

# Hearing Review

Making Education Easy

Issue 2 - 2007

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**Welcome** to the second edition of **Hearing Review**, a unique **New Zealand publication bringing you some of the most important scientific research from around the world every two months. We summarise the best we can find to save you time, and hope our interpretation of the results helps make your job easier.**

We have been absolutely delighted with the response to issue 1, and the enrolments have been flooding in. Thanks to everyone who provided feedback to the first edition and to our sponsors for their ongoing commitment. If you have a colleague who you think might like a copy please feel free to pass it on. We trust you find it stimulating and look forward to your comments and opinions.

Kind regards,

**Dr Ravi Sockalingam**

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## Auditory deprivation in adults with asymmetric, sensorineural hearing impairment

**Authors:** Silverman CA et al

**Summary:** This 2-year, prospective study compared outcomes in 21 monaurally aided (experimental group) and 28 unaided adults (control group) with asymmetric, sensorineural hearing impairment. Assessments included the pure-tone air-conduction threshold, speech-recognition threshold, and suprathreshold word-recognition tests. In the worst ears of the control group, significant declines in the mean suprathreshold word-recognition scores had occurred at both 1 and 2 years, but there was no change in the better ears. In the experimental group, no change in either ear was observed in regard to this parameter. In both groups there was a small but significant increase in the pure-tone average. The authors find that these results "are consistent with the presence of an auditory deprivation effect on suprathreshold word-recognition ability in the control group, suggesting that lack of amplification leads to decline in word-recognition performance over time in the worse ears of adults with asymmetric sensorineural hearing impairment."

**Comment:** A distinguishing feature of this study is that it tracked the impact of auditory deprivation over two years using pure-tone audiometry, speech reception thresholds, and suprathreshold speech discrimination measures. The latter measure was found to be most affected in the worse ears of those who did not wear any hearing aids. The take home message for us clinicians would be that if we cannot get our clients with asymmetrical sensorineural hearing loss to be aided bilaterally, we should at least convince them to wear a hearing aid in the worse ear so that their speech discrimination ability is not unduly compromised.

**Reference:** *J Am Acad Audiol.* 2006; 17(10):747-62 and comment in *J Am Acad Audiol.* 2006; 17(10):1 p preceding 681  
**PMID:** 17153722



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### Effects of reverberation and filtering on speech rate judgment

**Authors:** Moore R et al

**Summary:** The aim of this study was to examine the effects of listening conditions (such as would be encountered in every day life) on speech rate judgment. 20 young adults aged 20 to 40 years with normal hearing were asked to assess rates of speech using a 5-point scale. The test comprised of a single sentence which was delivered at speech rates between 90 and 250 words per minute under different conditions including non-degraded, reverberation, band-pass filtered, and low-pass filtered. Speech encountered under reverberation conditions was rated as more rapid than under the other three conditions. The authors conclude that these findings "may have implications for auditory rehabilitation and counseling."

**Comment:** This is an interesting piece of research and has important implications for the clinicians in terms of assessment and rehabilitation. Often, when older individuals with hearing aids complain that their communication partners speak too fast it may well be that they are listening to speech in a reverberant environment. As clinicians, we should consider including, as part of the routine battery of assessments, testing not just speech reception in noise but also speech reception in a reverberant environment.

**Reference:** *Int J Audiol.* 2007; 46(3):154-60



*Independent commentary by Dr Ravi Sockalingam, Senior lecturer, Communications Disorders, University of Canterbury.*

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

### Recognition of digits in different types of noise by normal-hearing and hearing-impaired listeners

**Authors:** Smits C et al

**Summary:** The authors developed adaptive speech-in-noise tests which measured the speech-reception-threshold (SRTn) i.e. the signal-to-noise ratio that corresponded to 50% intelligibility. The tests involved presenting digits to subjects under different noise conditions including continuous noise, 16-Hz interrupted noise, and 32-Hz interrupted noise. The current study assessed the value of these tests for discriminating between listeners with normal and impaired hearing. Subjects were also exposed to the standard Dutch triplet SRTn test in continuous noise. The efficiency of the tests was assessed using the ratio between the standard deviation in SRTn values between subjects and the measurement error. The study found that the "digit SRTn test in 16-Hz interrupted noise was very efficient in discriminating between normal-hearing listeners and hearing-impaired listeners, and might be used to screen for hearing loss as measured by pure-tone audiometry."

