

# Hearing Review™

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Issue 8 - 2008

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## Welcome to the eighth issue of Hearing Review.

In this edition, the results of a study that investigated the tympanometric characteristics of Chinese school-aged children with normal middle ear function raise interesting implications for clinic and screening programmes in New Zealand, while another study discusses the wide range of effects experienced by spouses as a result of their partners' hearing impairment. I hope you enjoy the latest edition and welcome your comments and feedback. Kind regards,

**Valerie Looi**

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## Hearing screening and diagnostic evaluation of children with unilateral and mild bilateral hearing loss

**Authors:** Ross DS et al

**Summary:** A workshop held in July 2005 in the USA identified several issues related to screening and diagnosing unilateral hearing loss and mild bilateral hearing loss in newborns, as well as recommendations for future research in this area.

**Comment:** Often one of the more contentious issues related to Universal Newborn Hearing Screening (UNHS) programmes are the policies and processes for children with unilateral (UHL) or mild bilateral (MBHL) hearing losses. This article (and that by McKay & colleagues on page 4 of this edition of Hearing Review) discusses some considerations around this issue. In this article, factors related to the identification of these children are addressed. Data from the USA suggest that UHL and MBHL tend to remain undetected, even with UNHS, unless specific efforts are made to identify these losses. Issues related to the sensitivity of screening protocols, equipment used for screening, test environment, cost-benefit ratio, audiological tests used, and diagnostic processes contribute to the low identification rate for UHL or MBHL. For example, there is no international standard for calibrating Otoacoustic or aABR screening equipment. Further, another issue to consider is when would be the optimal time for identifying these losses (e.g. at the UNHS, or later in childhood such as prior to school entry)?

<http://dx.doi.org/10.1177/1084713807306241>

**Reference:** *Trends Amplif.* 2008;12:27-34

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### Early listening and speaking skills predict later reading proficiency in pediatric cochlear implant users

**Authors:** Spencer LJ and Oleson JJ

**Summary:** The influences of auditory information provided by cochlear implants (CIs) were assessed after 48 months of use in 72 children with prelingual, profound hearing loss. Their reading skills were subsequently assessed after a mean 89.5 months of CI use.

**Comment:** Outcome data for children with CIs are generally very favourable, with many children being able to obtain high levels of expressive and receptive language skills, and able to attend mainstream schools. However, it is also known that the sounds perceived through the CI are different to sounds heard by a normally hearing child, or a child who uses a hearing aid(s). It is not clear whether they have access to the same phonetic information – i.e. is the auditory information provided by the CI detailed enough to allow children to make fine-grained distinctions in order to develop their phonological awareness, which is necessary for reading. This study found that the reading skills of children with implants were within the low average range, and higher than for children with profound losses without CIs. Similarly, the speech perception and production skills of the children with CIs were also significantly better than unimplanted children with the same level of hearing loss. Speech production and perception skills, as measured 4 years post-implantation, were strongly related to their later reading skills. In fact, 59% and 62% of the variance in word and passage comprehension, respectively, was accounted for by speech production and perception skills measured after 4 years of CI use. With this and other research finding that children with CIs have better access to sound than unimplanted children with equal levels of hearing loss, the former often have better speech production and perception skills, which seems to then translate into better reading skills. It seems reasonable to envisage that there would also be a predictive value of speech production and perception scores for later reading skills for other children with different hearing losses.

<http://www.ear-hearing.com/pt/re/earhearing/abstract.00003446-200804000-00012.htm;jsessionid=LJIGslrThmnOp1wTKJGVbWdL07NThbhQrHhrGG7mGL611Jz17SX!271767458!181195628!8091!-1>

**Reference:** *Ear Hear.* 2008;29:270-80

### Objective and subjective hearing aid assessment outcomes

**Authors:** Mendel L

**Summary:** Aided and unaided performance was assessed in 21 hearing aid users on the Revised Speech Perception in Noise test, the Hearing in Noise Test, the Quick Speech-in-Noise test and the Hearing Aid Performance Inventory (HAPI).

**Comment:** Although the use of subjective outcome measures for evaluating hearing aid fittings is fairly routine in audiological practice, the use of objective measures is less frequent, particularly 'real-world' assessments such as tests of speech in noise. This may partly be due to the perception that such tests do not provide a good indicator of real-world success with the device. However, comparisons of aided to unaided scores can provide useful information for counselling, verifying progress after the initial fitting, determining realistic expectations, crosschecking to subjective perceptions, and as 'proof' or back up. This study evaluated the use of 3 objective speech in noise tests, and found them to be sensitive to showing aided benefit. The results from these tests were compared to a subjective outcome measure (the HAPI); in New Zealand, the COSI would be a more commonly used measure. The strong correlations between the speech tests and the HAPI suggest that both objective and subjective measures can be used to document progress, and that the use of both types of assessments collectively may be a better determination of the true aided benefit, particularly for speech perception.

