Hearing Review™

Making Education Easy

Issue 11 – 2008

In this issue:

Welcome to the eleventh issue of Hearing Review.

In this edition, we discuss tools developed to ensure effective communication in different environments, such as the HINT, and directional open-fit hearing aids. Research is presented concerning self-reported hearing difficulties in unilateral deafness and another study reviews questionnaires to measure the impact of hearing impairment in individuals, as well as the outcomes of intervention and/or rehabilitation. Interesting data are reported from a study examining the relationship between the onset of otitis media and parent-identified cold-like illness.

I hope you enjoy the latest edition and welcome your comments and feedback.

Kind regards,

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Self reported hearing difficulties following excision of vestibular schwannoma

Authors: McLeod B et al

Summary: Responses from a questionnaire exploring self-reported hearing difficulties in unilateral deafness were compared from 221 post-surgical vestibular schwannoma patients, 51 normal hearers and 12 patients with severe unilateral deafness from other causes. The vestibular schwannoma patients rated their post-surgical hearing as profoundly deaf in the operated ear, and worse than pre-surgical in the other. Factor analysis results revealed a general hearing factor and five factors, indirect listening, direct listening, face-to-face listening, noise and distance, and localisation, representing performance in specific listening situations. No differences were found between the hearing-impaired groups on any of the factors. Both groups rated themselves as significantly worse than the normal hearers on all factors, and rated themselves worst on indirect listening, in which speech comes from the impaired side.

Comment: This questionnaire (with small modifications) could be used to determine the self-rated impact of unilateral deafness in adults, regardless of the aetiology. Current hearing-related self-rating scales do not specifically address the unique issues faced by a unilaterally hearing impaired person. This questionnaire asks about the person's ability to: i) hear when sound is on the impaired side, ii) hear when sound is on the non-impaired side; iii) localise sounds; iv) hear when sound is from in front, and v) hear at a distance when in background noise. Designed to be posted out and utilising a 10-point scale, the questionnaire would be easily administered and take little time to complete. One finding worth bearing in mind is that respondents with a unilateral hearing loss rated themselves as significantly impaired across a range of areas, suggesting that the common 'one ear is good enough' assumption may need reconsideration.

Reference: Int J Audiol. 2008;47:420-30

http://tinyurl.com/6jox3d

Auditory reality and self-assessment of hearing

Authors: Noble W

Summary: Prosthetic technology and the auditory ecology, dimensions of benefit from amplification, and dimensions of disability are discussed within the realm of hearing disorder and its management. It is noted that different prosthetic schemes are moderated by people's hearing and listening environments (ecologies) and by what individuals bring to the task of hearing and listening. Dimensions of benefit refers to what is achievable with prevailing technology, and also what people are aware of and identify as their needs. Dimensions of disability examines the range of hearing functions that need to be accounted for when managing impaired hearing. The article also discusses the characteristics of auditory reality.

Comment: This article reviews some of the questionnaires developed by the late Stuart Gatehouse to assess the impact of hearing impairment on an individual, as well as the outcomes of intervention and/or rehabilitation. Specifically, the SSQ (Speech, Spatial, and Qualities of Hearing Scale) and the GHABP (Glasgow Hearing Aid Benefit Profile) are described. An overview of the questionnaires' contents, administration, scoring, validation, and use are provided, along with the philosophies underlying their development. Additionally, the benefits of self-assessment measures, and the value of evaluating spatial hearing as an indicator of real life performance are addressed.

Reference: Trends Amplif. 2008;12:113-20

http://tinyurl.com/56hel2

Unaided and aided performance with a directional open-fit hearing aid

Authors: Valente M and Mispagel KM

Summary: This study used a special sound room set up to be an exact duplication of being in a loud restaurant, to realistically test a new hearing aid technology – open-fit behind-the-ear (BTE) hearing aids with directional microphones. Twenty-six subjects without prior experience with amplification were fitted bilaterally using the manufacturer's recommended procedure. Differences in performance between unaided and aided performance (omnidirectional and directional) were assessed by measuring reception thresholds for sentences, using HINT sentences presented at 0° with R-SpaceTM restaurant noise held constant at 65dBA and presented via eight loudspeakers set 45° apart. Wearing an open-fit hearing aid with a directional microphone resulted in an average 20% improvement in speech intelligibility compared to unaided hearing or aided with omnidirectional microphones. Performance with an omnidirectional microphone was not significantly better than unaided.

Comment: With the expeditious rise in the number of open-fit BTE hearing aid (HA) fittings, the results of this study are important for audiologists to consider both when selecting the type of HA for their client, and in counselling. It would seem that the option of a directional microphone provides a significant advantage for perceiving speech in background noise. For the speech material in this study, an overall directional benefit of 17% relative to omnidirectional and 15% relative to unaided performance was reported. Further, a patient may also be counselled that there could be little difference between listening unaided and with an omnidirectional microphone in noisy environments.

