers, club/pub music exposure for older teenagers, and workplace OH&S inductions).

The programme was developed based on sound health educational theory and makes use of specific activities that have been established as effective in promoting hearing health messages. Input from educational authorities at the teaching and policy/procedural level was sought in order to tailor the programme in ways that would be most acceptable to the target audience, namely primary school teachers.

The Hear4Tomorrow programme was trialled in both city and rural schools. Evaluations of students' knowledge and hearing health awareness were conducted prior to, immediate following, and at a three month follow-up. Results showed that student's knowledge of hearing health had significantly improved following participation in the programme.

The Hear4Tomorrow programme was effective at improving the students' knowledge about noise and its effect on hearing for both metropolitan and rural students.

- The H4T programme showed an increase in students' knowledge about the actual level of threat posed by common different sounds.
- After participating in the H4T programme students showed greater awareness of the types of sounds that may pose a risk to hearing.
  - Students identification of dangerous noises were more related to volume of the noise, and less to their "annoyance".
  - Students realised that it was not just personal listening devices that could cause damage but any music played over 85dB.
  - Student realised that rock concerts, school bands, car stereos can cause harm in certain circumstances.
- The H4T programme also increased the students' knowledge about which strategies may effectively protect hearing from the damaging effects of noise.
- The majority of students reported that they thought that the H4T program had improved their awareness of loud noise, their knowledge of protection strategies and their understanding of what decibels were.

Teacher feedback about the programme's implementation was also generally positive. Teachers thought that it was important that their students learnt about healthy hearing because students were involved in activities that were potentially hazardous or were using the "latest technology" which they viewed as dangerous. However, many teachers still expressed a concern about how congested the curriculum was, and acknowledged that hearing health was not a topic that was often considered. Teachers were more positive about a programme that could work within existing teaching requirements and that could be implemented easily into classrooms.

The programme was tested with schools in rural communities with high Indigenous populations. The program was generally well accepted by Indigenous professionals, with suggestions provided for promoting and enabling uptake within their and other communities. In most instances, suggestions were made for the H4T team to develop a strong basic programme that educators could adapt to meet the needs of their own communities and students.

The Hear4Tomorrow programme is one of many programmes that have been developed to educate students about hearing health and noise reduction, each with their own benefits and disadvantages. The best programme, however, will always be the programme that is embraced by its target audience and implemented. For the H4T team, this audience is both the students themselves and the teachers who will be the main decision makers as to whether to include H4T in their classrooms.

This programme has therefore been developed with the issue of sustainability as a major concern. Significant focus included fitting teaching messages to existing classroom requirements, providing necessary background information and notes, and including activities that suited to the resources currently available in classrooms. The result is an online resource that provides teachers with all of the necessary information to include hearing health lessons as part of their health programmes.

It should be noted that development of the hearing health education programme is only the first step. The ongoing implementation and dissemination of programmes relies on relevant community awareness and engagement, easy access by the audience to programme resources, and appropriate funding. Without these, there is a high risk that programmes will not be implemented or maintained, that resources will be underutilised, and that the education message will be subsequently lost.

## Table of Contents

Hear4Tomorrow (previously Hear Today, Hear Tomorrow):.....	1
A school curriculum based hearing health programme.....	1
Preface.....	2
The Hear4Tomorrow (H4T) Research Team.....	2
Acknowledgments.....	2
Executive Summary .....	3
RATIONALE .....	6
PROGRAMME DEVELOPMENT.....	8
Review of Programmes.....	8
Summary .....	10
Consultations with Relevant Personnel and Authorities.....	11
Health Promotion Theory.....	14
Development of Resources and Materials .....	14
Programme for Evaluation .....	15
Participants.....	20
Materials - Questionnaires.....	20
Results .....	23
The Final Programme. ....	33
FUTURE CONSIDERATIONS:.....	34
Sustainability – A Vital Concern.....	34
Hearing Health as a Priority - Building a Hearing Health Culture in Schools and the Community .....	34
Summary .....	36
DISSEMINATION OF FINDINGS .....	37
Community Presentations of the H4T Programme .....	37
Conference Posters & Presentations.....	37
Raising Awareness of the Website .....	39
REFERENCES .....	40
APPENDICES.....	42
Appendix A: Shaping Healthy Behaviours – The science of health promotion activities.....	46
Appendix B – Teaching Notes.....	48
Appendix C – Module Notes .....	64
Appendix D – Curriculum Details.....	94

## RATIONALE

Approximately one in six Australians are affected by some type of hearing loss (impairment of 25dB HTL in better ear within speech frequencies 0.5-4kHz) with this prevalence expected to rise to 1 in 4 by 2050 (Access Economics, 2006). The financial direct costs attributed to hearing loss (based on conservative estimates) were \$11.75 billion in 2005, and this is in addition to the indirect costs such as lowered quality of life, loss of leisure, and resulting disability have been suggested to total another \$11.3 billion (Access Economics, 2006).

Noise injury is believed to account for approximately one third of the costs associated with hearing loss and rehabilitation in Australia (Access Economics, 2006) with some form of high frequency hearing loss attributed to noise exposure experienced by 37% of all Australians over the age of 15 years (Wilson, Walsh, Sanchez, & Read, 1998). It has also been estimated that 10% to 15% of the Australians between the ages of 18 and 35 years of age are potentially at risk of a hearing loss caused by noise exposure (Williams 2011).

Historically, research has primarily been directed at examining noise exposure in workplace environments (WHO., 1997; Neitzel, Sexias, Goldman, & Daniell, 2004). In Australia, the National Occupational Health and Safety Commission (NOHSC) have developed the Standard for Occupational Noise which outlines acceptable workplace noise exposure levels. The current national standard (NOHSC 1007, 2000) sets acceptable noise exposure as being a LAeq, 8hr of 85dB, with a limit of 140dB as a maximum peak level. That is, workplaces are required to make steps to ensure that the noise to which their staff is exposed does not exceed the equivalent of an average of 85 dB over an 8 hour day. Decibels are measured on a logarithmic scale where an increase of 3dB is seen to represent a doubling of the sound level, thus halving the “safe” time for which exposure can occur. Thus an acceptable daily exposure of 85dB for 8 hours limit is equivalent to 4 hours at 88dB, 2 hours at 91dB, or a maximum of 15 minutes at 100dB.<sup>1</sup>

The limits described may be used as a guideline for measuring risk of hearing loss across all noise exposure environments, regardless of whether the source or the setting is work or leisure related. It is important to note that the hearing system does not differentiate between different sound sources. Music or leisure noise at high volumes and durations is as likely as “workplace” noise to cause hearing damage. As such, the former has come under increasing scrutiny for research and hearing professionals.

<sup>1</sup> It should be noted that the exposure standard of L<sub>Aeq,8hr</sub> 85dB is an acceptable rather than a risk-free exposure level. In fact it is estimated that 74% of individuals exposed at this level over the course of 40 years at work would, on average, suffer a 6% loss. (AS/NZS 1269,4; 2005). This level also assumed that noise exposure outside of the workplace is negligible. For both of these reasons, the 85dB8hr guideline is definitely best viewed as a maximum rather than a safe level

It is now recognised, that young people may be exposed to potentially hazardous sounds in some recreational settings. Engaging in leisure and recreational activities such as listening to loud music, using power tools, using leaf blowers, shooting, and riding quad bikes have also been documented as being hazardous to hearing (Marshall and Brandt 1974; Rabinowitz 2000; Bistrup, Hygge et al. 2001; Maassen, Babisch et al. 2001; Bohlin and Erlandsson 2007; Peng, Tao et al. 2007; Williams 2011). Further, there are increasingly numerous activities for young people to be engaged in that have the potential to pose a risk to hearing. Advances in technology, and changes in leisure patterns may also contribute to the number of young people engaging in high noise activities.

In addition, the media and community often highlight MP3 players as posing a hazard to hearing, with reports suggesting that usage of such devices at high volumes can cause noise injury. Recent studies indicate that the output levels from personal music players vary, with measurements placing maximum levels in the range of 97-107dBA (Keith SR 2008; Keppler, Dhooge et al. 2010; Williams and Purnell 2010) depending on the style of player and earphones/headphones used. Such measurements show the potential for these devices to cause harm (dependent on actual listening levels and duration of use) and that usage has also been linked to temporary threshold shifts (Keppler, et al. 2010). The widespread use of such devices across the population (particularly for younger listeners), equates to large numbers of young people who may be potentially at risk from their listening habits even if only a small proportion of users are listening at durations and levels that are potentially dangerous for hearing (Carter 2011).

Thus, young people have the potential to be commencing behaviours that are exposing them to high levels of dangerous noise during their schooling years prior to the commencement of any work (and in many cases, prior to any formal hearing conservation instruction). There is a real need to provide appropriate levels of education and information to children early so that they are better equipped to make wise decisions about their hearing health as they grow and are confronted by a wider range of noisy environments and activities.

The insidious nature of a noise injury means that most people are unaware of any developing hearing loss until it begins to seriously impact on day-to-day life. At present there is no cure for reversing the effects of noise damage. Many young people have the potential to be exposed to dangerous levels of sound, often without being aware of the possible negative impacts. Therefore, education is the key to preventing noise injury; ideally before bad exposure habits are created. The Hear4Tomorrow programme was developed with this aim in mind – to develop a programme with the potential for reaching a large number young people, prior to dangerous exposures, and educating them about how to protect their hearing for life.

## PROGRAMME DEVELOPMENT

### Review of Programmes

As part of the development of the H4T programme, a variety of health education programmes and resources (previously developed for, and conducted with, school children) were reviewed to identify elements of importance in developing a successful hearing health programme. This included evaluations of specific activities for adaptation for the H4T programme, as well as reviews of issues influencing different programmes' sustainability. A brief summary of some of the hearing related programmes investigated follows.

**Listen to Your Buds:** A US, web-based public education campaign developed by the American Speech Language Hearing Association (ASHA). The programme specifically targets children's use of personal music players, and is generally aimed at teaching parents how to encourage their children to participate in healthier hearing behaviours. The website contains a number of informational resources for parents who are seeking information on noise and hearing. The website also has a section for educators which provides suggestions for teaching hearing health in the classroom, and gives links to other hearing health education programmes.

**WiseEars:** A US based programme developed by the National Institute on Deafness and Communication Disorders (NIDCD). Wise Ears was first developed in 1999 and contains information for those wishing to educate children about hearing health behaviour. The WiseEar site was quite outdated at the time the H4T programme development began. However, a new campaign "It's a Noisy Planet" has recently been launched with a similar focus on providing informational resources for those seeking to help 8-12 year olds protect their hearing. Interactive activities on the site have also been updated to reflect the target audience. It is interesting to note that following an evaluation of WiseEars, Blessing (2008) recommended that hearing health programmes have their messages regularly updated and targeted at particular groups to be more effective. This advice emphasised the need for web based programme sites and messages to be monitored, evaluated and updated on a regular basis.

**Cheers for Ears:** A West Australian hearing health programme focussing on leisure noise exposure, particularly that from personal music players. The program gives schools the opportunity to invite an associated Cheers for Ears educator into their classrooms to teach students about hearing health. These visits are conducted at no cost to the school, and last approximately one hour.

**Hear 2day (formerly Hear 2day Gone 2morrow):** An Australian based outreach programme, primarily focussing on education about noise exposure from personal stereo players. Hear 2day also run classroom workshops, staffed by volunteer educators where children are taught about hearing health and have the opportunity to measure their own music player levels.

The advantages of the format for these latter two programmes is that the educator is a so called "expert" on the topic and can bring in novel equipment (that may not otherwise be available to teachers or students) to demonstrate the message to the students in a memorable and engaging way. Educators can either be volunteers or paid members of the organisation. However, the disadvantage of programmes like these is that they may not be available to all students as there will generally be a limited number of educators available to teach the programme at any one time. Furthermore, programmes may not be available in all areas or may be too expensive for some schools if a fee is charged for the visit. This can particularly be a problem for remote, rural areas or disadvantaged communities where there may be limited access to the necessary resources at a time that is optimum to fit in with the hearing health unit being taught.

**Dangerous Decibels:** The highly successful U.S.-based Dangerous Decibels<sup>2</sup> outreach program has been developed to include a wide range of activities including museum and virtual exhibits, educator training, and research studies. The school based component is taught by volunteers who themselves are specifically trained to teach the Dangerous Decibels programme to school children. This project also provides material online to support both teachers and students who may be unable to access the outreach programme. Some teaching activities are available in an Educators Resource Kit, and are supported by online interactive activities.

This is a well-balanced programme that uses a science focus to deliver a thorough hearing loss prevention message. Unlike the other programmes mentioned, the Dangerous Decibels programme incorporates messages across a range of activities, rather than a specific focus on one, such as mp3 player usage. Other major advantages of this programme include its research and evidence based foundation, use of interactive activities, its commitment to remaining current through regular updates. Further, the programme itself has undergone thorough evaluations (Griest, Folmer et al. 2007; Griest 2008).

With such a strong base program available, and a proven track record, the Dangerous Decibels was particularly worthwhile to emulate when developing an Australian programme.

<sup>2</sup> Oregon Health & Science University- Dangerous Decibels © 2008-2011. The resources for this program are available through their website and are available for education purposes. How Loud Is Too Loud? and What's that Sound? are two activities on the virtual exhibit that are mentioned throughout this report.

## Summary

After reviewing the above programs and other related programs (Burnley 1993; Chermak, Curtis et al. 1996; Griest, Folmer et al. 2007) it was evident that most included a variation on similar themes. Many of these relate to what have been described as the core elements of NIHL prevention programmes previously described by Lass et al (1987). These include teaching about the hearing system, hearing loss and causes, the effect of noise on hearing, potential warning signs of noise induced hearing loss and advice on how to prevent noise induced hearing loss.

However, although most had been well accepted, and some had been shown to be effective in raising awareness about noise and hearing issues, few had shown strong longevity and many had made little to no attempt at evaluating effectiveness. In contrast, Dangerous Decibels represented a programme that was not only based on strong evidence, but also was being continuously evaluated and updated. This high level of ongoing assessment and refinement of the programme therefore made it highly desirable as a model for the H4T programme.

Reviews of previous or existing programmes have shown that the difficulty in their development is not the creation of activities, or a relevant message (many of these have been developed and re-developed many times). Rather, the difficulty is in packaging the necessary message in a way that is acceptable to the target audience. A programme can only be effective if it is actually used and attended to. In our case, there existed two target audiences: the students to which the prevention message is aimed and also (perhaps more importantly) their teachers. It is the latter group's interest, and engagement in the program which is likely to be most vital for it to be willingly implemented and therefore have a chance of bringing about change.

The focus of the Hear4Tomorrow programme was to build upon existing educational resources previously developed and tested to teach hearing health. It was thus developed around recommended, tested, core components including; noise and its effect on hearing, identifying potentially dangerous noises or activities, understanding strategies for preventing hearing loss, learning background the structure and function of the ear, and what it would be like to experience hearing loss. In addition by developing the programme with a link to existing teaching activities, an emphasis was placed on identifying those factors most likely to influence uptake by educators. This was conducted via ongoing consultation with key education professionals – both within the field of hearing health education specifically, and more generally in the field of education.

Developing the programme is an important first step. A programme must be appropriate for the target audience, contain up-to-date interactive activities and use relevant, current technology. One of the key challenges facing a programme is sustaining the programme past the initial dissemination and implementation phase. Decisions and compromises need to be made in order to balance short-term impact and effectiveness with long term viability.

## Consultations with Relevant Personnel and Authorities.

It is important when developing and designing a programme for school children that the relevant educational authorities (e.g. Department of Education, classroom teachers etc) be involved in consultations prior to and during development. Ideally this should happen throughout the project but it is especially useful in the earlier stages of development as it allows for the major stakeholders' viewpoint to be factored into the project in a way that is likely to improve sustainability of any programme long term. For this reason, comments and feedback were sought from the educational professionals throughout the programme development phase. Initial discussions with the NSW Department of Education suggested that if a hearing health programme was to be developed, it should ideally focus around the Personal Development, Health and Physical Education (PDHPE) Syllabus (Board of Studies, NSW: 2007), and incorporate the related outcomes as part of its structure. In this way the programme could be used by teachers to meet existing teaching requirements, and would be likely to be viewed more favourably than one that is seen as additional to existing teaching objectives. Therefore it was deemed prudent to highlight how the H4T programme could be integrated with key learning areas (for all states) so that teachers were not left with the wrong impression that it was a new area that required separate teaching on top of existing requirements.

The Department representatives also highlighted the need to be aware of the limited time available in an already congested curriculum, and that hearing health/noise would only be viewed as one small aspect of the overall teaching goals. For this reason they strongly suggested that a shorter "to the point" programme would be more likely to be accepted by educationalists, especially those with no prior knowledge of hearing issues, than a programme requiring extensive implementation.

Further, the concurrent development and implementation of a National Curriculum meant that all complex programmes were potentially at risk of being incompatible with the upcoming new syllabus. For this reason, a shorter "to the point" programme was suggested as most likely to be easily adapted to changes in policy as it was developed and rolled out over 2012-2014 across all Australian States and Territories.

Discussions were also held with interested Itinerant Support Teachers (Hearing), a group already involved in some aspects of hearing health education in schools. These teachers work with students who have a confirmed hearing impairment across all educational settings in NSW government schools and provide support for students, their teachers and families. In this role they are often asked to provide healthy hearing education prevention messages to students and staff. Their knowledge of schools and schools' needs and their expertise in the field of hearing within the educational context made them a valuable sounding board for hearing health education activities.

Discussions with a group of these education professionals found that most thought a programme that taught students about noise injury was important and would be well received by their schools. After discussing the components and activities that were proposed for inclusion in the programme they suggested that the programme had merit and the proposed style would be suitable for the audience, garnering positive feedback - "Looks like a wonderful program every student should be involved in."

Another group of potentially helpful educational allies are student teachers, a group who are often seeking resources and teaching programmes as they become more involved in the education system. To find out more about the needs of this group, discussions were held with a university lecturer who teaches in the area of PDHPE for education students. The lecturer advised the H4T team that there was a preference for providing students with example programmes from established organisations that kept their information and resources up to date. The main focus was on introducing students to resources that are likely to be well regarded, of high quality, and would be accessible well past the students' commencement of teaching. Thus, student teachers may be a useful target in terms of promoting awareness of hearing health campaigns, but require the programme's dissemination to be managed carefully. To interest this group effectively a programme needs to be reliable for current and future information seekers.

Contact was also made with a number of people working in the hearing health field in Australia generally. Some were involved in developing healthy hearing programmes such as Paul Chang and Natalie Leishman. Others were involved with different hearing/deafness organisations for example Australian Hearing/National Acoustic Laboratories, the Deafness Forum, the Tinnitus foundation. Formal and informal information provided by all of these groups assisted to build a current picture of where hearing awareness and education was currently at in Australia, the main focus of different programmes, and the resources provided by each.

### **Key Issues identified by other researchers / interventionists**

The H4T team also conferred with developers of other programmes to discuss with them some of the successes and sticking points they came across when developing and implementing their campaigns.

In particular, one such contact (Kathy Webb, Executive director of Sight and Hearing Association America) clearly outlined some of the issues that they had faced with a similarly focused programme “Know Noise” (<http://www.sightandhearing.org>) developed to educate children about noise induced hearing loss. Her comments, below, indicate many of the issues face by health programmes being introduced to schools.

1. Ongoing distribution of the program: “After the first couple of years [a difficulty we had] was that many schools were not mandated to include hearing conservation in their curriculums – and it’s a struggle to find teachers who will work outside the box to include this in their yearly lesson plans and then they need approval from their schools administration, etc.” Thus they found that after the initial “honeymoon” period of distribution, interest from schools waned, especially in situations where the program was viewed as additional to rather than as a part of teaching requirements.

2. Implementation of the programme. “Most schools would ask our staff to come in and provide the teaching of the curriculum, but that became a cost-prohibitive venture for us, since we did not receive funding from the schools or outside sources to provide this service. It seemed it would be a natural fit for volunteers, but that was problematic, as well. So a few years later, we developed a “peer education” program, which we thought would help address issues the “teaching” issues that we were struggling with, but also help the older students retain the information and in turn, provide a positive role model to younger students, who in a few years could also teach the curriculum. It started out as a good experiment, but the momentum didn’t stay because it took too much coordination among teachers in the different grade levels and it was quite labor intensive for our staff to try and coordinate and educate the teachers and older students – our model was 8<sup>th</sup> graders teaching 3<sup>rd</sup> graders.” These types of comments reinforce the concerns that may face programmes which rely on volunteers (or paid staff) to visit schools and run the program. Finding, training, and keeping staff (be they students or professionals) becomes a potential sustainability difficulty.