[http://dx.doi.org/10.1044/1059-0889\(2007\)016](http://dx.doi.org/10.1044/1059-0889(2007)016)

**Reference:** *Am J Audiol.* 2007;16:118-29

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*Independent commentary by Dr Valerie Looi, a Lecturer in Audiology for the Department of Communication Disorders at the University of Canterbury. Her primary areas of research are in the field of cochlear implants, along with the music perception of those with a hearing impairment. She is particularly interested in developing a music training programme for cochlear implant users.*

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### The effect of hearing impairment in older people on the spouse

**Authors:** Scarinci N et al

**Summary:** In-depth interviews conducted with five female and five male spouses of older people with hearing impairment (HI) revealed a wide range of effects experienced by spouses due to their partners' HI.

**Comment:** The impact of HI on an individual and their quality of life is a well researched area. However, this article considers the impact of HI on their significant other (SO) – in this case, the spouse of an older person. It would seem reasonable to assume that the SO would be affected, however, this study highlights the extent (both depth and breadth of situations) that the SO is affected. Four major considerations identified were: i) That hearing loss affected the spouse's everyday life across a wide range of areas including communication, activity participation, emotions, socialisation, and the relationship itself; ii) Spouses felt that they continually needed to adapt to and/or assume control for their partner's HI (and often that they had to make the adjustments); iii) The effect of acceptance on the spouse – i.e. when the partner accepted their HI, the impact on the SO was decreased; and iv) The effect of ageing and retirement. These factors and the sub-issues discussed in this article raise some noteworthy and interesting points that may be helpful/applicable when counselling hearing impaired patients and their families.

<http://dx.doi.org/10.1080/14992020701689696>

**Reference:** *Int J Audiol.* 2008;47:141-51

### Tympanometric characteristics of Chinese school-aged children

**Authors:** Wong LLN et al

**Summary:** These researchers suggest that the use of the tympanometric characteristics observed in the Chinese school-aged children in this study (i.e., peak Ytm lower limit <0.2 mmho and Vec upper limit >1.5 cm<sup>3</sup>) should be considered in addition to ASHA 1997 tympanometric screening guidelines.

**Comment:** This Hong Kong study raises an interesting question – should clinics and screening programmes adopt different norms and/or referral guidelines for different ethnic populations? Although this study focused on Chinese school-aged children, the issue could be extended here in NZ to address the needs of the Māori and Pacific populations. For example, there are some suggestions that the average ear canal volumes for the Māori and Pacific populations may be larger than for the European population. If this was found to be the case, the clinical significance of this should be considered. For example, this study found that if screening programmes adopted a static acoustic admittance value of <0.2 mmho (instead of the ASHA guideline of 0.3 mmho) for referrals, the false-positive rate would be significantly reduced. This would then improve the sensitivity and specificity rates for the screening programme, and could have benefits for resource and cost considerations.

<http://www.ear-hearing.com/pt/re/earhearing/abstract.00003446-200804000-00002.htm;jsessionid=LJIGslrThmn0p1wTKJGVBWdLb07NThbhQrHrGG7mGL611Jz17SXl271767458!181195628!8091!-1>

**Reference:** *Ear Hear.* 2008;29:158-68

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### The effects of aging on distortion-product otoacoustic emissions in adults with normal hearing

**Authors:** Uchida Y et al

**Summary:** This investigation concluded that distortion-product otoacoustic emissions deteriorate with age independently of hearing sensitivity and may provide early indications of cochlear damage because of ageing.

**Comment:** Otoacoustic emissions (OAEs) are used clinically to detect cochlear impairment, particularly those arising from damage to the outer hair cells (OHCs). OAE testing is well accepted, and frequently utilised to either reconfirm behavioural thresholds, or to predict audiometric status if behavioural thresholds cannot be obtained. Research has also suggested that OAEs may be more sensitive than pure tone audiometry as an early indicator of subclinical cochlear damage. For example, it could provide early warning of damage from noise exposure or ototoxic drugs before pure tone thresholds are affected. In presbycusis, as the loss of OHCs is more evident than the loss of inner hair cells, could OAE testing also be used to assess the effects of ageing on cochlea function? That is, are there indications of ageing to OHCs before clinically-assessed audiometry thresholds are affected? This study investigated this question by assessing Distortion Product OAEs in normally hearing adults (thresholds ≤15 dBHL) aged 41–80 years. After adjusting for a host of confounding factors, the authors found that older age was associated with reduced DPOAE amplitude. This suggests that there is functional decline of OHCs associated with age, and this presents independently from peripheral hearing loss. This ageing effect was more pronounced in women than men.

