Hearing Review™

Making Education Easy

Issue 12 – 2008

In this issue:

Welcome **to the twelfth issue of Hearing Review.**

This edition presents data from a large survey of US university students questioned about their use of a personal music system; the results will no doubt resonate with those who worry about hearing loss associated with the long-term use of such systems. We also present results of a recent review that concludes that the Bone-Anchored Hearing Aid system may be worthwhile considering for children with bilateral conductive hearing loss.

I hope you enjoy the latest edition and welcome your comments and feedback. Thanks for your support and interest throughout the year, and best wishes for a very Merry Christmas and Happy New Year.

Kind regards,

Valerie Looi
Lecturer in Audiology, University of Canterbury
valerielooi@researchreview.co.nz

On the auditory and cognitive functions that may explain an individual's elevation of the speech reception threshold in noise

Authors: Houtgast T and Festen J M

Summary: This review investigated the evidence for auditory and cognitive functions underlying the variance in speech-in-noise test scores from hearing-impaired persons and examined quantitative data for correlations between various types of auditory or cognitive tests (the predictor tests) and speech-in-noise tests. These predictor variables included the pure-tone audiogram, measures of spectral and temporal resolution, intensity difference limen, age, and some cognitive aspects. The results indicated that these variables do not fully explain the variance relevant for speech reception in noise.

Comment: The speech reception threshold (SRT) in noise can provide a measure of difficulty experienced in noise. For a normally hearing person, the usual SRT is approx. –5dB for a large range of noise levels. Models used to predict SRT curves for the hearing impaired are based on 2 parameters – attenuation and distortion. However, there is a wide range of individual variability in SRTs and this article considers possible predictor variables. The results emphasise that no one individual, or combination of, predictor variable(s) can account for individual differences in noise SRTs. The various auditory and cognitive factors considered only accounted for approx. 70% of the variance.

Reference: Int J Audiol. 2008;47:287-95
http://tinyurl.com/59jww2

Reorganization of the adult auditory system: perceptual and physiological evidence from monaural fitting of hearing aids

Authors: Munro KJ

Summary: This article discusses clinical data relating to hearing aid-induced perceptual and/or physiological changes in the adult human auditory system and concludes that current evidence indicates a hearing aid can help with auditory deprivation for some listeners.

Comment: This is an excellent review of studies showing perceptual and physiological changes related to auditory deprivation and auditory attenuation. The former refers to a decrease in auditory performance, with the latter being the opposite effect. The evidence of physiological changes not only backs up behavioural findings, but allows a better understanding of the mechanisms which underlie these effects. It would seem that the mature central auditory system is more malleable and adaptable than previously assumed. The studies reviewed were for elderly listeners with symmetrical losses, fitted with a monaural hearing aid.

Reference: Trends Amplif. 2008;12:85-102

http://tinyurl.com/5rz7dt

Auditory perception and speech production skills of children with cochlear implant assessed by means of questionnaire batteries

Authors: Kubo T et al

Summary: These researchers evaluated early auditory perception and speech production skills, and compared outcomes between two groups of prelingually deaf children who were implanted with either a Nucleus cochlear implant (CI) (n=31) or a Clarion CI (n=38). After implantation, mean scores on three test batteries (the Listening in Progress score, the Infant-Toddler Meaningful Auditory Integration Scale and the Meaningful Use of Speech Scale [MUSS]) improved rapidly for both groups over the initial 6 months and gradually reached a plateau over a 6- to 12-month period; speech production skills as assessed by MUSS developed much more slowly and took over 3 years to reach a given level. No significant between-group differences were observed.

Comment: This Japanese study has relevance to NZ. It was initiated as the clinic concerned had just started to offer patients the choice of 2 different CIs, and the clinicians wanted to be able to compare the devices. In NZ, the adult branch of the Southern CI Programme now offers patients the choice of 2 devices; this may in future extend to the paediatric branch. Being able to compare outcomes would be important to help patients make informed choices. In this study, there was no difference between the 2 CIs, which is consistent with existing literature. Interestingly, the study reported that many parents made their device selection based on design of the external components, and/or the electrode configuration.

Reference: ORL J Otorhinolaryngol Relat Spec. 2008;70:224-8

http://tinyurl.com/6z3332

Current considerations in pediatric speech audiometry

Authors: Mendel LL

Summary: This article considers specific test principles and variables that must be addressed when evaluating speech perception performance in children, with reference to existing test materials and their level of sensitivity and standardisation for accurate assessment of a child's speech perception performance. The reviewer recommends a test battery approach for providing a comprehensive assessment of a child's capabilities, and emphasises the need for periodic assessment of a child's progress in speech perception, to determine if improvements may be possible with amplification and intervention efforts.