**Comment:** Digits are used in a dichotic format to assess auditory processing ability. In this study digits are used in noise in an adaptive format to measure speech reception threshold. The use of digits with 16Hz interrupted noise was found to be useful as a hearing screen. The findings of the present study are preliminary and larger scale studies are needed to warrant its use in a clinical setting. However, it does show promise as a valuable screening tool with potential to provide more valuable information regarding speech perception than a standard speech in quiet test.

**Reference:** *Int J Audiol.* 2007; 46(3):134-44

**PMID:** 17365067

### Directional benefit in the presence of speech and speechlike maskers

**Authors:** This study examined the use of directional hearing technology to overcome background noises (containing both energetic and informational masking components) in the setting of an everyday conversational speech environment. The masking effects used were forward and reversed speech and speech-modulated noise. In each of these conditions the directional technology was effective. There appeared to be no effect of the level of informational masking present in the background noise on the efficacy of the directional technology. The study also found that in the environment tested, the semantic information present in the masking speech appeared to make only a minor contribution toward informational masking.

**Comment:** This is yet another clear demonstration of the benefit of directional technology. Regardless of the type of maskers, directional hearing aids were found to be more beneficial than omnidirectional ones. Another interesting aspect of the study is that the semantic information in masking speech is very limited in terms of its contribution to informational masking in everyday listening environments. In summary, this study showed that directionality is beneficial for those clients who encounter any type of maskers in their everyday listening environments.

**Reference:** *J Am Acad Audiol.* 2007; 18(1):5-16

**PMID:** 17252955

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## Binaural advantages for users of binaural/ bimodal hearing devices

**Authors:** Ching TY et al

**Summary:** Differences in sentence perception in noise and sound localisation were assessed in adults (n = 21) and children (n = 29) with a single cochlear implant (CI) alone, and with a hearing aid in the other ear. The hearing aids were adjusted in order to complement the CIs. For sentence perception in noise there were binaural benefits in terms of binaural redundancy and head shadow with the hearing aid plus CI. This was unrelated to degree of hearing loss or length of use of bimodal hearing devices. Sound location was also improved with the hearing aid plus CI compared to CI alone. For children and adults with a unilateral CI and residual hearing in the non-implanted ear, implementation of binaural/bimodal fittings should be considered as standard management.

**Comment:** We are well aware of the advantages of having two hearing aids and that is the advice we give our patients. It is not surprising that the same advantages would apply to CI users with residual hearing in the non-implanted ear. It would be interesting to see if the results of this study could be replicated in a large scale longitudinal study conducted over several years.

**Reference:** *Audiol Neurotol.* 2006; 11(Suppl 1):6-11

**PMID:** 17063004

## Amplification with DNR and the perception of annoying and aversive sounds

**Authors:** Palmer CV et al

**Summary:** Noisy environments can create problems for hearing aid users, including understanding of speech, loudness discomfort, and annoyance with background noise. Digital noise reduction algorithms have failed to demonstrate benefits in terms of speech understanding in noise, but data for noise annoyance and aversion are lacking. The authors assessed perceptions of noise annoyance and aversiveness in subjects with moderate sensorineural hearing loss before, and 3 weeks after fitting with a hearing aid with a specific digital noise reduction system. Results were compared to those from subjects with normal hearing. Amplification increased the perception of annoyance and aversiveness. Perceptions of annoyance and aversiveness with the hearing aid were similar to those with normal hearing. The authors conclude that subjects receiving hearing aids should be counselled with regard to realistic expectations for annoyance and aversiveness of sounds

**Comment:** One of the major complaints from people recently fitted with hearing aids is that the aids are noisy. And this is also one of the major reasons why hearing aids ending up in the closet drawers for good. A numbers of studies have indicated, based on feedback derived from patients, that audiologists are often inept at providing counselling. Effective counselling regarding annoyance and aversiveness of sounds at the time of hearing aid fitting might be one sure one way of enhancing hearing aid acceptance by the clients we assist.