<http://www.ear-hearing.com/pt/re/earhearing/abstract.00003446-200804000-00004.htm;jsessionid=H6dhMTYLt1zP8zHrpsJ1VV0H8p1y121mh8ncMQypglhwYxRGjn!-264826664!181195629!8091!-1>

**Reference:** *Ear Hear.* 2008;29:176-84



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### The risk of tinnitus following occupational noise exposure in workers with hearing loss or normal hearing

**Authors:** Rubak T et al

**Summary:** The relationship between noise exposure and tinnitus was investigated in 752 workers with normal hearing and hearing loss, respectively.

**Comment:** This Danish study was conducted in response to increasing concern whether noise exposure at levels not associated with increasing the risk for hearing loss (e.g. <80 dB(A)) caused tinnitus. The finding that tinnitus was not associated with current or previous noise exposure in participants with normal hearing suggests that there is no foundation for the concern if the person has normal hearing. However, this is not the case for those with a hearing loss; the risk of tinnitus increased with increased level and duration of noise exposure for those with a concomitant hearing loss. That is, those with a hearing loss are more susceptible to developing tinnitus after exposure to noise, but long-term noise exposure to levels >80 dB(A) did not increase the risk of tinnitus if hearing thresholds were normal. One implication of this would be that caution should be taken before attributing tinnitus to occupational noise exposure for patients with normal hearing (e.g. in a worker's compensation or ACC claim). However, it is worth pointing out that, tinnitus aside, obviously increased exposure (both level and duration) to noise at levels >85 dB(A) increases the risk of hearing loss. This study also found that there was a higher prevalence of chronic otitis media and tympanic membrane perforation in those with tinnitus.

<http://dx.doi.org/10.1080/14992020701581430>

**Reference:** *Int J Audiol.* 2008;47:109-14

**Research Review publications are intended for New Zealand health professionals.**

### Intraoperative cochlear nerve monitoring in vestibular schwannoma surgery - does it really affect hearing outcome?

**Authors:** Piccirillo E et al

**Summary:** This study examined the usefulness of intraoperative cochlear nerve monitoring (ICNM) in the preservation of normal and social hearing in vestibular schwannoma removal.

**Comment:** This retrospective study of 99 patients with small tumours (<1.5 cm) and good pre-surgery hearing found that ICNM did not lead to a significantly better ratio of patients with preserved post-surgery hearing. Although ICNM was not shown to provide better hearing preservation rates, it did appear to be a good indicator of poor post-surgery prognosis with nearly all of the patients who had a diminished response at the end of surgery having poor postoperative hearing levels. This study also detailed the modified Sanna hearing classification, which is the suggested method for determining hearing levels for patients with acoustic neuromas. It considers both the PTA (average of 0.5, 1, 2 & 4kHz), as well as speech discrimination scores. Preserved hearing was defined as Class A or B (normal or social hearing, respectively) on the modified Sanna classification system. The role of ICNM is still under question, with some studies supporting its use, whilst others such as this one finding that it does not result in greater rates of hearing preservation.

<http://dx.doi.org/10.1159/000108623>

**Reference:** *Audiol Neurotol.* 2008;13:58-64

### Amplification considerations for children with minimal or mild bilateral hearing loss and unilateral hearing loss

**Authors:** McKay S et al

**Summary:** This article reviews amplification considerations and current hearing technology options for children with minimal or mild bilateral hearing loss or unilateral hearing loss.

**Comment:** In a complementary article to the Ross et al. (2008) article (on page 1 of this edition of Hearing Review), McKay & colleagues discuss the amplification issues associated with unilateral (UHL) or mild bilateral hearing losses (MBHL). Auditory deprivation is an important consideration – i.e. would the decision to 'wait and see' affect later success with amplification? Binaural advantages are also discussed, along with issues related to using prescriptive methods for determining target gain levels for hearing aid (HA) fittings. Often these prescriptions are studied on and designed for children with bilateral losses; modifications may therefore need to be made for UHL. In some cases of MBHL, another factor to address is whether the low level noise floor inherent in HAs offset any advantages of increased audibility provided by the HA? Considerations related to using wide dynamic range compression, feedback cancellation, and directional microphones are also mentioned. As current electrophysiological and behavioural audiology tests tend to be comparatively less sensitive for identifying children with lesser degrees of hearing loss, children with these levels of loss tend to be identified at a later age. While it is the family's decision whether or not to proceed with amplification or 'wait and see', the audiologist needs to continue to monitor the child's hearing levels and speech/language development, as well as provide information to parents/caregivers on how to maximise the child's listening environment, or other appropriate resources. The use of FM systems is strongly recommended for these children.

<http://dx.doi.org/10.1177/1084713807313570>

**Reference:** *Trends Amplif.* 2008;12:43-54

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