3. Maintaining resources to keep programme current. “Because we are a very small non-profit and the U.S. is experiencing a tumultuous economy, our budget constraints leave this project as a low priority for updating... our primary focus is screening children for vision and hearing issues.

Another difficulty that was mentioned by some professionals was the impact of a change in “champion” or key person for an activity. This was a fall over point for some programmes – inability for the programme to continue after the original instigator (or “champion”) moves on led to poor sustainability. Evidence for this was seen in a programme developed by Chermak in 1996 which was not ultimately implemented due to a change in focus by the lead. In contrast, Operation Bang, a hearing loss prevention programme created in 1991, was sustained after its chief instigator left. Schultz commented that after she left “others took it on [and] it became more than I could have imagined.” Schulz attributed this to the cooperation received from key personnel. Therefore it is important that programmes be developed within sustainable organisations or institutions, and they should not be reliant on a single developer.

As discussed, one of the most successful hearing health programmes reviewed (in terms of effectiveness and longevity) was the Dangerous Decibels program. The developers and experts associated with this programme provided valuable insight into the challenges of developing their hearing health programme. Their documentation of the processes they had previously undergone, as well as the availability and access to their resources was extremely helpful in gaining experience in developing the H4T programme. The programme is widely recognised as an effective hearing health outreach and having personal contact with all members of the team and their willingness to share their knowledge and experiences was invaluable. A number of discussions with this team enabled the H4T to be developed, based on the Dangerous Decibels Program in a way that utilised its successful elements while enabling it to be adapted to meet the outcomes of the Australian education syllabus and to allow it to be taught by classroom teachers rather than dedicated hearing health educators.

## **Indigenous Considerations**

Conversations and meetings were also held with members of Indigenous Communities in Lismore, Kempsey and the Northern Territories (AGS & S Fatnowna Education Consultancy, Dalaigur Pre-School and Children's Services, Mission Australia, Ngulingah LALC, Dharah Gibinj Casino Aboriginal Medical Service, Durri Aboriginal Corporation Medical Service, and Phoenix Consulting). Although Otitis Media was a major issue requiring the most attention from those involved, those consulted thought that a programme teaching students about the dangers of noise and strategies to protect their hearing was useful and would complement existing hearing health strategies (including those relating to OM). Teachers and Aboriginal education officers who experienced the programme thought that the interactive activities were ideal for engaging the interest of their students. However, each community stressed the need for the programme to be developed with local input, using local examples and the local language. Such comments suggested that it was important for the programme be developed with a detailed format allowing educators to easily access the message. But the format also needed to be flexible enough for it to be taught across different cultures and contexts in a way that was relevant to each. That is, the programme should provide a strong base with options that allow changes to be made to best reflect the community involved.

## **Summary**

Based on experiences for other programmes, it was decided to develop a programme that could be taught by teachers and integrated into the curriculum as a cost effective way of educating a large number of students. This decision was made in order to allow the program to reach a wider audience than one relying on "outside" teaching. A teacher-driven programme which is not reliant on outside assistance provides a better opportunity that the programme will continue past the initial development stage. However, it brings with it a stronger need to be teacher-friendly so that it may be incorporated without specialist knowledge into existing lesson plans. Thus the programme was developed with these factors in mind.

## Health Promotion Theory

The information gained from literature and programme reviews, alongside key health promotion theory was used to identify key areas or components requiring education for a hearing health programme. These included teaching students about the need for and ways of protecting their hearing. In order to motivate health behaviour changes, individuals need to be made aware of the risks they are exposed to, the impact this may have on their health, and the ways in which they can avoid or minimise their risk exposure. For this reason the H4T programme sought to include activities which teach students about the reality of hearing loss, the threats to hearing from noisy activities, and ways to estimate, measure, and avoid these risks. An outline of the relevant health promotion theory is included in Appendix A, Shaping Healthy Behaviours. Activities were sought out, developed and included to cover each of these components.

## Development of Resources and Materials

It has already been highlighted that many resources are already available for teaching children hearing health (Folmer, 2002; 2008). In reviewing past programmes, a search was conducted to identify existing resources, examine their availability, and assess their quality, to determine their suitability for inclusion in an Australian primary school programme. From this search a number of activities were selected for each component for possible inclusion in the hearing programme. Activities were selected if they were thought to be appropriate for the Australian classrooms, interactive and engaging, effective at communicating the outcome, if they could compliment other activities to give a balanced programme, and if they were available for modification from original developers for inclusion in the H4T programme. Activities were examined against the following criteria; ability of the activity to achieve the outcome for that component, level of positive student feedback, the time the activity took to complete, "teacher friendliness", and whether the activities would be suitable teaching to a class group. In such a way, a short list was created to pilot for inclusion in the final H4T programme. These activities were assessed against criteria set by teachers, and engagement levels of students as outlined below.

## Teacher Input

As one of the aims of the project was to develop a programme that classroom teachers felt able to teach, an on-line survey was developed to examine teachers' preferred characteristics of a hearing health education campaign. This survey was sent to a number of schools and teachers through personal and professional contacts. However, only twenty-two teachers responded to the survey and provided recommendations about the preferred content, structure, and those materials viewed as most suitable for a successful program to be implemented. The low response rate was disappointing and is likely to once more reflect the low priority placed on hearing health matters both in schools and the general community.

Regardless, results of the survey showed that teachers who did respond were generally favourable regarding the inclusion of hearing health material in classroom activities, specifically in relation to the health teaching areas of risk assessment and the need to make students more aware of the reality of consequences resulting from unsafe listening habits. Teachers also commented on some of the practical issues of promoting the up- take of a new programme in schools. Key concerns included access to high quality, up-to-date resources (preferably online), and the need to structure programs around existing teaching/syllabus requirements. Teachers also noted that limited time and financial resources were available to kick start new programmes within schools. They suggested short, integrated units were more likely to succeed and be taken up by educators, and thus have higher sustainability. Furthermore, as there may be limited budgets in place to purchase new materials for programmes, the resources needed to run a program should be easily and relatively cheaply sourced (61% of teacher respondents indicated a budget limit of approximately \$50).

## **Student Feedback**

As part of the evaluation, activities were piloted with a small group of ten students, divided into two age groups; middle primary and upper primary. After completing all of the activities the children were asked to rate the activities for each component. Student engagement, preferences and feedback was noted for consideration in the finalisation of programme activities as shown in Table 1, below.

## **Programme for Evaluation**

The final H4T programme took into account student and teacher feedback, suggestions from involved and interested parties, and the insights and experiences from other related programmes. When finalising the activities for the programme, it was important to ensure that there was a range of activities that could provide a balanced and varied learning experience for students. This meant that all activities were considered in the light of the larger H4T programme's needs. For example, even though a specific activity might have been preferred by students, another equally effective activity may be selected for inclusion instead in order to balance the programme in relation to other needs. Table 2 outlines the programme that was developed from these comments.

The programme was then prepared for a larger scale evaluation in schools, with the aim of developing students' knowledge and understanding of how safe listening practices promote personal well-being; and their ability to recognise the need for safe listening practices in a range of situations and activities; and confidence to select the most appropriate strategy to protect their hearing.

**Table 1** Components of the programme piloted with primary students, and comments on their suitability.

Activities marked by \* were selected by students as preferred activities.

Lesson Component	Activities Piloted	Student response
<b>What is it like to have a hearing loss?</b>	*Dangerous Decibels – What’s that Sound <a href="http://www.dangerousdecibels.org/exhibit/virtual-exhibit/">www.dangerousdecibels.org/exhibit/virtual-exhibit/</a>  NIHL simulator developed by NAL.	Interactive, age appropriate for target group, enjoyed by students, smart board allows class involvement.
	Video Preserving your Hearing <a href="http://www.sens.com/pyh/index.htm">http://www.sens.com/pyh/index.htm</a>	Better for older age group, students just watched and did not have to interact with group. Individually very effective but not classroom friendly.
<b>How do we hear?</b>	Poster of the ear with teacher explanation.	Teacher can target this to meet the needs and knowledge of the students.
	*Video clip Working Ear <a href="http://www.hearingcharities.org/about-hearing-loss/working-ear.html">www.hearingcharities.org/about-hearing-loss/working-ear.html</a>	Effective providing it is accompanied by teacher led discussion.
<b>What effect does noise have on our hearing?</b>	To model the effects of noise on the hair cells in the inner ear. Using Pipe cleaner to model damage to hair cells.	Both of these activities were effective. The students believed they could “fix” or straighten the pipe cleaners. Pipe cleaners were a little more difficult to obtain.
	*Using uncooked spaghetti to model damage to hair cells	The use of the spaghetti was a little bit messier, cheaper and easier to obtain.
<b>How loud is too loud?</b>	*Sound level measurement of a number of items	Allowed students to measure personal items. Sound level meters cost about \$50. Students could work in groups depending on number of meters.
	Measurement of personal music players using Jolene mannequins	Cost \$100 and teacher would need to construct the mannequin. Better suited for older students or individual student project.
	*Dangerous Decibel How loud is too loud? <a href="http://www.dangerousdecibels.org/exhibit/virtual-exhibit/">www.dangerousdecibels.org/exhibit/virtual-exhibit/</a>	Interactive and well-liked by students. Could be used if sound level meters were unavailable or complement measurement activity.
	Resource card	Although this activity could be used here and is more flexible than the Dangerous Decibel activity above it is less exciting for students and is better used in either the brainstorming activity at the beginning or the strategy activity below.
<b>How do we protect our hearing?</b>	Students brainstorm strategies to protect their hearing and identify when they might use each strategy.	Resource cards may be used in conjunction with brainstorming strategies regarding how students might protect their hearing and identify when they might use each strategy.
	*Students are asked to design a poster about how to protect their hearing. Write play or report.	Effective. Could be integrated into English or Creative and Practical Arts.

**Table 2.** An overview of the H4T programme used for classroom evaluations. (The outcomes selected are based on the general outcomes in state health syllabus and curricula documents)

Component	Outcome Students will be able to:	Student activity
<b>Intro. What do you know about your hearing?</b>	Explore current knowledge and attitudes about healthy hearing and what they want to learn.	Brainstorm what students know and want to know.
<b>1.What is it like to have a hearing loss?</b>	Appreciate what it is like to have a high frequency hearing loss	What is that sound? <a href="http://www.dangerousdecibels.org/virtualexhibit.cfm">www.dangerousdecibels.org/virtualexhibit.cfm</a> NAL Hearing Loss simulations.
<b>2.How do we hear?</b>	Understand how the ear works.	Using a diagram of the ear the teacher explains how the ear works.
<b>3.How loud is too loud?</b>	Identify loud sounds or activities.	Measuring sounds using a sound level meter. Explain how listening to loud noises is effected by time. Then using <a href="http://www.dangerousdecibels.org/virtualexhibit.cfm">www.dangerousdecibels.org/virtualexhibit.cfm</a> “How loud is too loud students estimate the how loud the object is, how long they can listen to it for and whether it will could damage their hearing.
<b>4.Protecting our Hearing</b>	Identify potentially hazardous situation Identify strategies to protect their hearing	Using a selection of the resource card brainstorm with students about how to protect their hearing in different situations.

## PROGRAMME EVALUATION

### Participants

Schools within metropolitan Sydney (both public and private) were invited to participate in evaluations of the H4T programme. A variety of methods were used for recruitment including contacting teachers, regional directors, principals, and schools via telephone, email, mail outs, and personal visits. However the interest of schools and teachers was found to be low, with poor uptake. Recruitment was also conducted through available contacts including parents, audiologists, and community health workers, and this method was found to generally yield more positive, albeit average, recruitment results. Once more, this appears to reflect the general low awareness of hearing health in the community as a priority – except for where personal interests are involved.

In total, eight schools agreed to participate in the evaluation phase, representing a wide range of school environments. The schools were equally divided between Metropolitan Sydney and the New England North West region of New South Wales. There were five public schools, two Catholic schools and one independent school. A total of 398 students and 15 teachers participated in the evaluation phase of the programme.

### Materials - Questionnaires

Participating students and classroom teachers were asked to complete questionnaires to evaluate the impact, relevance, and effectiveness of the programme. A description of the questionnaires follows, with questionnaire items shown in Table 3.

Students participating in the programme were asked to complete a pre questionnaire prior to the commencement of the program and a post questionnaire at the conclusion of the lesson. A follow up questionnaire was also administered three months after the programme was taught. Questionnaires were purposefully designed to be quiz like and were limited to a few key questions in deference to participants' young age and the limited class time available. All questionnaires included items about whether students could identify: loud sounds, sounds that could be potentially damaging to their hearing, and ways to protect their hearing from noise. Students were also asked if they thought that music had the potential to damage their hearing. In addition the pre-questionnaire asked students to identify why they thought their hearing was important, the post questionnaire asked students to provide feedback about the programme (e.g., identify something that they had learnt and an activity that they had enjoyed), and the follow-up questionnaire measured students' application of hearing health knowledge (e.g., asking students how they would protect their hearing at a disco and what message they would tell others about protecting their hearing).

**Table 3:** Items included in Student Questionnaires.

Questionnaire	Items
<b>Pre</b>	<ol style="list-style-type: none"> <li>1. What is the loudest sound you have heard?</li> <li>2. Why is it important to have good hearing?</li> <li>3. Name 2 sounds around your home, school or community that might be loud enough to damage your hearing?</li> <li>4. Do you think that listening to loud music will damage your hearing? Yes, no, unsure.</li> <li>5. Circle which of the following will protect your hearing from noise? Walk away from the loud sound. Put tissues in your ears. Turn the volume down. . Listen to loud music until your ears get use to it. Use ear plugs or ear muffs. Listen for a short period.</li> <li>6. Circle the sounds that may damage your hearing. Lawnmower, school disco, firing a gun, television, reading a book, tractor, blender, power tools, motor bike, listening to music, watching movies, road traffic.</li> </ol>
<b>Post</b>	<ol style="list-style-type: none"> <li>1. Circle the sounds that can damage your hearing? Dishwasher, music at a disco, lawnmower, school band. Talking. Rustling leaves, tractor, factory, whistle, library, restaurant, walking in the park, starting gun at carnivals.</li> <li>2. Name one thing that you have learnt today.</li> <li>3. Name 2 sounds that you may hear that are loud enough to damage our hearing.</li> <li>4. Circle which of the following will protect your hearing from noise? Walk away from the loud sound. Put tissues in your ears. Listen to loud music until your ears get use to it. Turn the volume down. Use ear plugs or ear muffs. Cover your ears with your hands.</li> <li>5. Which activity did you enjoy doing?</li> <li>6. Will listening to music damage your hearing? Explain why you think this.</li> </ol>
<b>Follow up</b>	<ol style="list-style-type: none"> <li>1. Is it important to protect your hearing from noise? Yes No because....</li> <li>2. Do you think that loud music will damage your hearing?</li> <li>3. Circle all the ways that you think might protect your ears from loud noises? Walk away from the loud sound. Put tissues in your ears. Turn the volume down. Listen to loud music until your ears get use to it. Wear ear plugs or ear muffs. Listening to sounds for a short period.</li> <li>4. Circle the sounds that may damage your hearing. Lawnmower, school disco, firing a gun, television, reading a book, tractor, blender, power tools, motor bike, listening to music, watching movies, road traffic.</li> <li>5. If you were a teacher what is one message you would want to teach someone about protecting their hearing?</li> <li>6. If you were going to the school disco where there is loud music, (91dB) how might you protect your hearing? Wear ear plugs. Stand near to the speakers so that your ears get used to the sound. Stand as far away from the speakers as possible. Only stay for a short time.</li> </ol>
<b>Teacher Feedback</b>	<ol style="list-style-type: none"> <li>1. Do you think that your students need to learn how to protect their hearing from loud noises? Is it a real problem?</li> <li>2. What are some of the activities that your students participate in that may be hazardous to their hearing?</li> <li>3. In relation to other health prevention subjects for example drug, smoking, skin cancer, healthy eating, do you think that there is room in the curriculum for hearing? If so how much?</li> <li>4. What outcomes/indicators do you see this program addressing?</li> <li>5. This PDHPE unit lends itself to be integrated with other Key learning areas. Which key learning areas do you see it integrating with?</li> <li>6. What activities were most effective for your students?</li> <li>7. What support would you need to be able to integrate this program into your class program?</li> <li>8. Who do you see as the best person to teach a hearing-loss prevention program?</li> <li>9. Classroom teacher      audiologist      educator      community health worker</li> <li>10. Other _</li> <li>11. Other comments or recommendations.</li> </ol>

All questionnaires were read to the class by the educator to help eliminate difficulties students might have with reading or following written instructions. This method enabled the questionnaires to be delivered prior to and directly following the lesson by the educator, eliminating the need for teachers to administer the questionnaire and return the results. For the students, the quiz like nature of the questionnaires resembled something that they might previously had experienced as an evaluation type exercise in class making it a familiar experience for them.

As discussed, an important aspect in the development of the H4T programme was liaising with teachers to gather their thoughts about the programme. This was done to enable modifications to be explored in order to suit teachers' needs in order to encourage long term uptake of the programme. Therefore classroom teachers who were present for the entire lesson during evaluation sessions were invited to complete a questionnaire about the effectiveness and suitability of the programme. Questions were developed to determine teachers' thoughts regarding: the importance of hearing health and its need to be included in curriculum, the effectiveness of the programme in addressing syllabus outcomes, the ability of the programme to meet students' needs, abilities, and interest, and the perceived teacher friendliness of activities. A pre-paid envelope was provided so that each teacher could complete questionnaires and return at a time convenient to themselves.

## **Programme overview and teaching procedure**

Each class participated in the 45 minute interactive program taught by the same educator. At the start of the lesson all students were asked to complete the pre-questionnaire.

The educator then worked through each of the activities shown in Table 2 as follows:

1. Introduction: The preliminary discussion was limited to five minutes, with the teacher prompting students by asking questions like, how do we care for our ears, do you know anyone who has a hearing loss, what things cause people to lose their hearing?

2. What is it like to have a hearing loss? This online activity requires students to choose the picture that matches different sound clues. The sounds can be played with or without the simulation of a hearing loss, and for this activity, students were asked to verbalise the difference between them both. Students were given the opportunity to do different sounds individually or with a classmate, and encouraged to try again if at first unsuccessful. The teacher initiated discussions that included the difficulties faced by someone with hearing loss, with an emphasis on the resulting communication difficulties

3. How do we hear? This discussion was guided by the students' prior knowledge. For students who knew how we hear it was just a refresher to make sure that the information was correct, for students who had less understanding a greater detailed explanation was given.

4. How loud is too loud? This section included two activities, hands-on-measurement and an online quiz. First children were taught how to use a sound level meter and were encouraged to measure different sounds in their surroundings in small groups<sup>3</sup>. After 10 minutes students reunited as a whole class and discussed their discoveries. Through these discussions, students were introduced to the concept that it is both the volume and the duration of sounds which determine how dangerous they are for hearing.

Students were then introduced to the Dangerous Decibels activity "How Loud is Too loud?" This activity is an online quiz that asks students to estimate if various household or common activities are likely to pose any threat for hearing. Students had to use their knowledge from measuring some sounds and estimate how loud they thought the object they selected would be and how long they could listen to it for.

5. Protecting our hearing. Students were shown a number of resource cards and asked how they would protect their hearing in each situation. Students were encouraged to consider whether there is more than one way to protect their hearing for each activity, and which may be the most appropriate for them.

Upon completion of the five lesson activities, students were provided with the post-questionnaire to complete. Classroom teachers who were present for the classroom teaching were also provided with questionnaire to return at a later time which enabled them to provide their feedback.

A follow up evaluation was also conducted three months after the programme was presented within the school. All participating schools were contacted and invited to participate in the follow-up to measure

students' long term retention of the hearing health messages.

## Results

### Teacher Feedback

After viewing the lesson, teachers were asked to complete and return questionnaires to provide information about the suitability and perceived effectiveness of the program. As for previous invitations for involvement, response rates were moderate with only 55% of the participating teachers choosing to participate by returning their completed questionnaire. The responses that were provided were collated and analysed, with the results provided here.