Comment: This fairly comprehensive review covers a wide range of speech materials that audiologists may wish to consider when testing children. More so than for adults, paediatric speech testing is affected by individual (e.g. age, vocabulary, language skills, cognition), as well as test variables (e.g. response mode, scoring, test material, reinforcement, length, presentation levels). Research suggests that there is often a gap between a child's actual competence and their performance on speech tasks; the gap decreases as children get older. The article reviews several standardised speech tests and their applicability for different situations. Closed-set tasks, environmental sound recognition, and speech reading tests are also suggested for children with greater levels of hearing loss.

Reference: Int J Audiol. 2008;47:546-53

http://tinyurl.com/6c2afm

Young adults' use and output level settings of personal music systems

Authors: Torre P 3rd

Summary: Data are reported from a survey of 1016 university students questioned about their use of a personal music system; listening patterns associated with these systems were elicited by 11 closed-set questions dealing with type of earphones used with the system, most common listening environment, length of time per day the system was used, and the volume setting. Results are also reported from a second study, in which a probe microphone placed in the ear canal of 32 participants was used to determine the dB SPL of four loudness categories where the participants blindly set the level of a personal music system: low, medium or comfortable, loud, and very loud.

Comment: Hearing loss from personal music players (PMPs) is a current 'hot topic'. In this large 2-part study, 92% of students reported using PMPs. Of these, 88% said they listened at a 'loud' or 'medium' volume, with 6% using a 'very loud' volume. In Part 2, the mean level for 'medium' was measured to be 72dB SPL, 'loud' being 88dB SPL, and 'very loud' as 98dB SPL. This study probably underestimates these levels as testing was done in quiet, with research suggesting that people increase music levels by 6–10dB when there is background noise. Well accepted guidelines for safe daily maximum listening times recommend 4 hrs for 88dB levels, and <25–30mins for 98dB. Research has suggested maximum safe listening times for iPods as: 4.5 hrs if the volume control is 70% of maximum, 1.25 hrs for 80%, and 5 mins at full volume.

Reference: Ear Hear. 2008;29:791-9

http://tinyurl.com/6d24nj

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.

Treatments for tinnitus

Authors: Noble W

Summary: Various forms of tinnitus treatments that have undergone clinical trial testing (phamacological, acoustic, physical and psychological) are reviewed in this article.

Comment: Tinnitus treatments are often subject to skepticism with no one particular treatment having proven universally beneficial. The fact that the mechanism(s) underlying tinnitus is not fully understood makes it difficult to determine how to treat it. Whereas pharmacological and physical treatments aim to affect the tinnitus itself, acoustic devices usually try to mask the tinnitus, and psychological treatments target how a person reacts to it. This article reviews the effectiveness (or otherwise) of recent treatment options. Of these, cognitive behaviour therapy seems to have had the most impact on improving quality of life. Importantly, the author stresses that as tinnitus is a somatopsychic disorder, the psychological aspects must not be ignored in any potential treatment regimes.

Reference: Trends Amplif. 2008;12:236-41
http://tinyurl.com/5aua84

Tinnitus outcomes assessment

Authors: Meikle MB et al

Summary: These researchers review four major types of outcome measures for tinnitus (including psychoacoustic measures, self-report questionnaires concerning functional effects of tinnitus, various rating scales, and global outcome measures), focusing particularly on their responsiveness to treatment-related change. The researchers recommend that future tinnitus outcomes assessments measure two aspects of tinnitus experience – sensory impairment as well as functional disability and handicap – as each provides unique insights into treatment-related changes in tinnitus.

Comment: As discussed in the adjacent article in this edition of HRR (see Noble W; Treatments for tinnitus), there are numerous treatments for tinnitus. How to evaluate the effectiveness of these is addressed in this article. Rating scales and questionnaires are the most common tools. However, the authors propose that most questionnaires, including the 9 reviewed in this article, are not sensitive enough to be applied as a measure of treatment effectiveness; they're more applicable to identifying people with tinnitus issues. In order to use them to evaluate treatments, they need to be more sensitive to treatment-related changes. This may be achieved through more detailed rating scale resolution, and/or selecting items that are likely to show changes following treatment. Also of interest are the similarities in the negative effects of tinnitus and pain – this discussion could be useful in counselling.