Reference: Int J Audiol. 2008;47:329-36

http://tinyurl.com/5636fu

The choice of compression speed in hearing aids: Theoretical and practical considerations and the role of individual differences

Authors: Moore BC

Summary: This review of fast- versus slow-acting compression systems in hearing aids refers to data from a study by Gatehouse et al., which suggests that compression is most advantageous for individuals who experience a wide range of sound levels within short periods of time, that slow compression generally leads to higher listening comfort than fast compression, that the benefit from fast compression varies across individuals, and that fast compression allows those with high cognitive ability to take advantage of temporal dips in a background sound. It is argued that dip listening depends on how well an individual cognitively processes the temporal fine structure of sounds and that this ability should be tested before selecting compression speed.

Comment: The technicalities behind compression in hearing aids (HAs) can be complex and confusing for many. Moore provides an excellent, simplified and objective explanation of the multitude of terms, concepts, and issues related to compression. He explains and deconstructs the complex technicalities behind the different types of compression, their uses, advantages/disadvantages, and suitability for different individuals. He also covers some of the 'marketing terms' that are often used by manufacturers. The latter part of the article deals with the relatively new issue of Dip Listening and how this may then affect the optimal compression parameters for an individual.

Reference: Trends Amplif. 2008;12:103-12

http://tinyurl.com/5lbh56

The choice of distracting task can affect the quality of auditory evoked potentials recorded for clinical assessment

Authors: Lavoie BA et al

Summary: The aim of this study was to determine which of five tasks gave the best recordings for clinical assessment of the auditory brainstem response (ABR), middle latency response (MLR), and the late latency response (LLR). Recordings of the ABR, MLR, and LLR auditory evoked potentials (AEPs) while subjects were engaged in five different tasks revealed that task did not affect the amplitudes or the latencies of the ABR, MLR, or LLR. However, the amount of pre-stimulus activity (noise) or amplitude rejection was significantly and differently affected by the distracting task. For the ABR, the math task was the noisiest but, for the MLR, the amount of noise was greater when watching a movie. For the LLR, reading and watching a movie yielded the lowest percentage of rejected traces.

Comment: ABR testing is a commonly used assessment of early AEPs. It is less susceptible to variations in patient's attention and/or sleep than the mid- and late-latency AEPs. These later AEPs can be dependent upon not only the patient being awake, but also their level of attention and concentration on a task. Late-latency AEPs are increasingly being used both in research and specialised clinical assessments, and therefore determining more (or less) suitable tasks for recording mid- and late-latency AEPs is an important issue. These AEPs are already more time-consuming than ABRs to record, without needing to further prolong the recording process by having high rates of rejected traces and/or inappropriate noise levels.

Reference: Int J Audiol. 2008;47:439-44

http://tinyurl.com/5uyrdl

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.

Assessment of speech intelligibility in noise with the Hearing in Noise Test

Authors: Soli SD and Wong LL

Summary: This paper discusses the challenges of assessing speech intelligibility in noise, the approach used with the Hearing In Noise Test (HINT), and the implications of the assumptions and constraints when interpreting test results.

Comment: The HINT is becoming an increasingly popular clinical speech test as it provides a more realistic evaluation than the usual monosyllabic words in quiet tests (e.g. AB word lists). It can be used for both within-subject comparisons (e.g. quiet vs noise; setting A vs B), or for between-subject comparisons (e.g. hearing impaired vs normal hearing). The HINT uses short, simple sentences from 1st-grade level children's books, with the noise being a filtered stationary masking noise specifically created for each different language. Adopting an adaptive procedure for each 20-sentence list, the HINT also has the advantage of being less likely to be affected by floor or ceiling effects. Norms are currently available for a range of languages, and this range is expanding. With the ever increasing number of patients in NZ for whom English is not their first language, the HINT could be a useful tool to consider.

Reference: Int J Audiol. 2008;47:356-61

http://tinyurl.com/6qo423

Functionally-based screening criteria for hearing-critical jobs based on the Hearing in Noise Test

Authors: Giguère C et al

Summary: This paper describes the modelling and validation procedures used to establish functionally-based screening criteria for hearing-critical jobs involving speech communication, using the Hearing in Noise Test (HINT) as an alternative to traditional pure-tone audiometric threshold measures. Hearing standards are expressed in terms of HINT screening threshold scores, derived from specification of the minimum level of auditory performance required of the workers. These researchers suggest that the HINT is applicable in a wide range of settings, including multilingual workplaces.