Responding teachers were generally positive in their feedback about the programme, especially the need to teach it. One teacher thought that it was important that their students learnt about healthy hearing because

<sup>3</sup> All participating classes/schools were asked to allow students to bring in objects that the students would like to measure, thus making the noise measurement activity very relevant to their students. However, as the educator could not guarantee the number of type of items available for measuring, a variety of noisy items was also provided by her e.g. blender, drill, school musical instruments, a whistle. students were involved in activities that were potentially hazardous or were using the "latest technology" which they viewed as dangerous.

Comments from other teachers included:

"[its] absolutely, vital that kids are aware of how loud noises can damage hearing",

"there was a lack of awareness of amongst students about how noise damages hearing."

"I don't think that many students would think about their hearing," and

"They did not seem to appreciate how common it was"

"they need to learn it is a problem".

"[the students] use heavy equipment e.g. tractors, lawnmowers, and are listening to music,"

However, many teachers still expressed a concern about how congested the curriculum currently was, with little space to accommodate a new programme "There is not room in the curriculum for anything else!! But yes if you could find room hearing would be important." Of those who responded, 60% of teachers indicated that they thought that they could find space to integrate H4T into current programmes.

Teachers commented positively on the ways that this programme helps students learn important information and skills:

"[Students] become aware of the possibilities of hearing loss & through education can work on measures to avoid damage"

"The students would develop awareness that loud noise affects your hearing in the future"

"[students] reduce the potential of hearing loss due to the appreciation of risk."

Although teachers did not name a specific unit for the programme to be developed for, they did indicate that this unit integrated with units already taught in the key learning areas of Mathematics, English, Science and Technology, Human Society and Its Environment and Creative and Practical Arts.

When responding to the question what activities they felt were most effective for teaching students about developing healthy hearing practices 70% of teachers mentioned the measuring of sounds and the

estimating of the loudness of the activities on “How Loud is Loud.” The simulation of a hearing loss was mentioned by 30% of the teachers. One teacher thought that all the activities were effective as they gave their students a clear understanding of how difficult it is to hear when one has a hearing loss, showed how noisy activities are potentially damaging to hearing and informed students of ways to protect their hearing.

Another teacher commented that using the Dangerous Decibels “How loud is too loud” interactive activity and asking children to estimate how loud they thought a sound was in relation to the other sounds helped to develop students’ ability to recognise potentially damaging sounds.

Comment was also made about how natural it was to ask students what hearing protection strategies they could use for each noise source and, through extended questioning, challenge students to realise that sometimes there was more than one strategy available. Children’s first responses to these questions often show an assumption that there is only one or a “right” strategy to protect their ears from noise. For example when asked how they would protect their hearing from the noise of a jack hammer many students’ first or only response it to suggest that they wear ear plugs. Although wearing earplugs would be an effective strategy, students encountering jackhammer noise while walking along a street will generally not have access to such hearing protection and so this may not be an appropriate strategy for such a context. By challenging them to think about the realistic strategies they often are able to come up with other options (such as, putting their fingers in their ears or crossing the road and walk further away from the sound, moving away quickly to limit the time in noise), which are more context-appropriate. In this way students are taught to think past a rote-learned response to think about what action is most appropriate to achieve an effective outcome. By problem solving “realistic” responses to noise, students are better equipped to find appropriate strategies in later real-life situations.

The programme was developed with the intention that classroom teachers could teach this programme, and teachers considered this to be possible. However, only one teacher thought that teachers should teach the programme and they still thought that a visiting professional added impact. Another 40% of teachers suggested that audiologists should teach it, with the remaining teachers suggesting it should be taught by a community educator.

Teachers overall thought that this was a well presented and informative programme. The lesson was simple and effective and students were easily engaged and stayed focussed throughout. In classes where students brought in their personal music devices teachers thought that allowing students to investigations and experiments with their personal listening devices were very relevant to today’s youth. However, teachers continue to hold concerns about the availability of time in the curriculum and their appropriateness of teachers holding the main responsibility of implementing the programme.

## **Student Evaluations**

A total of 398 students participated in evaluating the H4T programmes, completing the pre- and post-questionnaires.

### **Pre-questionnaires**

All students completing the pre-questionnaire recognised that hearing was important as it enabled them to learn, to communicate with others, and to keep themselves safe. Students’ responses included comments that without their hearing they would not be able to hear warning sirens, do well at school or listen to their friends or their music.

Three questions (Q1, 3, & 6) in the pre-questionnaire investigated whether students could identify activities or sounds that may damage their hearing.

Question 1, asked students to identify the loudest sound they had heard and their responses were analysed

to determine the extent to which “loud” was related to risky and/or annoying noise. Students’ answers were grouped into categories and are displayed in Figure 1. Students’ answers reflected a range of potentially hazardous sound levels as well as sounds that were annoying but potentially “safe.” The most commonly identified loud sound-grouping was music-related activities with a large number of students (35%) including this in their response. Traffic noise (20%) and screaming (14%) were the next two most common responses. Other answers also included a wide variety of sounds such as scratching nails on the chalk board, the neighbour’s dog, the blue whale, five year olds.

Question 3, asked students to list noisy situations they believed may be potentially dangerous for hearing. These activities may be ones that they had personal experience with, or ones that they were aware of. Again, responses were grouped into categories for analysis (Figure 2). The most commonly reported potential cause of noise injury was the identification of music-activities such as iPods, iPhones, stereos, or loud music (33%). Other major categories included human voices (people screaming, squealing or yelling; 18%), traffic noises (cars zooming past, trucks and motor bikes; 19%), and a small number (7%) thought that watching television was loud enough to damage hearing. Some students listed sounds like breaking glass, classroom smartboards, attending church, a lion roaring and/or dogs barking as potentially dangerous sounds, showing students had a loose understanding of what noise posed a risk for hearing.

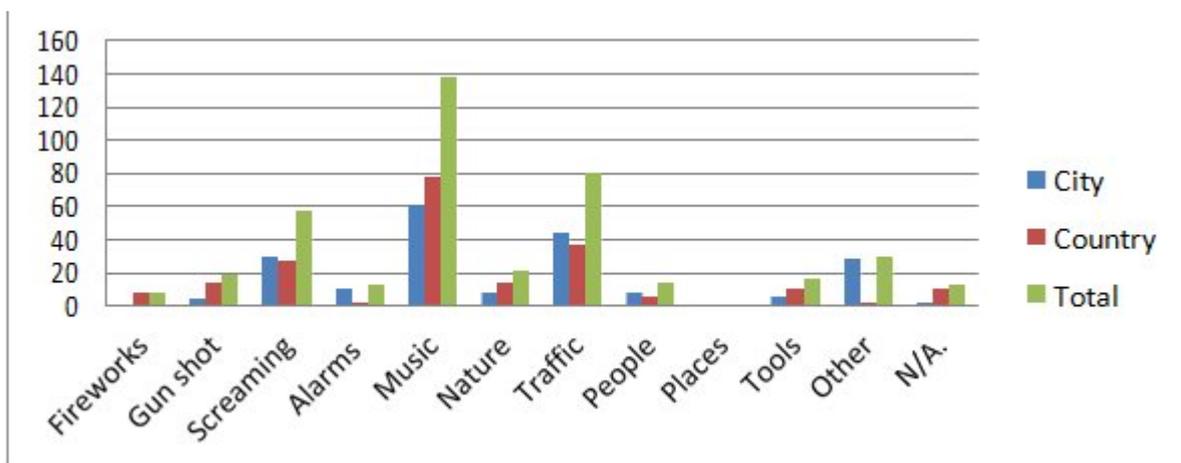


Figure 1. Summarised responses for q1 “What is the loudest sound you have heard?”

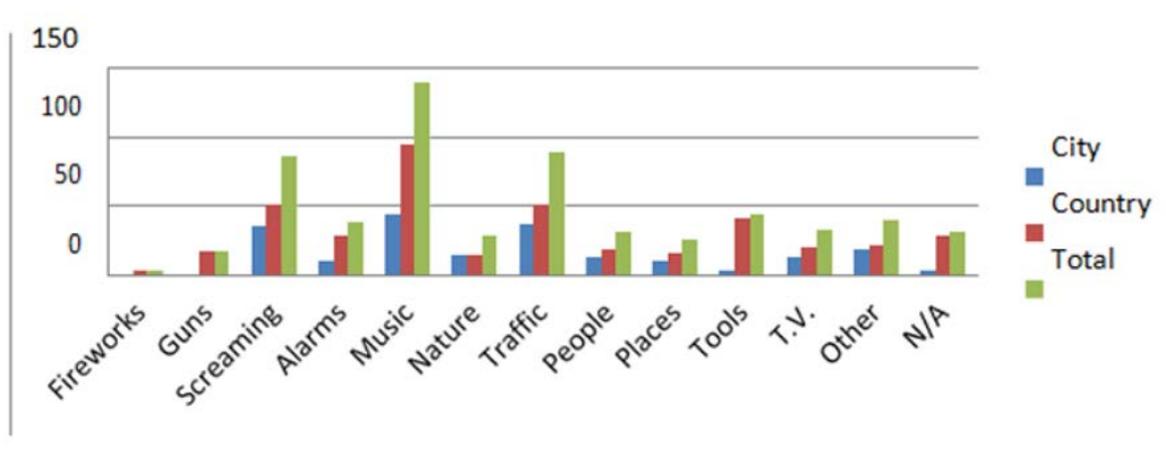


Figure 2. Summarised responses for q3 “Name sounds ...that might be loud enough to damage your hearing?”

Question 6, looked at whether students could identify which sounds may cause hearing damage from those in a given list. Power tools, guns and music were the activities that students most frequently identified correctly as potential causes of noise injury. However, only 22% thought that cutting the grass was

dangerous activity, while 33% thought that watching television was loud enough to cause a noise injury.

The final section of the pre-questionnaire investigated students' awareness of ways they could protect their hearing. Overall, country students appeared to have a greater knowledge of effective strategies than their city counterparts. Results showed that prior to the programme the majority of students were aware that turning the sound down on music devices was an effective way of protecting their hearing; however, this majority was a small one for city students (57%) in comparison to their peers in country areas 85%. Smaller percentages of students correctly identified strategies of walking away from the noise source (34% of city students and 68% of country students) or wearing hearing protection (37% city students and 70% country students) as effective ways of protecting their hearing.

### Post questionnaires

Post questionnaires were completed to look for changes in beliefs and acquisition of new knowledge following participation in the programme. One strategy for determining the programme's effectiveness was directly asking students for examples of new concepts that they were aware they had learned as a result of the programme's implementation. Students were asked to name one thing that they had learned from the programme and their responses were coded and analysed. The majority of responses focussed on the following areas; improved awareness of loud noise, knowledge of protection strategies and understanding of what decibels were. The most common response (31%) was that students said they had increased their awareness of noise and how loud some things are, e.g., "I measured how loud I played my saxophone. It was 87dBs. I can play it for 4 hours"; "I measured my iPod and found out how loud it can go. 110 dBs."; "We measured the trucks at the round-a-bout. They were 85 dB. It is the same as the How Loud is Too Loud traffichexagon." (A resource used in the H4T programme). Students also improved their understanding of how many loud sounds may be dangerous "Fireworks can hurt your ears."; "a rock band can hurt your ears." In addition, more than a quarter of students' responses (27%) related to learning about how they could protect their hearing "if you [sound] go over 85 (decibels) you can damage your hearing"; "do not listen to loud sound, don't turn your iPod up past half way." Nearly a quarter of students (23%) indicated that they had learnt about decibels, how to measure sound and now understood that anything over 85 dB may cause hearing damage.

The majority of students (80%) reported they had increased their knowledge of noise and how it affects hearing. A few students (6%) also indicated that they now appreciated their hearing more than previously. "Don't waste your hearing," "damage you hearing and it is gone forever," "ear (hearing) is good." A small number of students said that they had learnt not to put cotton buds in their ears.

If learning is perceived as interesting by the students, then students will willingly participate in the activities and the teaching and learning is seen as fun. Activities were therefore also investigated in relation to the level of engagement reported by students. So which of the activities did the students enjoy? The majority of students enjoyed learning about decibels and how loud things were. This was very new for the majority of the students with only a few students recognising or having previous knowledge about sound level meters. Of all of the students, 41% listed using the sound level meter to measure things as one of their preferred activities. The concept of loudness was also introduced via Dangerous Decibels' interactive "How Loud is Too Loud?" activity with 34% of students indicating this as a favourite.

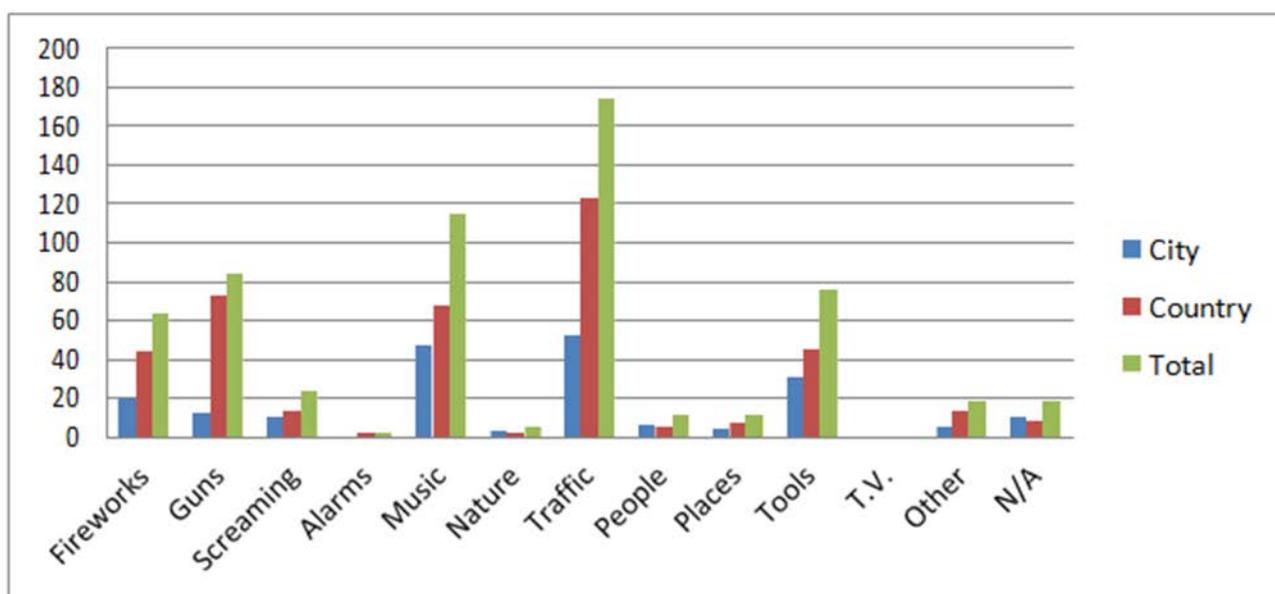
As part of their activities, one group of students measured traffic noise at their local round-a-bout and discovered that their measurements mirrored those on a reference sheet contained within the "How Loud is Too Loud?" activity. For these students matching their measurement to the reference sheet was seen as a validation of the sheet's accuracy and, as a result, of the reliability of all of the other measurements it listed. Thus the activity provided a foundation level, and could be seen as a first step in developing students' awareness about noise.

The post-questionnaire asked students again to name two sounds that they may hear that are loud enough to damage hearing. The students' answers have been grouped into categories displayed in Figure 3. After participating in the programme, 44% of the students identified transport/traffic as being potentially

damaging to hearing. Answers included a wide range of different types of transport such as planes, rockets, jets, tractors, jet skis, as well as previously identified sources such as trucks, motorbikes and general traffic noise. In the post-questionnaire, music was the second most common responses, identified by 28% of students as potentially dangerous and included activities such as the bagpipes in the their town’s parade, the school band, playing an electric guitar as well as personal listening devices. Power tools were listed by 18% of students and fireworks by 16%.

The programme was shown to increase students’ knowledge about the actual level of threat posed by common different sounds. Less than one percent of students now thought that watching the television or listening to animals and thunder were dangerous, while only two percent thought that people talking or restaurants posed a threat to their hearing.

After the programme there was an increase in the number of students who could correctly recognise potentially dangerous activities from the given list. The majority of students now recognised that attending a school disco (75%) or playing in school bands (67%) could cause noise injury. A high number of students also identified activities such as shooting (69%), cutting the grass (76%) and riding on a tractor (63%) as potentially dangerous to their hearing. Less than one percent of students still thought that reading, talking or rustling of leaves could cause a hearing loss.



**Figure 3.** A summary of the activities that students thought could damage their hearing.

There was an increase in students’ knowledge about which strategies may effectively protect hearing from the damaging effects of noise. Overall, 77% of students recognised that walking away from a loud sound was an effective strategy which enabled them to reduce noise injury. Also 71% of students thought that wearing hearing protection and 70% thought that turning the sound down were also effective strategies. Only a small number of students still thought that putting tissues in their ears or listening to music for long periods will also protect their hearing (6% and 4%, respectively).

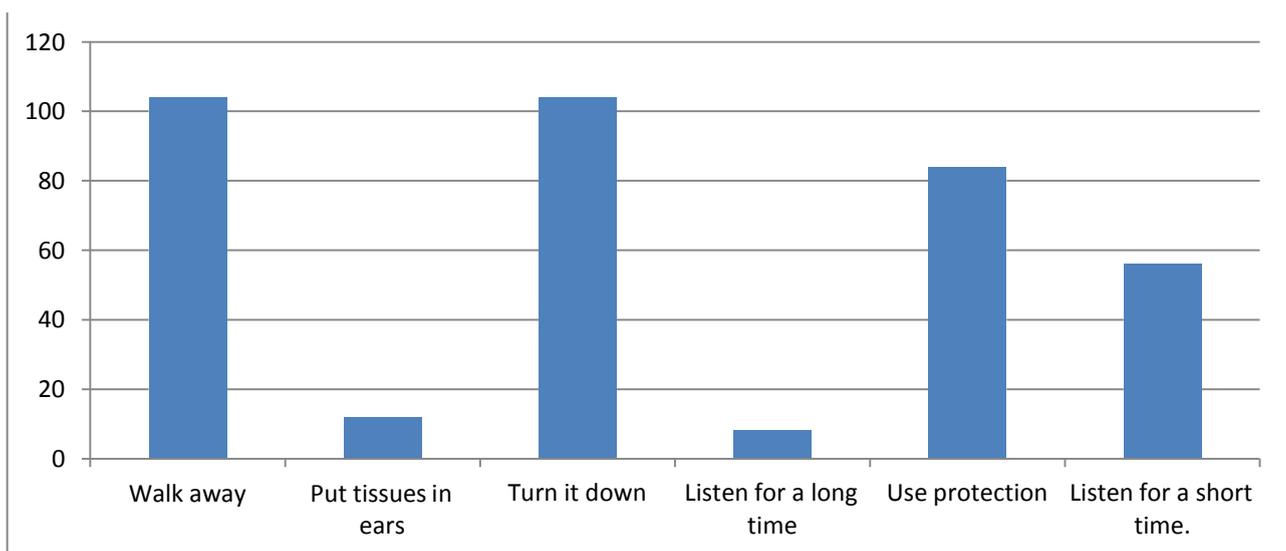
For the final question 78% of students still thought listening to music could damage their hearing. However, students recognised that it was not just personal listening devices that could cause damage but any music played over 85dB. Student responses also showed that they now realised that rock concerts, school bands, car stereos can cause harm in certain circumstances, showing knowledge of the types of factors involved – i.e., “if it was loud enough,” or “it is over 85dB” or “ you listen to it long enough.”

### Three month follow-up

Three months after the programme, schools were approached to arrange for a convenient time for students to complete a follow up questionnaire. However, only two schools (each with two classes) agreed to participate. A total of 110 students or 33% completed the follow-up questionnaire.