Reference: Trends Amplif. 2008;12:223-35
http://tinyurl.com/564zmc

Vestibular disorders in children

Authors: Wiener-Vacher SR

Summary: This article draws upon the results of a 14-year study conducted with a sample of more than 2,000 children referred for vertigo and balance disorders to the functional vestibular evaluation unit of a Parisian hospital ENT paediatric department. Clinical otological, neurological, and vestibular examinations are detailed; such testing helps to determine the best diagnostic procedure and therapy for vertigo in children and it is recommended that these be conducted prior to ordering expensive CT or MRI scanning.

Comment: This overview of a range of causes of vertigo in children may be a useful reference. As the author points out, with up to 3 sensory systems contributing to vertigo (visual, vestibular, and proprioceptive-somesthetic), it is difficult to determine the best diagnostic and therapy protocol. The article provides information on the cause, prevalence, clinical presentation, suggested assessments, and major treatment options for various conditions where a child may have vertigo; some of these are otology-related. Vestibular difficulties in children are often inadequately understood. In profoundly deaf children, it is reported that 20% have complete bilateral vestibular loss, and a further 40% have partial or asymmetrical vestibular impairments. This, in turn, may affect their development of motor or posture skills.

Reference: Int J Audiol. 2008;47:578-83

http://tinyurl.com/56u36h

Research Review publications are intended for NZ Medical Professionals.

An extension of the jerger classification of tympanograms for ventilation tube patency-specification and evaluation of equivalent ear-canal volume criteria

Authors: MRC Multicentre Otitis Media Study Group

Summary: Tympanometric criteria for ventilation tube (VT) patency or eardrum perforation were derived on 165 left and 171 right ears with functioning VTs and 103 left and 102 right noninserted ears, in children aged 3¾ to 7¼ years at their first postintervention visit. A comparison of measured equivalent ear-canal volume (Veq) across the VT-inserted and the not-inserted groups, and also within the VT-inserted group between the pre- and postintervention visits, yielded three alternative Veq cutoffs of ≥0.95 mL, ≥1.10 mL and ≥1.33 mL, pooled to ≥1.13 mL. Corresponding cutoffs for the pre- and postintervention difference in Veq occurred at 0.23, 0.44, and 0.39 mL, respectively, with a mean of 0.35 mL. Gender, but not age, influenced these values; boys had significantly larger Veqs (by 0.09 mL) than girls.

Comment: In addition to the current Type 'A', 'B', and 'C' classifications of tympanograms, this article proposes the addition of a Type 'F' to indicate a patent grommet. At present, patent grommets are indicated by a Type B tympanogram with a large Veq. Some audiologists may subdivide their Type B classification to highlight this (e.g. Type B^{high}), but this is not routine. The adoption of a Type F classification may be clinically useful as it would immediately differentiate between a functioning grommet vs. middle ear blockage. The study recommends using an Veq criterion of ≥1.13 mL for Type F for children aged 3¾–7¼ years. Also of consideration is the suggestion of allowing a 0.1 mL difference for the slightly larger Veq for boys (e.g. cut-off value of 1.1 mL for girls and 1.2 mL for boys).

Reference: Ear Hear. 2008;29:894-906

http://tinyurl.com/697d6q

The Bone-Anchored Hearing Aid for children: recent developments

Authors: Snik A et al

Summary: These researchers reviewed data from clinical studies involving the application of the Bone-Anchored Hearing Aid (BAHA) system in children with congenital or acquired conductive hearing loss. Findings revealed that, on average, such children benefited significantly more from the BAHA than from reconstructive surgery, indicating that the BAHA may be the best option for some children with a bilateral conductive hearing loss to achieve normal communication and speech and language development. However, the researchers note that in children aged <3–4 years, a more conventional solution must be adopted, e.g. a bone conductor with a transcutaneous coupling, because they are too young to undergo BAHA surgery. In the case of unilateral congenital conductive hearing losses, there is no convincing evidence in the clinical literature for early intervention.

Comment: The BAHA used to be the last choice for children, after alternatives such as a bone-conducted hearing aid (b-cHA) have been unsuccessful. However, there's ever increasing evidence that the BAHA may be preferable to either the b-cHA or reconstructive surgery. The latter is not recommended until at least 5–6 years of age, and retrospective studies report post-surgery hearing to be no better than 25–30 dBHL. That is, at best, the child still has at least a mild conductive hearing loss. Taken in conjunction with findings that a loss >15 dBHL can impact on language development, surgery may not be the 'gold standard' solution. The BAHA can help to close the air-bone gap, and provides more high frequency gain with less distortion than b-cHAs. This article outlines the BAHA, advantages, BAHA surgery, counselling considerations, as well as recent outcomes.

Reference: Int J Audiol. 2008;47:554-9

http://tinyurl.com/5gxwth