Comment: Although employment-related hearing screening is nowadays a relatively well-accepted practice, this article raises the less-considered issue of screening functional hearing status. For many jobs where communication is critical, knowing just the degree or configuration of a hearing loss is insufficient. Skills such as speech perception and sound localisation (both in quiet and noise) can be imperative to job requirements and safety. As the relationship between the audiogram and a patient's actual communication ability is not always clear cut, the use of a screening test such as the version of the HINT test in this article may be something employers in some professions may need to consider adopting. This may not necessarily be just as a pre-employment measure, but could also be used if employees are experiencing difficulty, or to help the workplace implement strategies to best assist all staff.

Reference: Int J Audiol. 2008;47:319-28

http://tinyurl.com/5hlex8

How should hearing screening tests be offered?

Authors: Koopman J et al

Summary: Data are reported from a postal-based questionnaire conducted in the UK, Germany, and The Netherlands, involving users of hearing devices, those that were in the process of obtaining one, or those that had indicated having a special interest in hearing. The questionnaire sought to determine how best to offer hearing screening to the general public. Respondents were enthusiastic about the idea of being able to undertake hearing self-screening tests via the internet, telephone, or questionnaires. A questionnaire as a method to screen hearing was generally preferred above using the internet, which was preferred over using the telephone for the test. About 27% of the respondents indicated preference for using exclusively one method. While 41% of respondents indicated interest in either method, 17% indicated they did not wish to conduct screening tests using the internet.

Comment: Having easily accessible hearing screening tests that the general public can access, use and trust, would have wide-ranging benefits. Increased awareness and identification of hearing loss is a pertinent issue, and having a method where people can assess their hearing in the privacy and confidentiality of their own home may be appealing. Such a screening test may not just be used for people to identify if they have a hearing problem, but it could also allow individuals to monitor their hearing, to evaluate the outcomes of rehabilitation or device modifications, or to compare between different device settings. Although the results suggest that respondents prefer subjective (i.e. questionnaires) to more objective methods such as an internet-based listening task, this may be related to people's scepticism and trust over the accuracy of the latter's results.

Reference: Int J Audiol. 2008;47:230-7

http://tinyurl.com/6fpjs4

Changes in transient-evoked otoacoustic emission levels with negative tympanometric peak pressure in infants and toddlers

Authors: Prieve BA et al

Summary: This study sought to characterise transient-evoked otoacoustic emission (TEOAE) and noise levels when tympanometric peak pressures (TPP) measured from tympanograms were normal versus negative in the same individual, using data from 11 children aged 3 to 39 months. When TPP was negative, TEOAE level was lower by approximately 4 dB across all frequency bands, but noise levels did not change between the 2 conditions. No significant differences were found among the mean reduction across frequency bands. There were no significant differences in the percentage of passes between TEOAEs collected on days when TPP was normal and when TPP was negative (the pass rate was affected in only 5% to 6% of cases).

Comment: In this study, results of comparisons between TEOAE recordings for the same child on days when middle ear pressure (MEP) was normal versus when negative (e.g. Type C tympanogram) suggest that a Type C tympanogram does not necessarily need to preclude conducting TEOAE measurements. The child's absolute TEOAE levels may be lower than when they have normal MEP readings; however, there was no major effect on the noise levels in the recording or on overall pass rates. That is, for most children, despite the reduction in TEOAE levels, the levels were still high enough above the noise floor for clinical assessments. Whether this extends to DPOAEs (Distortion-Product Otoacoustic Emissions) is a topic for further research.

Reference: Ear Hear. 2008;29:533-42

http://tinyurl.com/6locld

Daily tympanometry for high-resolution measurement of the time between onset of cold-like illness and middle ear effusion

Authors: Doyle WJ et al

Summary: Over a 7-month period, tympanograms and illness were recorded daily for 169 children (1–8.6 years of age) by parents. Of 433 cold-like illnesses (CLI), middle ear effusion (MEE) was noted in 37%, and MEE with a CLI was predicted by age, otitis media (OM) history, and environment. Middle ear pressure was significantly more negative during CLI episodes, and the magnitude was predicted by age, race, and OM history. The average difference in MEE-CLI onsets was 1.2 days; approximately 32% of MEE episodes occurred before the parent identified a CLI and an additional 17% occurred on the same day as the parent identified the CLI.

Comment: The relationship between tympanometry results, OM, and CLI is not consistent or predictable. There has been some previous suggestion of a causal link between CLI and OM. Should this be the case, there could be implications for how and when to treat children susceptible to OM. In this study, more frequent incidences of CLI were associated with younger age, a history of frequent colds, and attendance at daycare/preschool/school. Over 1/3 of CLI episodes were associated with OM. With half of the episodes of OM occurring before, or on the same day as parents even noticing a CLI in their child, this would suggest that using parental observation of CLI to monitor middle-ear status may not be reliable. That is, it may not be effective to try and prevent OM by intervening at the time of a parent-identified CLI.

Reference: Laryngoscope. 2008;118:1066-71

http://tinyurl.com/562749

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