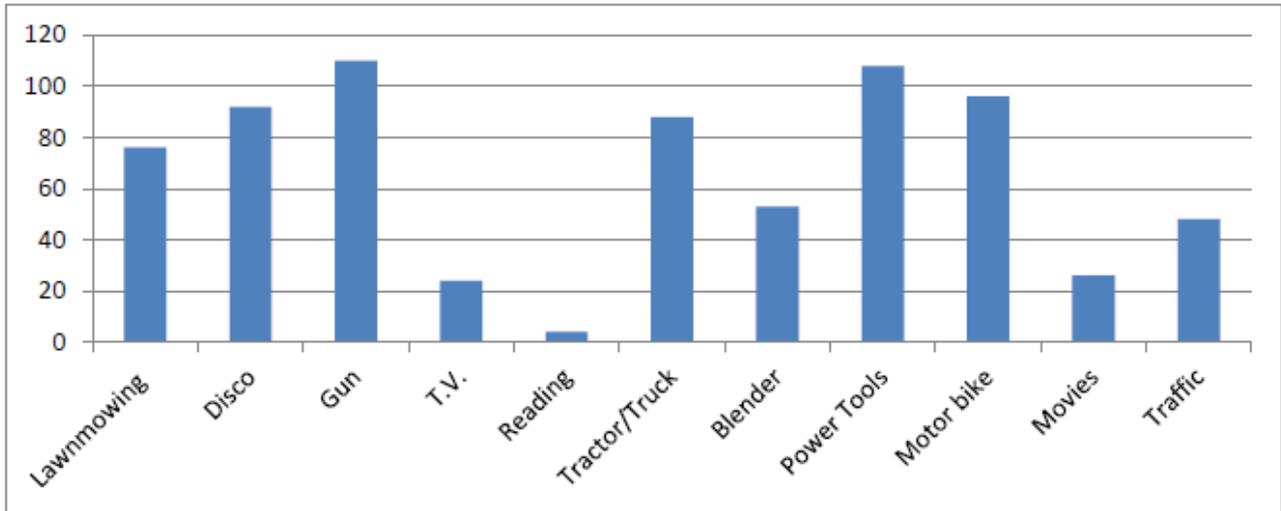
Nearly all of the students (99%) remained appreciative of their hearing. The students gave the following reasons for valuing their hearing; “Once you lose your hearing it is gone forever”, “hearing is how you communicate”, “hearing is a big part of your life” and “if you can’t hear you won't be able to talk to people.”

The majority of students identified from a list the three appropriate strategies for protecting their hearing (shown in Figure 4). A fourth “new” strategy for protecting hearing, namely “listening for short periods of time” was also included in the given list for students to select. This strategy was not originally explicitly outlined in the H4T programme, but was included here to see if students’ learning went beyond a superficial knowledge of the strategies discussed to a deeper understanding of the relationship between volume and time/duration in relating to noise exposure. Over half of the students were able to correctly identified this strategy as effective.



**Figure 4.** Strategies that students identified as ways to protect their hearing.

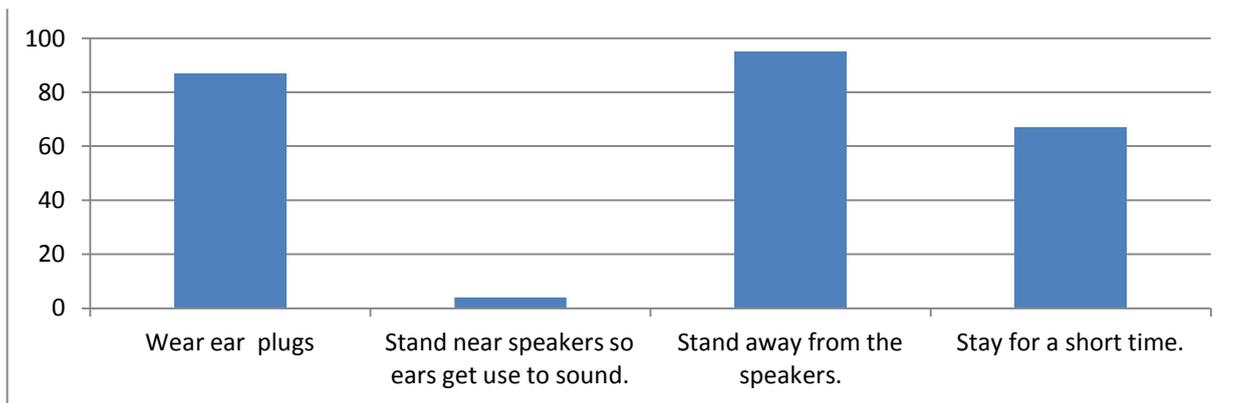
After three months, students continued to accurately identify potentially loud activities that could damage their hearing (as shown in Figure 5). The majority of students recalled that activities such as cutting the lawn, using power tools and shooting were loud enough to cause a noise injury. Although only 43% of students saw traffic as loud they did recognise riding a tractor or motorbike as risky activities. Another activity that the students recalled as risky was attending a disco. The majority of students also recognised that watching television posed less of a risk for causing a hearing loss than other activities



**Figure 5.** Activities that students identified as potentially damaging for their hearing.

In the follow-up questionnaire, students were asked to apply the knowledge that they remembered and create a message that they would be able to use to teach others about reducing noise exposure. This activity was designed to investigate students' depth of knowledge about the messages they had learned. Many students created general messages about hearing health such as: "Protect your hearing", "Don't listen to loud stuff," Others focussed on specific strategies related to music "Don't listen to loud music for a long period of time". Such responses indicate that knowledge had been acquired about the importance of level and duration on exposure.

The final question asked students to identify which strategies they could use at a disco to protect their hearing. The majority of students were able to correctly identify the following strategies: wearing hearing protection, standing away from the speakers and staying for only a short time as appropriate ones to use. (shown in Figure 6).



**Figure 6.** Strategies students identified as effective for protecting hearing at discos

## Comparisons of pre and post responses

Results from pre and post questionnaires showed that the H4T programme increased students' awareness about the variety of sounds that may be damaging to their hearing, with an increase in the percentage of students who subsequently recognised discos, lawn cutting, tractors and shooting as dangerous. The programme also helped students become aware of the difference between annoying noise and potentially dangerous noise – learning that although situations like going to restaurants and watching television may be noisy this does not necessarily make them dangerous to their hearing.

It is interesting to note that in the follow-up questionnaire, more students listed shooting, tractors, and discos as hazardous than in the post programme evaluations. Thus it appears that the learning gained in the H4T programme continued even after the programme had finished, with participants showing better understanding of the potential impact of these noisy activities on their hearing over time.

One of the aims of the program was to integrate the Hear4Tomorrow programme with the current N.S.W. PDHPE syllabus, so that it could easily be integrate with lessons already taught in schools. The syllabus states that “The safety and security of children is enhanced when they can recognise situations where personal safety may be at risk, and use strategies to protect themselves” (Pg. 8. Board of Studies 2007). Therefore it is important for the evaluation of the programme to look at whether there was an increase in students' ability to:

1. Recognise potentially hazardous sounds
2. Recognise which strategies are effective or ineffective at protecting their hearing.

### Student's ability to recognise potentially hazardous sounds.

In both the pre and post questionnaires, students were given a list of noises and asked to identify those they believed may cause noise injury. Children's ability to correctly identify activities as potentially either dangerous or not dangerous was calculated using their total score across all of these items as a percentage. Childrens' ability to correctly identify potentially risky situations in the pre, post, and follow up was then compared using a one-way anova. There was a significant effect of condition  $F(2,864)=364.371$ ,  $p<0.001$  Tukey post-hoc comparisons of the three conditions showed that the number of correct responses was significantly higher than the pre condition ( $M=49.68\%$ ,  $95\%CI[47.23,52.12]$ ) for the post condition ( $M=89.46\%$ ,  $95\%CI[87.82,91.11]$ ) and for the follow up condition ( $M=80.47\%$ ,  $95\%CI[77.16,83.78]$ ). Therefore the H4T programme showed an increase in students' ability to correctly recognise a number of potentially damaging sounds as posing a risk to hearing.

### Students'ability to recognise which strategies are effective or ineffective at protecting their hearing.

The students were also provided with a list of effective and ineffective strategies and were asked to identify which strategies would protect their hearing and which strategies would not. Students' ability to correctly identify strategies as effective or ineffective was also scored and the total percentage of correct responses was found to differ significantly across the three conditions (pre, post, follow-up)  $F(2,856) = 308.924$ ,  $p<0.001$ . Tukey post-hoc comparisons showed that the number of correct responses was significantly lower for the pre condition ( $M=61.5\%$ ,  $95\%CI [59.4, 62.6]$ ) than the post condition ( $M=92.42\%$ ,  $95\%CI [91, 93.8]$ ) and the follow up condition ( $M=82.8\%$ ,  $95\%CI [80.3, 85.2]$ ). Therefore this programme did increase students' knowledge about which strategies were effective and which strategies were ineffective at protecting their hearing from noise injury.

Interestingly, a significant difference was also found between the city and country students' knowledge of which hearing protection strategies were effective and ineffective in the pre survey,  $t(396)=10.504$ ,  $p<0.001$ , with city students showing poorer knowledge prior to participating in the programme. One possible reason may be that children in rural communities have a greater exposure to information about hearing protection generally and more exposure to hearing protection and its use. Although there was an improvement in

knowledge in both groups' ability to identify effective strategies, after the programme there was no significant difference between the two groups' city and country, with the city students showing a greater increase to "catch up" to their rural peers.

If students are to make informed decisions about protecting their hearing from noise, they must have a number of different effective strategies to choose from. It is therefore important that students are able to identify a variety of different effective strategies to protect their hearing and when each may be appropriately applied. The programme aimed to teach students three main strategies to protect their hearing from noise; turn down the sound, walk away from the sound and wear hearing protection. Students' ability to correctly recognise these key strategies as effective was calculated as a percentage of correct identifications of these items from a list. The percentage of correct identification of effective strategies was then compared across the pre, post, and follow up conditions with a significant effect of condition found  $F(2,864)=248.88, p<0.001$ . Tukey post-hoc comparisons of the three conditions showed that the number of correct responses was significantly lower for the pre condition ( $M=49.44\%$ ,  $95\%CI[46.48,52.40]$ ) than for the post condition ( $M=89.86\%$ ,  $95\%CI[87.69, 92.02]$ ) and for the follow up condition ( $M=78.60\%$ ,  $95\%CI[67.61, 71.83]$ ). Therefore the programme was effective at increasing students' knowledge about strategies to protect their hearing.

It should be noted that although a small decrease in awareness was sometimes seen from post to follow-up evaluations, students' knowledge remained higher than that shown for pre-testing. A small drop-off from post to follow-up assessment is normal and to be expected.

## Summary

The Hear4Tomorrow school programme was effective at improving the students' knowledge about noise and its effect on hearing in both the country and metropolitan schools. The programme increased students' awareness of activities that could potentially cause a noise injury and their knowledge of strategies that may be effective for preventing this.

The programme increased students' awareness of activities and machinery around their home that are known to be noisy and potentially dangerous for hearing, including lawn-mowing, tractors, and chainsaws. Although students recognised music and personal listening devices as a potentially dangerous, this programme provided them with more information about using such devices, and managing their behaviour to minimise their risk. After the programme students were aware of the volume of their personal listening device i.e. "that my iPod [may] go up to 110 dB," and what constituted a safe listening level "that if you put the dot on the iTouch in the middle it is safe." Students also discovered that playing an instrument may cause a noise injury, "I measured my saxophone and it was 87dB," and the noise of many school discos can be high "music at a disco is 91dB and can damage your hearing." The programme had helped students realise that their personal listening devices were not the only music source that could damage their hearing, and were developing an understanding that it is the volume and duration of sound rather than any specific device(s), that causes injury.

## **The Final Programme.**

The development and evaluation of activities has led to the finalised form of the H4T programme now available through its own dedicated website: <http://hear4tomorrow.nal.gov.au/>

As outlined above, this programme was developed around existing materials that are available or accessible to all. A conscious decision was made to select resources that have been designed, developed, and tested by other institutions, viewed to be suitable for Australian classrooms, and readily available to Australian teachers. All activities were trialled and only those with positive feedback from both students and teachers were included.

The final programme incorporates the key components outlined as important for any health education activity, and provides students with the necessary information about hearing and noise to maintain good hearing health via four distinct modules. The programme has made use of feedback from educators and responses of students to create a programme that children will enjoy and teachers will find useful within their existing teaching requirements.

The online programme provides teachers with an outline of a basic programme, but also includes optional activities, or ideas for extension work depending on access to resources and available time/interest. All of the necessary resources for the programme are provided in the one location online. Shown in Appendix B & C, this includes Teaching notes (with related background readings), Module outlines, and links to relevant sites. Information is also provided regarding the relevant teaching objectives within each state/territory curriculum what can be addressed by the H4T programme (See, Appendix D).

One unexpected complication was one encountered while attempting to develop the H4T programme around state curricula, as a result of the current development of a National Curriculum. The National Curriculum was in the process of being developed and written at the same time as H4T programme preparations were underway. Unfortunately, the new curriculum means that it becomes difficult to develop state- curriculum-based resources with so much uncertainty around what form the new nationwide curriculum will take. Furthermore, many teachers will be busy implementing the National Curriculum over the next few years and may not have the necessary time or be interested in addressing new topics as they become familiar with the new system. The focus of the H4T programme therefore needed to shift away from being tied specifically to (soon to be superseded) state curriculums. Instead, sustainability of the programme will be increased by developing the programme in line with general curriculum objectives and themes, while maintaining necessary flexibility for it to be adapted as new objectives are developed and introduced.

## **FUTURE CONSIDERATIONS: Lessons Learned during Development and Evaluation of the H4T Programme**

### **Sustainability – A Vital Concern**

Changing one's behaviour to develop healthy listening habits takes time. This programme should be seen as an extension to home-based teaching about the risks associated with listening to loud noises and as a precursor to noise reduction education that some students may later receive in the workplace. Obviously, one short programme will not guarantee healthy hearing behaviour, but it can foster awareness and introduce students to strategies that will help them to prevent noise injury. From a health promotion perspective, it would be helpful to incorporate a sequence of lessons so that the topic can be revisited in later classes/grades, each building on the back of the other and challenging students to think about protecting their hearing in different situations. Students in higher grades may address issues such as dealing with peer pressure to improve their abilities to make decisions to protect their hearing, examining the different types of hearing protection available to them, and practising correctly inserting ear plugs. Students may also be encouraged to further develop their knowledge and skills through other related activities (e.g.. creating a campaign which informs others of the importance of hearing health, writing to authorities about a noise issue or concern in their local environment).

One area of concern emanating from the teachers' responses was that only one teacher thought that teachers should teach the programme. The others thought that the programme should be taught by audiologists or education officers. The programme has been developed in such a way as to enable it to be taught by teachers, or by education professionals or hearing health professionals. However, reliance on the latter two groups can bring with it two significant difficulties for sustained access to the H4T programme. Some past programmes implemented through external organisations have ceased to be taught when that organisation longer can no longer provide the people to teach the programme and/or key people in charge of the programme change, leaving a hole that goes unfilled. Reliance on external parties therefore remains at the mercy of the staff and organisations involved to remain interested, involved, and available to teach the programme. A secondary significant (especially in country areas) concern is the difficulties experienced in areas where there is limited or no access to audiologists, education officers or equivalent trained professionals to conduct the programme. Although there are obviously some benefits of engaging external assistance in promoting and delivering the H4T programme, care needs to be taken that this does not unnecessarily risk limiting the programme's uptake. It is likely that teachers may be encouraged to teach the programme if appropriate training/education material was made available to increase their knowledge and confidence with a topic that many are likely to feel unfamiliar with. The structured support materials contained within the teaching and module notes should go some way to alleviate this concern. In addition, further investigation into the reasons behind teachers' reluctance to teach the programme themselves may be necessary in order to address such concerns where possible. Perhaps the most significant barrier is the low-priority status often associated with hearing health messages, discussed below.

### **Hearing Health as a Priority - Building a Hearing Health Culture in Schools and the Community**

One of the most significant problems the H4T team faced in developing and trialling the programme was gaining the interest of teachers and access to schools. This occurred at the development, recruitment, and follow up phases when attempting to gain access to schools or receive feedback about the programme's structure. One consequence of this was the inability of the team to establish a control group for the evaluation as schools were only interested in allowing access for the implementation phase, to gain information for themselves – rather than participating for the greater good to assist with the development of the program. The lack of a control group could be mediated somewhat by the used of pre and post testing, but the lack of interest and engagement shown points to potentially larger concerns. The experiences of the Education Officer suggested that schools' disinterest stems from a lack of awareness rather than any specific

unwillingness to teach hearing health. For most schools and teachers, hearing was, simply just not seen as a big enough issue as to warrant resources. For some teachers, hearing impairment may be seen simply as a disability to be managed when it occurs, rather than as an injury that may be preventable by reducing noise exposure. Teachers' own low awareness about hearing health issues contributes to a lowered confidence and interest in teaching the topic. Again, provision of clear, informative teachers' notes and highlighting ways to access additional resources could assist improve teacher awareness about the need for the programme and improve uptake. Teachers may also be encouraged to teach the programme if appropriate training/education material was made available to increase their knowledge and confidence with a topic that many are likely to feel unfamiliar with.

As outlined, the change-over to the new National Curriculum does pose some potential challenges for the programme. However, these changes in curriculum bring with them advantages also. Some of the relevant curriculums are still under development, providing opportunities to increase the awareness and perceived importance of hearing health and to have mention of it made within the syllabus. Such inclusion is not easy, but is by no means impossible. However, lobbying is required from respected and influential sources within the area of hearing health that are in a position to promote hearing health as an issue for educational authorities to take seriously.

The establishment, acceptance, and adoption of any programme takes time. Programmes need to be developed within organisations that are prepared to fund not only the development of the programme but the implementation phase, and are able to promote and update the programme on a regular basis going forward. Classroom programmes also need to be supported by campaigns that look at ways of including the health message within the wider school and general community. That is, that alongside the programme, schools also need to look at the school activities that students participate in and examine ways to create safe hearing experiences within these, thereby openly and actively modelling healthy hearing behaviours. This may mean lowering the volume at the school disco, or timetabling noisy activities on different days to limit a student's daily exposure. Similar changes have been made in many schools in relation to becoming "SunSmart schools" by providing shade in the playground, or moving lunch to an earlier part of the day. Involving students in discussions about why these steps are taken further reinforces healthy hearing messages to students and assists by indicating that it is seen by others as an important issue worthy of implementation and becoming involved with.

School programmes are unlikely to thrive in isolation. Instead, they will be more effective when they reflect health messages being promoted in the wider community. (e.g., in the case of sun-smart messages, school programmes picked up on important messages being promoted more generally within the population). Effective widespread hearing health promotion therefore will not result from a single intervention for school age children. Rather, this should be seen as just one part of a wider intervention where the target should be raising community awareness and engagement such that school based programmes are sought out.

A school based hearing health programme has the highest likelihood of success when introduced in an environment/culture that already has some base awareness of hearing issues, and is supportive of the need to reduce noise exposure. Unfortunately, many of the difficulties experienced during the development of this program highlights that this is not yet the environment in either Australian schools or the wider community. Without wider community engagement hearing remains to many a low priority in terms of health education. More effort is needed to coordinate community education programmes to raise awareness and have hearing recognised as an important issue.

## Summary

The Hear4Tomorrow programme is a general programme aimed at introducing this topic to Primary school students. Although successful at increasing students' knowledge and skills one 45 minute lesson will not achieve the aim of preventing noise-induced hearing loss. Therefore other programmes need to be developed for different age groups, so that there is a continuum of learning starting in the home, progressing through the school years and on to the working environment. At each stage the knowledge, skills and attitudes relating to healthy hearing need to be reinforced and developed.

The biggest hurdle is likely to continue to be the engagement of teachers, schools and wider communities with the issue of hearing health. Hearing continues to receive little awareness in much of the community, and is subsequently seen as a low priority. Activities that promote hearing health issues outside of schools will help to raise awareness within schools of the need to be talking to students about hearing matters.

An organisation that funds the development of a prevention programme should be responsible for seeing that it is implemented. Prevention is about achieving long term goals. Like many cancers, the damage from noise injury occurs long before symptoms appear. Early education is ideal for providing young people with the best opportunity to look after their hearing health well into the future. However, this education is more than just having access to a programme. Education is required to increase awareness of hearing health generally and for it to be viewed as an issue within schools and the community that warrants their resources. In this way, programmes need to be cared for and modified to ensure they remain useful and relevant to the target groups past their initial development. Without such steps, there is a risk that the resources used for the initial development of a programme will be wasted through lack of long-term use.

## DISSEMINATION OF FINDINGS

### Community Presentations of the H4T Programme

An introduction to the Hear4Tomorrow programme was presented to the following groups. These power point presentations outlined the importance of providing a noise injury programme to children, the range of hazardous children were exposed to today, and an outline of the programme.

- Ministerial Standing Committee on Hearing NSW
- Itinerate Hearing Teachers
- Deafness Centre Children's Hospital Westmead

### Conference Posters & Presentations

Addison, I., Gilliver, M., Williams, W. (2010) Hear Today, Hear tomorrow: How can an effective, sustainable school-based hearing awareness message be developed? Audiology Australia Conference, Sydney Australia.

Hear Today, Hear Tomorrow is a project that aims at providing students with the knowledge, skills and attitudes that will enable them to make informed decisions about protecting their hearing from noise. Based on other successful health education programs, and in consultation with interested professionals a hearing prevention programme will be designed from a scientific base that can be integrated into the school curriculum, and taught by classroom teachers. The project aims to develop a program providing students with a clear, concise message that, if adopted, will enable them to protect their hearing in noisy environments. In working with and alongside Indigenous communities this program will then be adapted or redesigned to reflect the unique experiences/environments in which our indigenous students live.

A variety of hearing health programs have previously been developed (in Australia and overseas) aimed at improving young people's participation in noise reduction activities, and have provided important insights into factors that impact on such program's likely success. Information is now available about so-called "crucial components" recommended for hearing education programs and activities that have been successfully used in different settings. However, a major difficulty that the majority of programs face is their sustainability beyond an initial implementation phase. This is particularly critical when considering the time and financial costs associated with the development of any program. A discussion of these issues is presented alongside suggestions for minimising their impacts.

Addison, I., (2011) Hear Today, Hear Tomorrow – a school based hearing health program, Community Nurse Audiometrists Association Conference

A variety of hearing health programs have previously been developed aimed at improving young people's knowledge about the potential hazard of noise. The core components of a noise prevention program have been identified. This presentation looks at providing community nurses with interactive engaging and time saving activities and resources that will complement and enrich a hearing program. The flexible nature of these activities means that they can be adapted for use when educating students in the classroom, teachers or parents or community groups.

Accepted: Addison, I., Gilliver, M., Williams, W. (2012) Being Heard: A tool kit to educate the next generation. Audiology Australia National Conference

NB: The below abstract was accepted for a workshop presentation, however it was necessary for it to be withdrawn when OHS did not approve the use of grant money towards the cost of attendance.

A variety of hearing health programs have previously been developed (in Australia and overseas) aimed at improving young people's knowledge about the potential hazard of noise. These programs all enable students to make informed decisions about their hearing.

The core components of a noise prevention program have been identified, but what is needed is better dissemination of existing hearing loss prevention programs. Therefore, there is a need to develop skills and techniques at adapting already successful programs to meet the needs of the communities in which we live. This is particularly critical when considering the time and financial costs associated with the development and teaching of any program.

A discussion of the elements of these techniques is presented along with a challenge for us to start educating others educators e.g. classroom teachers and health workers. By educating other educators our programs are accessible to a wider audience and are more sustainable.

Audiologists being respected, knowledgeable and approachable members of society are frequently asked by members of their community to provide hearing education and resources. A discussion of the elements of the program that integrate into the Australian school curriculum, are interactive, loved by students and are successful at teaching students to

This workshop looks at providing them with interactive engaging and time saving activities and resources that will complement and enrich their hearing programs. The flexible nature of these activities means that they can be adapted for use when educating students in the classroom, teachers or parents or community groups.

## Raising Awareness of the Website

The Hear4Tomorrow programme is available via the Hear4Tomorrow website (<http://hear4tomorrow.nal.gov.au/>), and links to the site have been included on the NAL website. Other hearing organisations (including the Hearing CRC) have also expressed interest in providing links on their sites.

Information and submissions about the programme and website have also been distributed to relevant educational organisations/publications including:

- Active healthy Magazine (The Australian Council for Health, Physical Education and Recreation)  
<http://www.achper.org.au/publications/active-healthy-magazine>
- The Pulse (The Australian Council for Health, Physical Education and Recreation Victorian Branch)  
<http://www.achper.vic.edu.au/news>
- Resources page (The Australian Council for Health, Physical Education and Recreation Western Australia Branch)  
[http://www.achperwa.asn.au/index.php?option=com\\_content&view=article&id=81&Itemid=191](http://www.achperwa.asn.au/index.php?option=com_content&view=article&id=81&Itemid=191)
- Resources page (The Australian Council for Health, Physical Education and Recreation Queensland Branch)  
<http://www.achperqld.org.au/programs-resources/resource-reviews>
- Curriculum Perspectives (Australian Curriculum Studies Association Inc)  
<http://www.acsa.edu.au/pages/page33.asp>
- Independence Journal (Association of Heads of Independents Schools of Australia)  
<http://www.ahisa.edu.au/independence/current-issue/>
- PDHPE Teachers' Association Newsletter  
<http://www.pdhpeta.org/about-pdhpeta.html>
- Resource page (NSW Department of Education and Teaching)  
<http://www.curriculumsupport.education.nsw.gov.au/primary/pdhpe/phc/index.htm>
- Resource page (Victoria Department of Education and Early Childhood Development)  
<http://www.education.vic.gov.au/school/teachers/teachingresources/social/physed/Pages/support.aspx>
- Resource page (Queensland Government School Health and Wellbeing Initiatives)  
<http://education.qld.gov.au/schools/healthy/index.html>
- Resources (Australian Health Promoting Schools Association)  
<http://www.ahpsa.org.au/>

## REFERENCES

- Access Economics (2006). Listen Hear! The Economic impact and cost of hearing loss in Australia. Melbourne, Cooperative Research Centre for Cochlear implant and Hearing Aid Innovation and the Victorian Deaf Society.
- Axelsson, A., Jerson, T. (1985). Noisy Toys: A Possible Source of Sensorineural Hearing Loss. *Pediatrics* Vol. 76 No. 4 October 1, pp. 574 -578
- Board of Studies, NSW (2007). Personal Development, Health and Physical Education K-6 Syllabus. Board of Studies. NSW. Sydney
- Bistrup, M., Hygge, S., Keiding, L., Passchier-Vermeer, W. (2001). Health effects of noise on children and perception of the risk of noise, *Nat. Inst. of Publ. Health*.
- Bittel, S. N., B. A. Freeman, & Kemkar, B.E. (2008). "Investigation of toy-noise exposure in children." *Seminars in Hearing* 29(1): 10-18.
- Blessing, P. (2008). Wising up about noise-induced hearing loss: An evaluation of WISE EARS! A National campaign to prevent noise-induced hearing loss, Thieme Medical Publishers Inc
- Bohlin, M. and S. Erlandsson (2007). "Risk behaviour and noise exposure among adolescents." *Noise and Health* 9(36): 55.
- Burnley, J. (1993). Hearing Health project. Awareness and prevention through behavioural change. Sydney.
- Carter, L., (2011). "Prevalence of Hearing loss and its relationship to leisure-sound exposure. Sydney, National Acoustic Laboratories.
- Chermak, G., Curtis, L., & Seikel, J.A. (1996). "The effectiveness of an interactive hearing conservation program for elementary school children." *Language, Speech, and Hearing Services in Schools* 27(1): 29-39
- Folmer, R. (2002). "Why aren't hearing conservation practices taught in schools?". *Audiology Online*, 7/2/2002 available from [http://www.audiologyonline.com/Articles/pf\\_article\\_detail.asp?article\\_id=354](http://www.audiologyonline.com/Articles/pf_article_detail.asp?article_id=354)
- Folmer, R. L., S. E. Griest, et al. (2002). Hearing conservation education programs for children: A review. *Journal of School Health* 72(2): 51-57.
- Folmer RL. (2008) Hearing Loss Prevention Practices Should Be Taught in Schools. *Seminars in Hearing* 29(1):67-80.
- Griest, S. (2008). "Evaluation of a Hearing-Loss Prevention program." *Seminars in Hearing* 29(1): 122-136.
- Griest, S., R. Folmer, et al. (2007). "Effectiveness of "Dangerous Decibels," a school-based hearing loss prevention program." *American Journal of Audiology* 16(2): S165.
- Keith SR, Michaud DS, Chiu V. Evaluating the maximum playback sound levels from portable digital audio players. *J Acoust Soc Am*. 2008; 123(6):4227-4237
- Keppler, H., Dhooge, I., Maes, L., D'haenens, W., Bockstael, A., Philips, B., Swinnen, F., Vinck, B. (2010) Short-term auditory effects of listening to an MP3 player. *Archives of otolaryngology head and neck surgery*. 136 (6) 538-548
- Lass, N.J., Woodford, C.M., Lundeen, C., et al. (1987) A survey of high school students' knowledge and awareness of hearing, hearing loss, and hearing health. *Hearing Journal*; 15-19.
- Maassen, M., W. Babisch, et al. (2001). "Ear damage caused by leisure noise." *Noise & Health* 4(13): 1-16.

Marshall, L. and J. F. Brandt (1974). Temporary Threshold Shift from a Toy Cap Gun. *Journal of Speech and Hearing Disorders* (39) 163-168

Neitzel, R, Sexias, N, Goldman, B & Daniell, W (2004), Contributions of Non-occupational Activities to Total Noise Exposure of Construction Workers, *Annals of Occupational Hygiene*, 48(5): 463 – 473

NOHSC: 1007 (2000) National Standards for Occupational Noise National Occupational Health and Safety Commission Canberra, ACT

Peng, J., Tao, Z., & Huang, Z. (2007). "Risk of damage to hearing from personal listening devices in young adults." *Journal of Otolaryngology* 36(3): 179-183.

Rabinowitz, P. (2000). "Noise-induced hearing loss." *American family physician* 61(9): 2759-2760.

WHO (1997) Prevention of Noise-Induced Hearing Loss, Report of an Informal Consultation held at the World Health Organization, Geneva, 28 – 30 October 1997

Williams, W. (2011). Life time of exposure to sound - what is a safe exposure? (Profiles), National Acoustic Laboratories.

Williams, W. and J. Purnell (2010). "The statistical distribution of expected noise level output from commonly available personal stereo players." *Acoustics Australia* 38(3): 119-122.

Wilson, D., Walsh, P.G., Sanchez, L. & Read, P. (1998) Hearing Impairment in and Australian Population, Centre for Population Studies in Epidemiology, SA Department of Human Services, Adelaide

## **APPENDICES**

The following appendices contain copies of material available online as part of the Hear4Tomorrow programme website.

The programme is divided into four distinct modules, relating to different elements of health education theory (Appendix A), and developed to correspond to existing teaching requirements in each state (Appendix D).

Background information about hearing health, hearing loss prevention and overviews of the modules are presented in a single teaching notes document (Appendix B). Detailed notes on each of the four modules are also provided (Appendix C).

## Appendix A: Shaping Healthy Behaviours – The science of health promotion activities

In today's society, we benefit from access to a wealth of research about how different choices and behaviour can affect short and long term health. Reputable information is freely available for a range of health concerns along with corresponding advice about how best to attempt prevention or minimisation of adverse impacts to our health. However, promoting healthy behaviour is more than just providing access to facts and information. Many things influence our behaviour decisions, particularly when it comes to health.

Motivation to participate in “healthy behaviours” is influenced by both internal and external factors. A popular model used by researchers to capture these influences is the “Health Belief Model” (HBM; Rosenstock, 1966; Rosenstock, Strecher & Becker, 1988). This model lists three areas which impact on our decisions around health issues. An outline of the different areas, their implications for health education generally, and examples of how these may apply to hearing health are shown in the table below.

The Hear4Tomorrow programme has been structured with these HBM elements in mind. The programme aims to go past information provision about the mechanics of noise and hearing, to a more cohesive examination of hearing as a health issue. The modules have been designed to assist students to appreciate the value of good hearing health, understand those activities which may threaten hearing, and develop a solid understanding of how to identify and minimise noise risks to which they are exposed. Ultimately, the programme aims to increase students' awareness of hearing health issues, their engagement and motivation to protect their hearing, thereby increasing the likelihood of self guided action.

## References

Rosenstock, I., M., 1966. Why people use health services, *Milbank Memorial Fund Quarterly* 44 (3), 94–127

Rosenstock, I., M., Strecher, V., J., & Becker, M., H., 1988. Social learning theory and the Health Belief Model, *Health Education Quarterly*, 15(2), 175-183

HBM Area	General Definition	Implications for Health Education	E.g. Hearing Health Education
Perceived Severity & Perceived Susceptibility	<p>These relate to our beliefs about:</p> <ul style="list-style-type: none"> <li>The extent or impact of a health condition on the individual's life</li> <li>The likelihood that the individual could develop the health condition</li> </ul>	<p>Motivation towards health behaviours can be improved through:</p> <ul style="list-style-type: none"> <li>Raising awareness of the actual consequences of risky behaviours and the condition</li> <li>Providing information about populations at risk, and their risk levels</li> <li>Exploring how personal factors or behaviour may influence risk for the individual</li> </ul>	<p>Children will be more motivated to look after their hearing health if they understand:</p> <ul style="list-style-type: none"> <li>The importance of hearing, and the difficulties face when hearing is damaged</li> <li>It is possible for noise to damage hearing</li> <li>Activities which they participate in may be noisy enough to damage their hearing</li> </ul>
Perceived Benefits and Barriers	<p>Benefits and Barrier perceptions work as a type of “cost-benefit” analysis, where the individual weighs up beliefs about:</p> <ul style="list-style-type: none"> <li>Expectations that the advised behaviour will be effective in reducing risk or minimising harm.</li> <li>The perceived physical, psychological or financial costs of undertaking the advised behaviour</li> </ul>	<p>Healthy behaviours will be viewed more favourably if:</p> <ul style="list-style-type: none"> <li>Advised action is clearly defined and explained</li> <li>The expected outcomes of the behaviour are explained</li> <li>Potential barriers are identified and minimised through education and assistance</li> </ul>	<p>Children will more likely be engaged in healthy hearing behaviours if they know</p> <ul style="list-style-type: none"> <li>When noise exposure can be damaging</li> <li>How personal noise exposure can be reduced to safe levels without adversely impacting comfort or enjoyment of related activities</li> </ul>
Cues to Action	<p>Certain activities or environmental cues can work to increase motivation and activate readiness to undertake healthy behaviour</p>	<p>Participation in healthy behaviour can be improved by:</p> <ul style="list-style-type: none"> <li>Instructing individuals “how-to” undertake appropriate action</li> <li>Raising awareness about the health issue, and providing reminders</li> </ul>	<p>Children will be cued to action by teaching that:</p> <ul style="list-style-type: none"> <li>Provides information about how to take steps to protect their hearing in different environments</li> <li>Hearing is something that should be considered as part of a healthy lifestyle</li> </ul>
Self Efficacy	<p>This relates to the individual's belief that they are capable and confident in taking the appropriate action</p>	<p>Participation can be improved with interactive training, guidance and positive reinforcement</p>	<p>Children's self efficacy about hearing health can be improved by giving them opportunities to plan ways to reduce noise exposure in their day-to-day lives</p>

## Appendix B – Teaching Notes

### Hear4Tomorrow – Teaching Notes

#### Why Teach Hearing Health?

This question is a common reaction when the suggestion is made to include hearing health in classroom activities. Teachers want to know (with good reason!) how hearing health is relevant to their students, and why they should include it in their teaching programmes (which are often already crowded with a range of other competing topics). They also want to know the benefits of teaching such a programme, and whether it will be helpful for students in the future.

These are reasonable and, in fact, sensible concerns. The following section aims to explain why hearing health is a relevant programme of study for primary students, and how it can be included as part of (rather than on top of) existing teaching requirements in Australian states and territories. In addition the notes provide some background to the effectiveness of the programme and its grounding in health education theory.

The notes provide a broad overview of the hearing system, information about hearing loss, (in particular, noise induced hearing loss), and noise reduction methods. This information (along with that provided in the module notes and supporting documents) should provide teachers with all that is needed to teach the Hear4Tomorrow programme.

#### Is there a NEED to teach Hearing Health?

World-wide estimates of hearing loss in school-aged children vary considerably. Population surveys of young adults (aged 17 – 20 yrs) have reported prevalence of high frequency hearing loss at 11.9% (Muhr, Rasmussen, & Rosenhall, 2007) and 16% (Rabinowitz, Slade, Galusha, Dixon-Ernst, & Cullen, 2006). Given that even mild permanent hearing loss can reduce success in communication, leading to poor social interactions and reduced academic performance, it is important to provide and implement appropriate means of educating children about the risks posed by noise, and ways in which they may protect their hearing.

An increase in incidence of hearing loss among school-aged children has been linked to an increase in children's exposure to excessive levels of sound while participating in leisure activities (Lankford & West, 1993; Bess & Poynor, 1974; Katz, Gerstman, Sanderson, & Buhanan, 1982). There has been some discussion about the extent to which such leisure noise currently impacts on the hearing of children and young adults. However, researchers are agreed that many activities in which young people engage involve levels of noise exposure that may be posing a risk to their hearing.

Noise Induced Hearing Loss IS PREVENTABLE if individuals have the necessary information and skills to monitor their noise exposure and take action to look after their hearing health. The consequent impact of noise exposure on hearing is dependent on both the volume of the noise involved, and the amount of time the individual is exposed. In the majority of cases one or both of these factors are under the control of the individual. However, individuals need to be aware of the risk posed by noise, and have knowledge of how to reduce their exposure in order for them to make use of the control they have.

In general, health education is often best introduced via an "inoculation" approach. Research also suggests that risk-reduction programmes are likely to be most effective when they promote not only increased awareness, but also promote changes in attitudes underlying behavioural change (Bruvold, 1993). Programmes should raise awareness of the risks associated with specific activities, with the aim of promoting and strengthening positive attitudes towards appropriate low-risk behaviours. This method can effectively be used with young children to strengthen their beliefs regarding healthy behaviours with the aim of inoculating them against later temptations to participate in harmful activities (Maibach, 1995).

Comprehensive hearing health educational programmes presented to children at an early age (e.g. in primary school) can provide a level of defence against later poor hearing and noise choices. This type of programme can provide an early intervention approach that can also carry subsequent benefits for any later programmes aimed at specific stage-relevant concerns (e.g. MP3 use in young teenagers, club/pub music exposure for older teenagers).

A range of issues on healthy lifestyles have now been included in most modern primary school curricula in Australia. However, despite the high developmental and societal costs associated with hearing impairment, education on the risk of noise exposure and strategies for noise reduction remains lacking in current curricula (see Folmer, 2003 for a discussion of the importance of hearing conservation programmes). The Hear4Tomorrow programme has been developed to fill this significant gap.

### **So, what is the Hear4Tomorrow Programme?**

The Hear4Tomorrow programme is a free resource for Australian schools, made possible as a result of Commonwealth Government funding. The programme was developed by the National Acoustic Laboratories (world leaders in hearing related research). It has been put together and trialled by an experienced teacher in rural and metropolitan schools with positive results.

The aim of the programme is to provide teachers with a resource that enables them to teach hearing health in a way that complements their existing teaching programmes. Hearing loss prevention could easily be seen as part of the science syllabus (it includes information about the hearing system); maths (it includes measurement of sound) or even art (activities may include the development of hearing health messages via paper or A/V mediums). However, we recognise that hearing loss prevention is first and foremost a health issue, and thus the programme has been developed to fit within the scope of state-based health-related teaching requirements.

As a health programme, Hear4Tomorrow is based on well-respected health education theory and principles (see shaping healthy behaviours). <http://hear4tomorrow.nal.gov.au/Shaping.html>

It includes four modules that work together to teach hearing health while engaging and motivating students to participate in noise reduction behaviours. In doing so, the programme keeps a strong focus on significant (state-based) learning objectives from Australian Primary Health-related curriculum. The programme can be used in conjunction with teaching topics such as harm minimisation, risk identification, and health promotion. (A summary of the most relevant teaching outcomes for each state can be found at [http://hear4tomorrow.nal.gov.au/images/Syllabus\\_outcomes\\_by\\_state.pdf](http://hear4tomorrow.nal.gov.au/images/Syllabus_outcomes_by_state.pdf))

For this reason, the Hear4Tomorrow programme should not be seen as a competitor to the education of other health issues in schools. Rather, many parallels can be drawn between the strategies and behaviours used for identifying and addressing risks to hearing, and those used to address other health threats already often taught in classroom programmes (e.g., sun exposure).

### **How Does the Hear4Tomorrow Programme Work?**

The programme is divided into four distinct modules, each covering a different aspect of hearing health. Based on health education theory, each module is aimed at raising awareness and improving student motivation to engage with hearing health. Details about each of the four modules can be found at:

<http://hear4tomorrow.nal.gov.au/Modules.html>

An overview of the essential aims and components is included in each module.

The Hear4Tomorrow programme acknowledges that many teachers may have little prior knowledge or experience teaching hearing health, and may have limited time in which to acquire the relevant background. The module -by- module teaching notes provide a general introduction to the topic of hearing health. Used **with** the module notes, they should provide sufficient information from which to teach the Hear4Tomorrow programme.

## Hear4Tomorrow - Teaching Notes

### Module 1. Understanding Hearing Loss

Students' motivation to engage in healthy hearing behaviours is significantly influenced by their beliefs about the real life impact of hearing loss on day-to-day life (See "Shaping healthy behaviours" for information about perceived severity). Students are more likely to be interested in protecting their hearing if they understand the difficulties faced by people with a hearing loss.

**Module Aim:** To raise students' awareness of the real life impacts of hearing loss.

#### Students will be able to:

- Appreciate what it is like to have a high frequency hearing loss. (This is the type of loss that occurs through noise injury)
- Better understand the need to maintain good hearing health.

#### Background Reading

##### Why is it important to look after your hearing?

Hearing loss means that some sounds can't be heard. People with mild hearing loss may miss only soft sounds; for those with more severe hearing loss, many sounds may be inaudible. The inability to hear sounds loudly enough is only one of the problems associated with hearing loss. There are other effects of hearing loss which can interfere with listening and communication:

- Loud sounds may cause discomfort (reduced dynamic range)
- Particular speech sounds might not be audible (e.g. high-pitched sounds like "s" or "f") making it harder to understand speech and follow conversations
- Listening in background noise might be difficult (difficulty separating sounds from the surrounding noise)
- It may be hard to know where sounds are coming from.

Our hearing ability can affect our quality of life. Hearing difficulties can result in social difficulties or loss of confidence. Difficulties with conversation can leave us feeling embarrassed or left out, or withdrawing from social occasions.

With a hearing loss, listening can be tiring. Hearing loss can also make it difficult to hear important sounds in the environment, the telephone, doorbell, television, or important warnings sounds (e.g. traffic approaching, smoke alarms etc).

For many students (and in fact for many adults) the importance of hearing, and the consequences of hearing loss are difficult to comprehend clearly. The old saying "You don't know what you've got until it's gone" is very true for hearing, with many people unaware of how much they rely on their hearing, or how delicate their hearing is. As a result, it is easy for students to underestimate the importance of good hearing health.

This module sets the stage for the Hear4Tomorrow programme by providing students with a better understanding of the experience of hearing loss to better appreciate the need to maintain good hearing health.

#### Lesson Components (See also module notes):

##### 1. Introduction/discussion of hearing loss

Conducting an early discussion about students' beliefs is helpful to see what areas may have the greatest impact for them, and thus are most likely to motivate engagement in noise reduction behaviour. Students who have personal knowledge of hearing loss (either themselves or a close friend/family member) may be particularly helpful in discussions aimed at raising classmates' awareness.

## 2. Hearing Loss Simulations

A common belief about hearing loss is that it can be simply equated to a lowered volume of sound. That is, that people experiencing hearing loss just need amplification, or “to turn the volume up”, in order to overcome difficulties. This belief is also reflected in the way people view hearing aids. For many, there is a belief that just as the lenses in eyeglasses can “fix” many visual impairments, amplification in hearing aids will “fix” hearing impairments.

This component aims to provide students with an appreciation of the complexity of hearing and how hearing loss can interfere with the ability to access sound. A particular focus should be on access to speech sounds (as opposed to environmental/incidental sounds), as disruptions to speech sounds have serious consequences for communication, and thus for personal relationships.

For all simulations, it will be helpful to emphasise that simply “turning up” the sound is generally insufficient to allow the sounds to be understood. Rather, the quality/clarity of the sound source has been impaired. (In general terms a conductive hearing loss leads to a loss of loudness while sensorineural hearing loss leads to a loss of loudness as well as a lack of clarity).

## Module 2. The Hearing System and Noise

In order to effectively protect their hearing, students need to have a general understanding of how their hearing works. By understanding how the different parts of the ear function, students are better able to appreciate how noise may threaten to damage their hearing. Ultimately, this knowledge can also help students understand how different hearing protection methods can succeed in removing or decreasing the threat.

**Module Aim:** To educate students about how their hearing works, and in doing so teach them about how noise can cause damage.

### Students will understand:

- How the ear and hearing system function
- How hearing may be damaged by noise.

### Background Reading

#### How do we hear?

Sound occurs when a moving or vibrating object (e.g., vocal cords) causes the air around it to move. Your ears pick up sound which travels in invisible waves through the air. Sound waves travel down the ear canal and hit the eardrum in the middle ear. This causes the eardrum to vibrate. Three tiny bones in your middle ear link the vibrating eardrum to the cochlea in the inner ear.

The cochlea is filled with liquid that carries the vibrations to thousands of tiny “hair cells” sitting on a membrane that stretches the length of the cochlea. The hair cells on the membrane fire off tiny electrical signals. These electrical signals travel up the cochlea nerves of the auditory pathway to the brain. All this happens in a fraction of a second.

#### Introduction to Hearing and Hearing Loss

[Read: Hearing and Hearing Loss – An overview](#) (See Supplementary readings below).

This provides an introduction to the hearing system (including the parts of the ear) and an explanation of how sounds are processed. Also included is information about different types of hearing loss including sensorineural hearing loss (which can be caused by excessive noise exposure) and prevention of hearing loss.

#### Why is Noise Hazardous to Hearing?

The hearing system is complex and delicate. The inner part of the ear (or cochlea) contains fluid, and thousands of tiny hair-like cells. These hair cells bend in response to the vibrations caused by sound, creating a signal which is transmitted to the brain. Although they are flexible, repeated or prolonged exposure to high levels of noise can result in the hair cells being permanently bent, or even broken.

One way to think about it is to compare the effects of noise on hair cells to that on trees by the wind. Trees will sway with the wind but generally return to an upright position when it is calm. However repeated strong winds can lead to a tree being permanently “bent”, and very strong winds (even over a short time) can cause a tree to bend and break. So too noise can damage the sensitive structures in the ear, permanently bending or breaking the sensitive hair cells. If damaged, these cannot be repaired, leading to hearing loss that is irreversible.

Loud sound does not have to be physically painful to cause hearing damage. If you are in a situation in which you need to raise your voice to be understood by someone 1m away, then the noise is probably too loud. Damage to hearing from noise accumulates, just as the sun can gradually damage our skin. The higher the level of sound, and the longer the exposure, the more damage is likely to occur.

**Lesson Components (see also module notes):**

**1. How do we hear? Introduction to the ear and hearing system, and its functioning.**

**2. How does noise damage hearing? A demonstration of how noise can result in damage.**

Understanding how the hearing system works helps students to better understand how damage can be caused by high levels of noise. This module contains resources to provide a general overview of “How we hear”, which can be tailored to suit the level of the students. As a health-based programme Hear4Tomorrow does not require a heavy teaching focus on the science of hearing, although there are many opportunities to extend investigation and knowledge in this area if desired. Rather, teachers are advised to incorporate enough information about sound and hearing to allow students to understand the need to protect their hearing, and how noise reduction methods may benefit (e.g., by blocking harmful levels of noise to the ear).

Students are also given a concrete example of the general effect of noise on the ear’s hair cells. The focus here is on providing students with a visual reminder of how excessive noise can result in damage, and the permanence of this damage.

### Module 3. How Loud is Too Loud?

Students need to be able to recognise risky environments in order to protect themselves from hearing damage. This module develops students' ability to judge their exposure and identify when it is high enough to potentially threaten hearing health.

**Module Aim:** To inform students how to recognise risky noise-exposure environments.

**Students will be able to:**

- Understand the relationship between volume, time and risk
- Identify noise environments which might pose a risk to their hearing.

### Background Reading

#### When does Noise Pose a Risk?

Noise exposure is measured in relation to the intensity (the loudness or volume measured in decibels; dB) and the duration (the amount of time exposed). It is the cumulative combination of these two factors which determines the risk to hearing. It should be noted that exposure to extremely loud sounds (i.e., those over 140dB) are considered to be dangerous for exposure of any duration. Sounds below 75-80dB are generally considered to pose little to no risk to hearing.

When discussing "safe" noise exposure, the standard usually referred to is that laid down by workplace health and safety regulations. In Australia, an acceptable daily noise dose is the equivalent of exposure to 85dB over an 8 hour period (often denoted 85dB  $L_{Aeq,8h}$ ). This means that a noise with the intensity 85dB is considered to pose a risk to hearing if the exposure duration is greater than 8 hours.

As the intensity/volume of the sound increases, the acceptable exposure duration decreases. The decibel scale is non-linear, which means that as the volume increases by small increments, the acceptable exposure time decreases dramatically. For every 3dB increase in volume, the acceptable exposure duration decreases by half. So for sounds at 88dB, the acceptable exposure time is only 4 hours. For sounds at 91dB, exposure should be restricted to 2 hours, and so on. Thus when noise reaches volumes of 100dB, the acceptable exposure time is only 15 minutes.

## Noise Induced Hearing Loss

Read: Preventing Noise-Induced Hearing Loss (NIHL) (See Supplementary readings below).

This provides an introduction to the idea of noise exposure and the threat it poses.

### Lesson Components (see also module notes):

#### 1. Defining noise exposure

For students, an understanding of the dB scale does not need to be as detailed or deep as outlined above, although some teachers may wish to discuss this within an extended lesson. The focus should be on the instruction that noise exposure is related to volume and time, and that even small increases in volume have significant impacts for the “safe time”.

It is also important to provide students with a concept of 85dB such that they are better equipped to make judgements about the potential risk of noise environments they may find themselves exposed to. The description “If you need to raise your voice to hold a conversation with someone 1m away” can be a good warning sign for students that the noise environment may be in excess of 85dB and thus pose a risk to their hearing.

Providing students with a visual table of noise levels and their associated acceptable exposure durations (e.g.85dB for 8 hours, 88dB for 4 hours, 91dB for 2 hours) along with some examples of noises at these volumes can help students orient themselves to the relative risk posed by higher exposure volumes in their environment.

#### 2. Measuring noise exposure

This section aims to familiarise students with an idea of what different volume levels “sound like”. By having a framework of where different noises sit in relation to each other, students can be better informed about when and how to modify their exposure to safe levels.

A number of activity suggestions are provided for this component, and teachers are welcome to select those that best suit their class and classroom. By far, hands-on measurement with a sound level meter is the most popular and the most engaging of these activities. However additional activity ideas are also provided if this is not appropriate.

#### Do I need a sound level meter?

The results of our programme evaluations indicate that, where possible, access to a sound level meter improves the understanding and engagement of students with the teaching message. Basic sound level meters (available online or at electronic stores for less than \$50) are more than adequate for these activities.

However, alternate activities are suggested if a sound level meter is not available.

A number of “apps” are now available to enable a smartphone/tablet to measure sound levels. These are not a substitute for a dedicated, properly calibrated sound level meter, and accuracy may vary depending on many factors including the limits of the device’s internal microphone (in particular, they are likely to be less accurate for high volumes). However, they may be used as a tool in conjunction with the other information available to provide access to a hands-on activity in the absence of a dedicated sound level meter.

## Module 4. Protecting Our Hearing

Students will be more likely to look after their hearing health if they know the different ways to do so. The more comfortable and capable they feel about reducing their noise exposure and carrying out related behaviours, the more likely they are to engage making healthy hearing decisions.

**Module Aim:** To educate students how to best protect their hearing in different environments.

### Students will be able to:

- Understand the different methods for reducing their noise exposure in risky situations
- Choose which methods may be most appropriate in different contexts.

### Background Reading

#### Prevention Is Best!

There are two ways to reduce noise exposure: reduce the volume, and/or reduce the duration. For younger students, exposure to noise is not always something they have control over, and thus may not be able to always avoid – even if they wanted to. It is important then to provide students with realistic options for ways they can reduce their noise exposure if they find themselves in a noisy environment.

[Read: Protecting your hearing \(See Supplementary readings below\)](#)

**A note on hearing protection:** There are many forms of hearing protection available including different types of earplugs and earmuffs. Like sunscreen, the protection rating of each can be graded based on the amount of noise they block out. However, unlike sunscreen – the highest rating isn't always the best choice – wearing heavy duty earmuffs to a concert or band practice isn't going to be helpful! At the end of the day, the “best” hearing protection, is the hearing protection that you are comfortable using and have available to use.

## Lesson Components (see also module notes):

### 1. Noise reduction strategies

### 2. Choosing the right strategy

The teaching components for this module focus on teaching students to reduce volume at the ear – by walking away, turning down the volume, or using hearing protection. It is important for students to realise that they have different methods at their disposal to protect their hearing health, and be able to think about why different methods may be appropriate for different contexts.

## Supplementary Readings

### Hearing and Hearing Loss – An Overview

The following sections provide an overview of the hearing system, including the parts of the ear, and types of hearing loss.

#### The Parts of The Ear

Your ear is made up of a conductive pathway which includes the outer and middle ear and the neural nerve pathway that includes the inner ear and auditory nerve.

#### The Outer Ear

The outer ear consists of:

- an external flap of skin (pinna) and cartilage
- the ear canal that leads down to the eardrum.

The **pinna** is the external flap of skin that helps you know the direction of sound. Its purpose is to collect or funnel sounds into your ear canal, yet it is not very important for good hearing.

The ear canal varies in size and shape from person to person. It runs nearly horizontally toward the centre of the head for about 2.5cm (in adults) and ends at the eardrum.

The skin along the outer part of the canal has tiny hairs and produces a waxy substance called **cerumen**. This earwax discourages foreign objects from entering the ear, and keeps the skin of the canal from drying out.

#### The Middle Ear

The middle ear consists of:

- the eardrum
- an air-filled cavity that includes three middle ear bones
- oval and round window membranes
- the eustachian tube.

#### The eardrum and middle ear bones

The cone-shaped eardrum is stretched across the ear canal and is quite stiff, yet flexible. Behind the eardrum three bones are connected to form the ossicular (pronounced oss-ick-you-lar) chain. They are the:

- hammer (malleus)
- anvil (incus)
- stirrup (stapes).

The **hammer** is connected to the **eardrum** on one end and through the **anvil** to the **stirrup** at the other end.

The **stirrup** is the smallest bone in the body, smaller than a grain of rice. It rests against the oval window membrane leading into the inner ear.

The stirrup moves in and out of the **oval window membrane** like a piston as the drum moves in response to sound.

The **round window membrane** is located just below the oval window and is flexible. When the stirrup moves in and out, it pushes the fluid in the cochlea, and the round window allows the fluid to be displaced.

The middle-ear cavity, filled with air, is connected to the back of the nose and throat by the **eustachian tube**. This tube adjusts the air pressure in the middle-ear space to match the air pressure on the outside of the eardrum and is normally closed. In a plane when you take off or land, it helps to yawn or swallow because these actions usually open the eustachian tube to adjust the air pressure in the middle ear space.

### **The Inner Ear**

The inner ear is made up of:

- the cochlea
- semicircular canals.

The **cochlea** is a tiny spiral-shaped structure, about the size of a pea. It is nestled in the bone of the skull and filled with fluid. A thin membrane with around 15,000 microscopic hair cells sits in this fluid. Each cell is tuned to a particular sound or frequency.

The tiny hair cells connect to the cochlea nerve that sends messages to the brain. The **semicircular canals** are mainly responsible for the sense of balance.

Source: <http://www.hearing.com.au/how-do-we-hear>

## About Hearing Loss

There are three types of hearing loss: conductive hearing loss, sensorineural hearing loss, and mixed hearing loss.

### Conductive Hearing Loss

Conductive hearing loss can be acquired or congenital and is caused by blockage or damage in the outer and/or middle ear. A conductive hearing loss leads to a loss of loudness and can often be helped by medical or surgical treatment.

Some of the causes of conductive hearing losses are:

- blockages of the ear canal by impacted wax or foreign objects
- outer ear infection (sometimes the result of swimming)
- 'glue ear' (middle ear infection), a common problem in young children
- perforated eardrum, maybe from a bad middle ear infection or an accident
- otosclerosis, a hereditary condition where the bone grows around the tiny stirrup bones in the middle ear
- partial or complete closure of the ear canal.

### Sensorineural Hearing Loss

Sensorineural hearing loss can be acquired or congenital and is caused by damage to, or malfunction of, the cochlea (sensory part) or the hearing nerve (neural part).

Sensorineural hearing loss leads to a loss of loudness as well as a lack of clarity. The quantity and the quality of sound are affected and sometimes may limit the benefit of a hearing aid.

Causes of acquired sensorineural hearing loss include:

- the ageing process
- excessive noise exposure
- diseases such as meningitis and Meniere's disease
- viruses, such as mumps and measles
- drugs which can damage the hearing system
- head injuries.

In Australia, 20 children per 10,000 live births will be born with a congenital sensorineural hearing impairment. Causes include:

- inherited hearing loss
- premature birth, lack of oxygen at birth, or other birth traumas
- damage to the unborn baby from a virus such as rubella
- jaundice.

### Mixed hearing loss

Mixed hearing loss results when there is a problem in both the conductive pathway (in the outer or middle ear) and in the nerve pathway (the inner ear). An example of a mixed hearing loss is a conductive loss due to a middle-ear infection combined with a sensorineural loss due to damage associated with ageing.

Source: <http://www.hearing.com.au/types-of-hearing-loss>

## **Tinnitus**

Tinnitus is the term for noises which are heard 'in the ears' or 'in the head' - buzzing, ringing, whistling, hissing, pulsing and other sounds which do not come from an external source.

Tinnitus is extremely common. Most people will experience tinnitus at some time in their lives, but it usually only lasts for a short period. Around 10 per cent of the population experience persistent tinnitus and one per cent will be severely bothered by it.

### **What causes tinnitus?**

Although tinnitus is often associated with hearing loss, the presence of tinnitus does not mean the person is going deaf. Nor will the tinnitus itself cause a hearing loss or other illnesses.

There are a number of causes which may provide the initial trigger including:

- middle ear infection
- dental or jaw problems
- some medications
- exposure to loud noises
- inner ear damage.

### **What effect does tinnitus have?**

Around one per cent of people have troublesome tinnitus. Unnecessary fears about damage to the ear or brain, or that one is going to be stuck with the problem for life, can lead to the subconscious focussing on the small tinnitus signals coming from the ear, creating feelings of annoyance, apprehension or even anxiety or depression.

Tinnitus is more common in hearing-impaired people, but not necessarily because the inner ear is damaged. If you are hard of hearing, communication is often a strain, and this 'straining to hear' may focus the subconscious to pick up anything coming from the inner ear.

### **Important Note Regarding Tinnitus:**

Tinnitus can be a useful teaching example of the severity of hearing loss, and the susceptibility of our ears to damage. A personal experience of (or an exposure to) tinnitus can provide a strong motivator for individuals to look after their hearing health. For many people who have little understanding of hearing loss, tinnitus is seen as more intrusive; with larger impacts on everyday life than hearing loss is understood to have. It is also an experience that is may be more familiar (even in a temporary way) than the experience of hearing loss. For those exposing themselves to high levels of noise tinnitus is not uncommon immediately following exposure. Alongside Temporary Threshold Shift (TTS, a condition usually resulting in a feeling of dull or impaired hearing for a finite time period after high noise exposure) tinnitus can be seen as a warning sign that damage may be occurring.

In teaching however, care must be taken not to unduly exaggerate the difficulties resulting from tinnitus. The experience of tinnitus varies widely across individuals, as does the distress it causes. Focussing on the negative aspects of tinnitus can be counterproductive to managing the condition for those who experience it. It is important not to create an environment where students who currently experience tinnitus, or who may later experience it, become so stressed as to not be able to effectively manage their hearing health as a result.

## Prevention of Hearing Loss

### Preventing Noise-Induced Hearing Loss (NIHL)

Exposure to noise is the most common cause of preventable hearing loss experienced in the community. The risk of permanent hearing loss from noise is related to the loudness of the noise and the duration of the exposure. One-off exposures to extremely high levels of impulse sound (e.g. sound of a gunshot) can and do cause instantaneous damage to hearing. The following section provides information about NIHL and the nature of the risk posed by noise to hearing.

Noise injury is mostly acquired gradually as the result of exposure to loud noises over an extended period of time. Typically this has been through working in a noisy environment; however, of more recent concern is the trend toward numerous noisy leisure activities that are also capable of causing damage to hearing. The hearing mechanism does not distinguish between “pleasant noise” which we may seek out and “unpleasant noise” which we may wish to avoid for reasons other than hearing conservation.

Repeated or prolonged exposure to loud sounds increases the risk of hearing damage, and the effects are cumulative. The loudness of a sound is measured in decibels which is a non-linear scale used for scientific purposes. For the purposes of looking after your hearing it is important to note is that if you need to use a raised voice to communicate or carry on a normal conversation between two people at a distance of 1m then the noise level is potentially hazardous (around 85-90 dB), and exposure over a significant time could cause problems. If, after experiencing loud noise (for example after a dance party or ‘loud’ event) the world seems a little quieter and/or you have ringing in your ears then the sound level is definitely hazardous. Your ears are giving a warning to be careful.

Sounds below 75 decibels are unlikely to cause hearing damage, regardless of the duration of exposure. As the loudness of the sound increases, the duration of “safe” exposure decreases. For example, exposure to sounds above 85 decibels for more than 8 hours a day significantly increases the risk of subsequent hearing loss.

Hearing damage is caused by too much noise reaching your ears. This noise exposure is a function of loudness and time so to reduce your exposure you must reduce the volume or loudness and the time. Noise exposure is cumulative over the life-time, meaning that every exposure adds up – just like too much UV radiation from exposure to the sun. In the short term there may be few apparent effects but it is the long term damage that counts.

Hearing slowly gets damaged in an almost imperceptible way and it can take many years of exposure for the affected individual to actually take notice. Noise injury is painless and bloodless and does not rate high on a scale of physical injury such as a broken arm or leg but it is a real injury nevertheless.

Thus it is important to take a long term perspective and reduce your noise exposure. You can improve your hearing health by,

- avoiding loud noise;
- removing the source of noise;
- removing yourself from the noise; or
- reducing the volume.

Remember "If you lose it, it won't come back".

### Protecting your hearing

- Avoid loud sounds and noise if you can.
- Sudden, very intense sounds (e.g. gunshots) are particularly dangerous and can cause immediate, permanent hearing loss.
- If you attend loud music events (concerts, bands), use hearing protection (such as earplugs). Special

earplugs can be made for musicians that protect the hearing while preserving the sound quality of the music.

- Limit the time in very noisy places, and take regular breaks in quieter areas.
- If you use a personal stereo, set the volume at a moderate level. Avoid turning up the level of your personal stereo to try and drown out other background noise.
- Be aware that your risk increases if you are occupationally exposed to solvents or toxins or if you are taking certain drugs – your Chemist/Doctor should be able to tell you more.
- If you cannot avoid loud sound, then you should protect your ears with earplugs or ear muffs. Balls of cottonwool or paper tissue offer little protection.
- You should give your ears frequent rest from noise.

## References

- Bess, F. & Poynor, R. (1974) Noise induced hearing loss and snowmobiles. *Archives of Otolaryngology* 99(1), 45-51.
- Bruvold, W. H. (1993) A meta-analysis of adolescent smoking prevention programs. *American Journal of Public Health*. 83, 872-880.
- Folmer, R.L. (2003) The importance of hearing conservation instruction. *Journal of School Nursing*. 19(3), 140-8.
- Katz, A.E., Gerstman, H.L., Sanderson, R.G. & Buhanan, R. (1982) Stereo earphones and hearing loss. *New England Journal of Medicine* 307(23), 1460-1.
- Lankford, J.E. & West, D.M. (1993) A study of noise exposure and hearing sensitivity in a high school woodworking class. *Language, Speech and Hearing Services in Schools*, 24(3), 167-173.
- Maibach, E. & Parrott, R.L. (1995) *Designing Health Messages: Approaches from communication theory and public health practice*. Thousand Oaks, CA. Sage Publications
- Muhr, P., Rasmussen, F., & Rosenhall, U. (2007) Prevalence of hearing loss among 18-year-old Swedish men during the period 1971-1995. *Scand J Public Health*. 35(5),524-32.
- Rabinowitz P.M., Slade M.D., Galusha D., Dixon-Ernst C. & Cullen M.R. (2006) Trends in the prevalence of hearing loss among young adults entering an industrial workforce 1985-2004. *Ear and Hearing* 27(4),369-375.

## Appendix C – Module Notes

The Hear 4 Tomorrow Programme has been developed to enable any teacher to easily teach hearing health to primary school aged students. This page outlines the programme and provides access to downloadable background reading and support materials for teachers, as well as classroom teaching resources.

Hear4Tomorrow has been developed to include topics that research has shown to be important for effective hearing health education, including:

- **Understanding hearing loss**
- **How do we hear?**
- **How loud is too loud?**
- **Protecting our hearing**

This is done in a modular teaching format which allows classes to work through a series of related activities, gaining a better understanding of each area.

Modules can be presented together as a single one off lesson/activity or spread over a series of lessons or time periods according to classroom schedules. Each of these modules is provided below with descriptions, downloadable teaching background reading and recommended teaching activities, including access to resources.

Where practical, variations and/or additional teaching activities are also described to allow teachers maximum flexibility in the way they incorporate the programme within their teaching schedule and link to other classroom activities.

## Module 1. Understanding Hearing Loss

### Why...

Students' motivation to engage in healthy hearing behaviours is significantly influenced by their beliefs about the real life impact of hearing loss on day-to-day life (See "Shaping healthy behaviours"). Students are more likely to be interested in protecting their hearing if they understand the extent of difficulties faced by people with a hearing loss.

### What...

**Module Aim:** To raise students' awareness of the real life impacts of hearing loss.

### Students will be able to:

- Appreciate what it is like to have a high frequency hearing loss. (This is the type of loss that occurs through noise injury).
- Better understand the need to maintain good hearing health.

### Lesson Components:

- Students discuss their knowledge of, and beliefs about, hearing and hearing loss.
- Students experience simulations of different types of hearing loss through interactive and online activities.

### Preparation:

- Large piece of paper/smart board to record children's thoughts.
- Access to hearing loss simulations – For all activities this can be done live (via online resources). However some activities also allow for files to be accessed prior to the class and saved for offline use if preferred.

### How...

#### 1. Intro/Discussion

##### Procedure:

1 Begin with the question on the board/paper "**What do you know about hearing?**"

If desired, prompt a discussion with some of the following questions:

- How do we hear?
- Do you know anyone who has trouble hearing?
- Why is hearing important?
- What might you find hard if you had difficulty hearing?

2 Discuss students' comments and introduce the idea that hearing is important for environmental sounds and particularly for communication. This is reinforced through the following activities.

#### 2. Hearing Loss Simulations

The activities below allow students to explore how the world may sound to someone with a hearing loss. The simulations of different types of sounds can be useful for prompting discussions about the range of impacts hearing loss can have.

The aim of all activities is for students to appreciate the importance of good hearing health, and have a realistic understanding of how their life may be impacted by a hearing loss.

Both of the activities (A & B) may be used to emphasize different impacts of hearing loss on everyday life and the ability to communicate. Or, if time is limited just one may be chosen to explore in more detail.

### **A. Dangerous Decibels' "What's that Sound?"**

#### **Description:**

An interactive "matching" game that can be done individually or in groups. Students experience how everyday sounds might hear with a hearing loss. The game plays a series familiar sounds (modified to simulate a hearing loss), and students are required to identify and match these to their actual source.

Link: <http://www.dangerousdecibels.org/virtualexhibit/1whatsthatssound.html>

#### **Procedure:**

Introduce the matching game as a way of explaining how even familiar everyday sounds may be difficult to interpret with a hearing loss.

Using smart boards or computers children play the game by trying to guess the item or activity that matches the sound they hear. Each sound can be done by the whole class, or individual students asked to take it in turns to guess the sound. (To make it harder, ask students to guess some sounds without the visual clues. Although this is very difficult). When the correct sound is identified, ask students to listen the same sound without the hearing loss simulation and discuss how they may sound different (i.e. quality and volume of sound).

### **B. Hearing Loss and Understanding Speech**

#### **Description:**

Four audio speech files simulating different types and levels of hearing loss. Students are given the opportunity to explore the real life impact hearing loss may have on understanding speech, and thus its ability to impair communication with others

Link: <http://www.nal.gov.au/hearing-loss-simulations.shtml>

#### **Procedure:**

Introduce the activity by discussing the most important use of hearing for most people – communication with others. Discuss how different types of hearing loss can have different effects on your ability to understand speech.

Introduce and play each of the audio simulations, giving students an opportunity to discuss what information can or can't be easily extracted from the speech files. Demonstrate to students that simply "turning up" the volume of the files does not necessarily improve comprehension.

A "fill in the blanks" or similar comprehension activity (based on the written transcript – link

provided on the site) may also be developed to give students an understanding of the personal frustration resulting from difficulties comprehending speech.

## **Summary**

The aim of this module is for students to better appreciate the value of maintaining good hearing health, particularly for communication. In doing so, students should develop an understanding of the type of difficulties and frustrations experienced by people with a hearing loss.

A short discussion may be useful at the conclusion of the chosen activity/s, including prompt questions such as:

- What sounds were most difficult to hear – did you sometimes confuse them with other sounds?
- Did turning up the volume help?
- What things might make it even harder to hear (e.g. background noise, not facing people)?

## **Optional Extensions**

### **Communication Activities**

#### **Description:**

Inclusion of activities that reinforce the importance of good communication for team and relationship building. Highlight how easily communication breakdowns can lead to difficulties.

#### **Task:**

There are a wide range of activities already in use in most schools that demonstrated the importance of communication. Nearly any of these can be included here to reinforce that message, while also highlighting the role of good hearing for effective communication.

#### **Procedure:**

Discuss with students how significantly hearing loss can adversely impact our ability to communicate effectively. Difficulty communicating can lead to frustration. Furthermore it can lead to difficulties developing and building personal relationships.

Run 1 or more communication activities and discuss how communication breakdowns due to hearing loss may affect the outcome.

### **Preserving your Hearing**

#### **Description:**

A short (downloadable) flash player file from Sensimetrics including information about hearing loss and providing audio examples of mild, and moderate hearing loss as well as the experience of tinnitus. It also includes a simulation of severe hearing loss, as it might be heard with or without a hearing aid.

Link: <http://www.sens.com/pyh/index.htm>

#### **Procedure:**

This clip is less interactive than the other simulator options as it is presented in a straightforward “video” format without the ability to pause easily.

As such it is best presented with a brief description of what will be viewed and with a note for students to listen carefully to each of the simulations, concentrating on how hearing loss changes the sound of speech and music.

The clip includes information about hearing loss and hearing loss prevention which may also be discussed briefly at the end of the session.

## Module 2.The Hearing System and Noise

### Why...

In order to be able to effectively protect their hearing, students need to have a general understanding of how their hearing works. By understanding how the different parts of the ear function, students are better able to appreciate how noise may threaten to damage their hearing. Ultimately, this knowledge can also help students understand how different hearing protection methods can succeed in removing or decreasing the threat.

### What...

Module Aim: To educate students about how their hearing works, and in doing so teach them about how noise can cause damage.

### Students will understand:

- How the ear and hearing system function
- How hearing may be damaged by noise.

### Lesson Components:

- How do we hear? Introduction to the ear and hearing system, and its functioning
- How does noise damage hearing? A demonstration of how noise can result in damage.

### Preparation:

- Ear diagram – either in picture or video format (as per below activity)
- Pipe cleaners/raw spaghetti.

### How...

#### 1. How Do We Hear?

##### Description:

Using a poster or video of the ear, the teacher explains how the ear works.

##### Resource:

Diagram of the ear: Link: <http://hear4tomorrowtest.nal.gov.au/images/conductive-loss-new.jpg>

Link to online video of the ear with audio commentary:

Link: <http://www.hearingcharities.org/about-hearing-loss/working-ear.html>

##### Procedure:

Using the diagram or video, familiarise students with the different parts of the ear (e.g. outer, middle and inner ear) and describe how sound travels through the air and ear.

- a) Sounds result from vibrations (or sound waves) in the air.
- b) Sound waves travel through the air and enter the ear canal via the external part of the ear (the pinna).
- c) The sound waves travel down the ear canal to the ear drum (tympanic membrane) causing it to vibrate.

d) The vibrations of the ear drum cause the three small bones in the middle ear (malleus - hammer, Incus - anvil, Stapes - stirrup) to vibrate. NB These are the smallest bones in the human body.

e) The Stapes is connected to a fluid filled organ called the cochlea in the inner ear. (The cochlea has thousands of tiny sensors called “hair cells”.)

f) The vibration continues to cause these hair cells vibrate and send signals to the brain which is interpreted as different sounds.

**NB:** The video also provides an introduction to how high noise levels can damage the ear.

## 2. What effect does noise have on our ears?

### Description:

Use household items to provide a hands-on representation of the permanent damage caused by excessive noise.

### Resources:

Pipe cleaners or uncooked spaghetti

### Procedure

- Revise the importance of the small “hair cells” within the cochlear for transmitting sound information to the brain.
- Explain to students that they are going to walk through events of a day where they expose their ears (and their hair cells) to different levels of sound.
- Teacher demonstrates the activity: Have students hold the base of 4 or 5 pipe cleaners in one hand so that the pipe cleaners point upwards as a representation of some hair cells. The free hand is used to brush against the hair cells (pipe cleaners) gently if the sound is soft and more vigorously as the sound increases.

This can be conducted as a class activity with the teacher providing a “scripted day” with all students following. Or the teacher may prefer to demonstrate with an example of their day, and ask other students to give their own examples – either in pairs, groups or to the whole class. For example,

- The day starts with quiet breakfast at home. (lightly brush hand over tops of pipe cleaners)
- Students arrive at school and gather in the playground chatting and playing. (slightly stronger movement, taking care not to bend pipe cleaners)
- The bell rings (Stronger movement –pipe cleaners may start to bend)
- It is the school swimming carnival. Sitting in the stand, while cheering for your house or team, and everyone is yelling or shouting support. (Strongest movement with some of the pipe cleaners bent over at the end).

Recap on the events chosen and the effect of the sounds on the hair cells. Demonstrate how, once bent, the hair cells do not easily recover from the damage caused by noise.

**Alternative:** If Pipe cleaners are not available, raw spaghetti can be used as a substitute. In this case the spaghetti will break as stronger “noise” is used. NB The activity may be best conducted outside

**Summary:** Explain that although the hair cells are meant to move when sound hits them (this

is how we hear!), too much noise causes them to bend too far or to break. Sound (or music) is not a bad thing – but we need to make sure that we don't have so much that it hurts us.

### **Extension Activities**

The emphasis of “How do we hear” is on providing students with the necessary background about the hearing system to enable them to appreciate the threat posed by noise. However, if desired this component can be expanded to create a greater focus on the ear and hearing process. Suggestions include:

- A drama/dance of parts of the ear. Get students to act out the different parts of the ear as a soundwave passes through the system.
- Build models of the ear using everyday items. E.g. a funnel may be used as the pinna and ear canal. A tambourine as the ear drum etc. The focus should be on remembering the part each section plays in processing sound rather than a realistic/visual representation of each part.

The idea of sound waves can also be explored through many activities, to suggest a few:

- Feeling the vibration of music, by holding a balloon near a speaker
- Paper cup & string “telephone”
- Experimenting with tuning forks
- Make your own “tuning fork”. Tie a fork in the centre of a approx 70cm of dental floss/cotton. Wrap each end of the cotton around your forefingers so that the fork still swings freely between them. Press forefingers with string to the small bump where the ear meets the cheek. Swing the fork on the string so it gently hits the table or another object. The vibrations of the fork will travel up the cotton and be felt/heard as a ringing noise.

## Module 3. How Loud is Too Loud?

### Why...

Students need to be able to recognise risky environments in order to protect themselves from hearing damage. This module assists students' ability to judge their exposure and identify when it is high enough to potentially threaten hearing health.

### What...

**Module Aim:** To inform students how to recognise risky noise-exposure environments.

### Students will be able to:

- Understand the relationship between volume, time and risk.
- Identify noise environments which might pose a risk to their hearing.

### Lesson Components:

- Defining noise exposure
- Measuring noise exposure

### Preparation

- Arrange a variety of objects to be made available for volume measurements. In the days leading up to the module, if possible, encourage students to bring in objects they may wish to measure the volume of (e.g. musical instruments, toys).

### How...

#### 1. Defining Noise Exposure

##### Description:

This is designed as a basic introduction to noise and how it is measured.

This component should be kept short, highlighting the information most relevant to the students involved. It is likely unnecessary to provide too much detail about how decibels are defined or the more complex calculations that accompany some noise exposure measurements.

##### Procedure:

The dangers of noise exposure can be taught in a similar way to other traditional health messages in schools that related to cumulative exposure– e.g. sun exposure, or healthy eating. Using such examples not only assists students understanding of noise, but also reinforces their knowledge about identifying risk across these other health concerns.

	<b>Sun</b>	<b>Healthy eating</b>	<b>Noise &amp; Hearing</b>
<b>Intensity</b>	UV index  e.g. time of day, time of year	High vs low energy e.g. “sometimes” vs “rarely” foods	Volume of noise  e.g. quiet to loud
<b>Duration</b>	Time spent in the sun	Amount of different food types eaten	Time spent in noise
<b>Risk rating</b>	<b>Intensity x duration</b>		

Key ideas to include are:

- Sound by itself is not a bad thing – but needs to be enjoyed in moderation and safely.
- As the noise level goes up, the “safe time” decrease.
- Noise can start to be dangerous once it hits 85dB\*.
  - A good approximation of 85dB is any noise that forces you to shout to be heard by someone 1m away (this idea is expanded upon in the next component)
  - Noise at 85dB generally is regarded as “safe” for an exposure time of 8 hours (an approx work day).
- The key element to focus on is that even a small increase can have a big effect on the risk posed by the noise source.
  - A table of exposure levels and times can be shown to students as a guide showing how increases of 3dB, halves the acceptable exposure time.

NB: A fuller description of noise, its measurement, and associated units is outlined in the teaching notes for this module.

## 2. Measuring Noise Exposure

The following activities all aim to provide students with a better understanding of different noise levels and their relative risk to hearing. Ideally, students are given the opportunity to measure day-to-day noise for themselves (Activity A) and contrast the relative risk of different levels through the online interactive game (Activity B). This can be supplemented or replaced by the more low-tech options (Activity C) as appropriate.

### Activity A: Measuring noise using a sound level meter

#### Description:

This activity aims to give students some hands-on experience measuring the sounds in their day-to-day environment using a Sound Level Meter (SLM). Ideally, measurements can be done by students in small groups (either by running other parallel activities at the same time, or accessing multiple SLMs for the session) to allow all students hands-on experience. Alternatively, the activity can be done as a class exercise with a smaller number of single/pairs of students taking turns to measure items in front of the class group.

### **Procedure:**

Start the activity by showing students the SLM, explaining what it is used for, and how to care for it (e.g. Taking care not to damage microphone).

Discuss what sounds may be useful to measure – e.g. objects teacher or students have brought to class, a school bell, stereo. Some schools may also be able to measure external sounds from within the school premises (e.g., traffic noise if next to a busy road or highway).

Get students to measure different noises\*, and record their findings.

When measurements are completed, compile a table of results listing items measured in order of volume. Discuss and classify which activities were “quiet” (under 85dB), which were loud (above 85dB) and any that were very dangerous (100dB+).

Depending on the measurements taken, it may be interesting for students to compare their findings to published sound levels online for similar activities.

**\*Extension:** For louder noises, get students to measure the noise up close, and at different distances (e.g. 1m away, 3 m away) and record their results.

### **Activity B: Dangerous Decibel Interactive How Loud is Too Loud?**

Description: This is an online, interactive activity, whereby students can “test” their knowledge of which sounds pose a risk to their hearing. The test begins with 18 “cards” that can be selected and flipped to display a noise source (e.g. blender, washing machine). The student must then decide whether the noise source shown is potentially dangerous or safe. Once a choice is made, further information about the source is revealed including dB level and “safe” exposure time.

Link: [www.dangerousdecibels.org/exhibit/virtual-exhibit/](http://www.dangerousdecibels.org/exhibit/virtual-exhibit/)

### **Procedure:**

This activity can be done individually or in groups with students at desktop computers, however, it lends itself particularly well to use of a smart board or similar as a full class activity.

### **Suggested procedure:**

Explain/remind students that any sound over 85 decibels will potentially damage their hearing if they listen to it for more than 8 hours. You may also wish to include the information that this safe time halves for every 3 decibel increase. (e.g. Write example/table on the board: 88dB = 4 hour, 91dB = 2 hours etc.).

Explain the interactive game to the students by demonstrating the first example on the smart board with the whole class. Select a hexagon on screen and when the item is revealed discuss with the class if it would be “Safe” or “risky”. NB It may help them to consider if they think they could have a conversation with someone 1metre away while next to the object making noise. Choose “yes” or “no” and check the answer.

Presentation ideas:

- Give students opportunities to select the next hexagon themselves, and/or to answer individual items. E.g., ask a student to estimate how loud they think the object might be and how long they can listen to it for (refer them to the safe noise table as a reference). The remainder of the group indicate whether they think the student is correct or if the sound is louder/quieter before revealing the answer.
- You may wish to divide the class into “teams” and keep score of who has the most correct answers – e.g. table groups, house groups etc.
- As each item is shown, nominate a student to fill out the dB and time information on a card with the name of the object. At the end of the game, ask students to arrange the cards into order of quiet to noisiest.
- After revealing a noisy item, students can be prompted to think how they might protect their hearing if they were around that noise (thinking about when they might come across the object, and what methods might be available/possible in that environment).

### **Activity C: Hearing Loss Prevention Strategies**

#### **Description:**

This is an “offline” version of Activity B which can be used as a replacement for or in addition to. Students explore and compare the sound levels of different items using flash cards.

#### **Resource:**

Flash cards + description table (to allow classes to make their own).

#### **Procedure:**

As for Activity B, students choose a flash card and the item is shown to the class. Discuss whether students believe the item is a safe or risky noise source. Check decisions by displaying the dB/time information on the reverse of the card.

A list of the flashcard information is also provided in the resource sheet to allow teachers/students to make their own flashcards. Classes may also want to include flashcards depicting items they have measured or objects that are of particular relevance to their own lives.

#### **Optional Extension Activity:**

### **Activity D1: Personal Stereo Player Volumes**

#### **Description:**

A topic of concern often raised is young people’s use of personal stereo players (PSPs - e.g., ipods, mp3 players etc), and their potential to damage young ears (see teaching notes for more information). PSPs have the potential to play music at high volumes, and for extended periods of time. This activity aims to give students important information about the volumes produced by their music players, so they are better able to make decisions to protect their hearing.

#### **Resource:**

PSP Use Survey (or similar) can be used in class – or as a take home activity.

### **Procedure:**

Ask students to complete the PSP use survey at home prior to class. Students may record their own listening habits, but it may be more beneficial to also ask them to survey family members/friends.

Collate and compare the listening habits of class members, and those surveyed.  
Compare the volumes for quiet and for noisy environments.

As a conservative estimate, 75% volume can be considered potentially “risky”. Count the number of people listening at this or higher volumes, and discuss the impact of long-term vs short term listeners.

Using the 60-80% rule\* – count the number of people who are listening at 80% volume regularly or who are listening at 60+ % volume for more than 90 mins a day.

### **Activity D2: Measuring PSP outputs**

#### **Description:**

Students may create and/or use a Jolene type doll or appropriate equipment to measure their Personal Stereo Players.

#### **Resources:**

This activity requires some technical equipment to build a measurement tool. Information such as that contained in the Dangerous Decibels’ “Jolene Cookbook” may assist.

#### **Suggested Procedure:**

Ask students to do three measurements:

- 1 First students play their music as loud as they would normally listen to it, and measure their “normal” volume
- 2 Then removing the ear bud from their ears, they measure and record the maximum volume of their player
- 3 Finally, while connected to the measurement tool, students adjust the volume to a level below 85dBs which is a potentially safe listening level, and note the player volume setting that achieves this (e.g. “60% full volume”).

#### **Teaching Notes**

\*Researchers (Fligor, 2009) suggest that PSP should be limited to volume to 80% of the maximum dial setting if the listening time is 90 min or less per day, and to limit volume to no more than 60% of the maximum setting for longer listening times.

**Fligor, B. J.** (2009b). Risk for noise-induced hearing loss from use of portable media players: A summary of evidence through 2008. *Perspectives on Audiology*, 5, 10–20

## Module 4. Protecting Our Hearing

### Why...

Students will be more likely to look after their hearing health if they know the different ways to do so. The more comfortable they feel that they are capable of reducing their noise exposure and carrying out related behaviours, the more likely they are to engage in making healthy hearing decisions.

### What...

**Module Aim:** To educate students how to best protect their hearing in different environments.

### Students will be able to:

- Understand the different methods for reducing their noise exposure in risky situations
- Choose which methods may be most appropriate in different contexts.

### Lesson Components:

- Noise reduction strategies
- Choosing the right strategy
- Promoting Healthy Hearing (optional)
- Using earplugs (optional).

### Preparation

Where possible have some examples of hearing protection available for students to see and handle. If teaching students how to insert earplugs, have a set for each child (with spares), and ensure all children have clean hands before commencing. Some teachers may prefer to invite an audiologist or other hearing specialist into the classroom to teach about use of earplugs, and hearing health issues.

### How...

#### 1. Noise Reduction Strategies

##### Description:

Students discuss ways they can look after their hearing health, and environments where they may need to take steps to reduce their noise exposure.

##### Procedure:

Discuss/brainstorm the different strategies available to prevent noise injury. Ask children to brainstorm all the strategies they can think of that will help protect their hearing from noise injury. It may be helpful to write students suggestions on the board and discuss with the students any strategies that are ineffective and why – and mark less than ideal strategies (e.g., with a “?” or a “X”).

As students suggest ideas, make sure the key three are included in the final list:

- Moving away from noise
- Turning down noise at the source
- Using barriers/hearing protection.

Recap on the preventive strategies. Ask students why it might be useful to have a range of different strategies.

## 2. Choosing a Safe Strategy

### Description:

There is not one “right” strategy for reducing noise exposure. This activity aims to assist students understand the differences between hearing protection methods, and choosing the most appropriate strategy for the situation.

### Resource:

Worksheet - Choosing a safe strategy

### Procedure:

In small groups, or as a class, get students to recall noisy situations they have been exposed to in the past, or may be exposed to in the near future and list these (5-10 is likely to be plenty).

Once the list is complete, remind students of the different hearing protection strategies and ask students to discuss each situation/activity and decide which strategy may be best in each. It may be helpful to have students transcribe their list onto the attached template and complete the table. e.g.

<b>Noisy Activity.</b> From your list, write down 5-7 noisy activities you may be exposed to.	<b>Can you move away?</b>	<b>Can you turn it down?</b>	<b>Can you wear earplugs/hearing protection?</b>	<b>What strategy is best?</b>
E.g. Someone is mowing the grass at the local park near where you are playing	Yes, you could move to another area of the park	No – you can't turn a mower down!	Maybe -but you don't usually have earplugs with you at the park!	Moving away is going to be the best option in this situation

Remind students that sometimes different strategies may be possible. E.g. “wearing hearing protection” will nearly always protect hearing – but it may not be the best option in environments when you are exposed to unexpected noise and don't have hearing protection with you!

## Optional Extension Activities

### A. Spread the Word!

#### Description:

Students are more likely to engage in health behaviours they feel a part of. Ask students to be involved in educating others about healthy hearing.

#### Suggestions:

- Ask students to design a poster about how we can protect our hearing.
- As a class – design a healthy hearing campaign for the school/local area.
- For older students, involve students in teaching younger grades/classes about hearing.

### B. Using Earplugs

#### Description:

Students' motivation to wear earplugs will be improved if they feel comfortable and confident about how to access and use them.

#### Procedure:

Inexpensive foam earplugs can be purchased from most Chemists or hardware stores, and usually include instructions for use. If available, you can also show students other available types of earplugs.

If possible, invite an audiologist or other hearing health expert to assist in running the lesson. You may wish to demonstrate the correct procedure and send children home with earplugs to try under parental supervision.

Explain to students that earplugs can be used to protect their hearing, but they need to be worn correctly. Show students how the foam earplugs should be rolled to a thin cylinder, then inserted into the ear canal (while pulling up and out on the pinna). Earplugs should be held in place for approx 10 seconds while the foam expands to fit the ear canal. Some earplugs will also include indicators to show if they are not inserted correctly.

NB: Basic hygiene precautions should be taken prior to the lesson. Ensure children have clean hands and that they only trial the activity with clean ear plugs (do not allow them to swap earplugs with each other or between ears). If any students have discharge from their ears or heavy wax build up they should not be involved in the activity.

## Appendix D – Curriculum Details

### Queensland

Key Learning Area:

In QLD, the Hear 4 Tomorrow programme fits within the Health and Physical Education KLA.

The key items are listed below. Although most suitable for students in Year 5, relevant components are also listed for year 7.

	Year 5	7
<b>Learning and Assessment Focus</b>	Students demonstrate evidence of their learning over time in relation to the following assessable elements: <ul style="list-style-type: none"><li>• Knowledge and understanding</li><li>• Investigating</li><li>• Planning</li></ul>	
<b>Ways of Working</b>	Students are able to: <ul style="list-style-type: none"><li>• identify and apply safe practices</li><li>• collect, organise and evaluate information and evidence</li><li>• propose, justify and implement simple plans or actions to promote health and wellbeing</li><li>• reflect on and identify how their own and others' behaviours, skills and actions influence health and wellbeing, movement capacities and personal development</li></ul>	<ul style="list-style-type: none"><li>• identify risks and justify and apply safe practices</li><li>• identify issues and plan investigations and activities</li><li>• collect, analyse and evaluate information and evidence</li><li>• propose, justify, implement and monitor plans or actions to promote health and wellbeing</li><li>• reflect on learning, apply new understandings and identify future applications.</li></ul>
<b>Knowledge and Understanding</b>	<b>Health</b> <ul style="list-style-type: none"><li>• Individual and group action can promote health and wellbeing, including safety e.g. wearing hearing protection to prevent hearing loss lowering noise at events to protect hearing of attendees,</li><li>• Health includes physical, social, emotional and cognitive (relating to thought processes, reasoning and intuition) dimensions e.g. choices about hearing protection methods can assist in promoting hearing health</li></ul>	<b>Health</b> <ul style="list-style-type: none"><li>• Individuals, groups and communities act on the advice in health promotion campaigns to promote health and wellbeing, including safety, and contribute to management of health risks e.g. Individuals reducing noise exposure, despite peer pressure to be involved in noisy activities, communities advocating for low-noise events or machinery</li><li>• Family, peers and the media influence health behaviours e.g. advertisements and celebrity personal stories of hearing damage can influence adolescents to maintain hearing health.</li></ul>

Extracted from: <http://www.qsa.qld.edu.au/7294.html>

## Victoria

### Domain:

In Victoria, The Hear 4 Tomorrow Programme fits with in the domain of Health and Physical Education, with particular relevance to the Key Concepts of Health Promotion, and Safety. For Level 4, i.e., “Describe the physical, social and emotional dimensions of health and establish health goals and plan strategies for improving their personal health.”

### Learning Focus:

Students develop an understanding of the right to be safe. They learn to describe and assess the strategies for responding to situations that are potentially unsafe, risky or harmful in a range of settings (at home, at school and in the community).

### &

Students consider what it means to be physically, socially and emotionally healthy. They explore their own and others’ views about health and suggest what it might mean for certain groups of people; for example, the elderly, people with a disability or those from another culture. Students consider factors that affect their own and others’ ability to access and effectively use health information, products and services. They discuss and develop strategies for improving their personal health.

### Standards:

Students describe the actions they can take if they feel unsafe at home, school and in the community.

Students describe the physical, social and emotional dimensions of health and establish health goals and plan strategies for improving their personal health.

For example, students:

- consider what it means to them to be healthy
- reflect on aspects of their personal health that could be improved or maintained
- design strategies to achieve an improvement in their personal health
- investigate a range of health services and products that can be used to meet a specific health need or concern
- identify health services in the local community, including what they provide and who can access them
- identify where they can get information on health issues.

Extracted from: <http://vels.vcaa.vic.edu.au/support/charts/hpe.html#health>

## South Australia

### Learning Area:

In South Australia, the Hear4Tomorrow programme fits within PDHPE.

### Key Ideas:

---

#### A summary of relevant key ideas and outcomes for primary and middle years

---

<b>Primary Years (Standards 2 &amp; 3)</b>	2.6	Students accept increasing responsibility for their future wellbeing and analyse factors that support or present risks to their health and that of their families, friends and communities. <b>F In KC1 relating to Outcome 2.6</b>	Explains ways in which communities support their own and others' health. F In KC2
	2.7	Students identify potential hazards or threats to their health and safety and devise plans for acting to protect themselves and their communities. <b>F Id In KC3 relating to Outcome 2.7</b>	Plans and practises strategies to maintain safety in the home, school and community. F Id In T KC3
<b>MIDDLE SCHOOL YEARS</b>	3.6,4.6	Students consider the range of influences on their health associated with increasing freedom of choice, critically examine information available about those choices, and devise personal and community strategies based on them. <b>F In T KC1 KC6 relating to Outcome 3.6, 4.6</b>	3.6 Analyses a variety of community health issues that affect them and investigates community programs to address them. In T KC1 KC6 4.6 Identifies health issues relevant to adolescents in their community and develops strategies to deal with those issues for self and others. <b>In T KC1 KC3</b>
	3.7, 4.7	Students learn to assess and build their understandings of skills to effectively manage risky and challenging situations for themselves and others. <b>In T KC6 relating to Outcome 3.7, 4.7</b>	3.7 Identifies skills to deal with situations that pose a risk to their health and safety. In T KC1 <b>4.7</b> Analyses and articulates the consequences of risk taking and demonstrates behaviours to minimise harm. <b>In T KC1 KC2</b>

---

## Australian Capital Territory

### Essential Learning Achievement:

The Hear 4 Tomorrow programme fits within the Health and Physical Education ELA, specifically ELA 12: The student takes action to promote health.

“In order to take action to promote health, students need to understand and develop ways of maintaining a healthy lifestyle. This involves the development of skills in decision- making, planning, risk management and problem-solving, as well as the ability to access relevant health information and services. Students also need to understand health and lifestyle issues that are likely to affect them and the community, now and in the future.”( P120, [http://activated.act.edu.au/ectl/resources/ECTL\\_Framework.pdf](http://activated.act.edu.au/ectl/resources/ECTL_Framework.pdf))

### Band of Development:

The programme would suit students in later childhood or early adolescence.

### Related Attitudes and Values:

- Value the benefits of a healthy lifestyle
- Appreciate the need to take personal responsibility for their own health choices
- Appreciate their right to personal safety and their responsibility for contributing to the safety of others.

### Essential Content: Safety

	Later Childhood	Early Adolescence
<b>Students have opportunities to understand and learn about:</b>	<b>12.LC.12</b> how the places people live, work and play can influence their health	<b>12.EA.10</b> factors influencing risk-taking and possible consequences of risk behaviour  <b>12.EA.11</b> strategies to minimise harm (e.g. acquiring knowledge, safe attitudes, developing personal skills, identifying support networks)
<b>Students have opportunities to learn to:</b>	<b>12.LC.15</b> consider how their choices influence health status now and in the future  <b>12.LC.17</b> assess options and consequences in responding to unsafe situations  <b>12.LC.18</b> identify risk situations, people and places and ways to respond  <b>12.LC.19</b> plan how to take responsibility for their own safety and that of others	<b>12.EA.13</b> investigate how contemporary health issues affect young people and identify health information, services and products designed to address the health needs of young people  <b>12.EA.14</b> critically interpret what is presented in the media about health  <b>12.EA.18</b> identify risk factors and behaviours in real-life situations and identify and assess strategies to minimise harm  <b>12.EA.19</b> recognise unsafe situations and make judgements about when it is necessary to seek help from others.

## New South Wales

### Syllabus:

In NSW, the Hear 4 Tomorrow Programme fits within the Personal Development, Health, and Physical Education syllabus. Specifically, in relation to the strand of Personal Health Choices, and Safe Living.

### Stage:

The programme is best suited for students in Stage 3.

### Knowledge and Understanding - Outcomes & Indicators

Values and Attitudes: V4- Increasingly accepts responsibility for personal and community health:

- Values their health and safety and that of others
- defends the need for making decisions that enhance health
- appreciates the need for shared responsibility and decision making
- values the need to pursue healthy lifestyles
- appreciates the need for safe practices in a range of situations and environments.

Personal Health Choices: 3.12 - Explains the consequences of personal lifestyle choices:

- Identifies the effects of their decision on themselves, other, and the environment
- Identifies the positive and negative effects of various substances on the body
- Describes the factors that influence personal health choices.

Safe Living: 3.13 - Describes safe practices that are appropriate to a range of situations and environments:

- Demonstrates ways to improve unsafe environments
- Devises strategies to respond to risky and dangerous situations
- Plans how to take responsibility for their own safety and that of others
- Uses safety devices and protective equipment in relevant situations.

## Western Australia

### Learning Area:

In WA, the Hear 4 Tomorrow programme fits within the learning area of Health and Physical Education.

### Phase of Development:

The programme is best suited to Middle Childhood.

### Links to Outcomes

#### 6. Students visualise consequences, think laterally, recognise opportunity and potential and are prepared to test options.

Students visualise and predict their future health, based on the decisions they are prepared to make about a range of health options. They test options and think laterally in family, school, work and other social situations to achieve sound health practices.

#### 11. Students value and implement practices that promote personal growth and well-being.

Students examine the physical, mental, emotional and social development of the individual and the impact of interactions between the individual, the wider community and the environment on the health of populations. They acquire understandings, attitudes and values which are essential for promoting health practices and which encourage participation in regular physical activity and the adoption of a well-balanced lifestyle, taking into account work, leisure and rest.

They use skills to safeguard and enhance their physical and mental health and to plan for their future.

#### 13. Students recognise that everyone has the right to feel valued and be safe, and in this regard understand their rights and obligations and behave responsibly.

Students recognise and comment on safe practices and are able to recognise safe people and safe houses. They know their rights and understand and value the obligations associated with particular health issues such as sexuality, hygiene, communicable diseases, relationships, drugs, **personal safety**, sun protection, **injury prevention**, first aid, road safety, tobacco smoke and car exhaust fumes. Students know the rights and responsibilities of employers and employees in regard to occupational safety, health and welfare.

## Northern Territory

### Learning Area:

In The Northern Territory, the Hear 4 Tomorrow programme fits with the Health and Physical Education learning area. In particular, it relates to the strand Promoting Individual and Community Health - “Learners focus on developing the actions needed to maintain and promote personal health and safety and the services available in the community to promote health and safety”

### Band:

The programme is most likely to be appropriate for students in Band 3.

### Relevant Outcomes

HP 3.1 Individual and Community Health and Safety - Analyse images of health, develop strategies to promote personal safety and well-being and investigate the health services available to different groups in the community:

- generate personal health goals based on what it means to be healthy, and take action to achieve the goals, **[In 2] [LT-P]**
- describe strategies to respond to situations that are potentially unsafe, harmful or risky in a range of settings and activities
- identify safety equipment, rules and procedures to be followed for various recreational and sporting activities **[Con 1] [Con 3] [SOSE-Soc] [VL]**.

## Tasmania

### Syllabus Area:

In Tasmania, the Hear 4 Tomorrow programme fits within the Health and Wellbeing area, specifically in relation to Physical Health and within the strand of Understanding Health and Wellbeing.

Key Focus Area	Suggested Content Focus
<b>Health Knowledge &amp; Practices Safety</b>	Health promoting behaviours in relation to common illnesses Behaviours and practices that promote personal and group safety in varied environments Risky and challenging behaviours, risk assessment strategies, risk management, positive and negative risks Harm minimisation strategies
<b>Taking Action</b>	Strategies to promote personal and community health Using self management skills such as decision making, planning, goal setting, problem solving and choice to take action

**Stage:** The most appropriate standard is standard 3, stages 7-9.

Performance Criteria	Stage 7	Stage 8	Stage 9
<b>Students understand how to maintain and integrate the elements of a healthy lifestyle</b>	<ul style="list-style-type: none"> <li>understand some factors that influence personal health and wellbeing</li> <li>identify situations and behaviours that are safe or unsafe</li> </ul>	<ul style="list-style-type: none"> <li>understand the role of individuals in maintaining health and wellbeing</li> <li>identify how situations can be made safer</li> </ul>	<ul style="list-style-type: none"> <li>understand their personal role in maintaining health and Wellbeing</li> <li>Understand and propose personal actions to promote personal and group safety</li> </ul>
<b>Students use health knowledge to promote personal and group health and wellbeing (PC2)</b>	<ul style="list-style-type: none"> <li>identify personal and social skills required in planning</li> <li>Identify choices individuals make</li> </ul>	<ul style="list-style-type: none"> <li>understand how to use particular personal and social skills in planning</li> <li>identify factors that influence personal choice</li> </ul>	<ul style="list-style-type: none"> <li>understand how particular skills contribute to health and wellbeing plans</li> <li>understand some factors that influence personal choice</li> </ul>