**Reference:** *Trends Amplif.* 2006; 10(2):95-104

**PMID:** 16959733

## The effects of digital noise reduction on the acceptance of background noise

**Authors:** Mueller HG et al

**Summary:** Speech intelligibility and acceptable noise level (ANL) were assessed in 22 adults fitted with 16-channel wide-dynamic-range compression hearing aids with two simultaneous digital noise reduction (DNR) algorithms. The Hearing in Noise Test (HINT) was used to assess ANL under three separate conditions: Hearing aid with DNR on; hearing aid with DNR off; and no hearing aid. ANL was significantly improved (mean 4.2 dB) with DNR-on compared to DNR-off. The mean HINT score was not significantly improved with DNR-on, and did not significantly correlate with ANL with DNR on or off. The authors conclude that "at least within the constraints of the DNR algorithms and test conditions employed in this study, DNR can significantly improve the clinically measured ANL, which may result in improved ease of listening for speech-in-noise situations."

**Comment:** This study demonstrated the benefit of digital noise reduction in speech understanding in noise, and for ease of listening. While the ANL and HINT were used as measures to investigate the benefit on a relatively small sample of patients, clinicians might still need to rely on their patients' feedback to ascertain the real life benefit of DNR.

**Reference:** *Trends Amplif.* 2006; 10(2):83-93

**PMID:** 16959732

**Disclaimer:** This publication is not intended as a replacement for regular medical education but to assist in the process. The reviews are a summarised interpretation of the published study and reflect the opinion of the writer rather than those of the research group or scientific journal. It is suggested readers review the full trial data before forming a final conclusion on its merits.

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### Contralateral suppression of transient evoked otoacoustic emissions in children with auditory processing disorder

**Authors:** Sanches SG and Carvalho RM

**Summary:** Abnormal suppression of transient evoked otoacoustic emissions (TEOAEs) with contralateral white noise in children aged 7 to 11 years with auditory processing disorder (APD) was assessed in this study. The children were divided into 3 groups as follows: those with no auditory deficits (n=15); those with APD and a high standardised test score (n=20); and those with APD and a low standardised test score (n=16). Linear and nonlinear acquisition modes were used to determine TEOAE suppression. The results of this study suggest that in children with APD, abnormal TEOAE suppression is significantly more common. The authors suggest that contralateral suppression of TEOAE may be a useful tool for assessing the efferent pathway in children with APD.

**Comment:** The link between APD and the efferent system as evidenced by abnormal TEOAE suppression has been noted in a number of studies. While there have been differences between studies in terms of the criteria used in defining APD, it might be worthwhile exploring the inclusion of TEOAE suppression as part of the electrophysiological battery of APD tests. In NZ, as in most other English-speaking countries, electrophysiological tests are not typically used by clinicians in APD assessment and diagnostics. Therefore it might be a long while yet before TEOAE suppression is applied clinically.

**Reference:** *Audiol Neurootol.* 2006; 11(6):366-72

**PMID:** 16988500

### Can a hearing education campaign for adolescents change their music listening behaviour?

**Authors:** Weichbold V and Zorowka P

**Summary:** The effect of a hearing education campaign on the behaviour of 1,757 high school students with regard to music listening practices was examined by this study. The students were asked to complete a questionnaire before, and 1 year after, implementation of the education campaign. The questions included: (1) average frequency of discotheque attendance; (2) average duration of stay in the discotheque; (3) use of earplugs in discotheques; (4) frequency of regeneration breaks while at a discotheque; and (5) mean time per week spent listening to music through headphones. The only positive change observed following the education campaign was that there was an increase in the number of regeneration breaks taken. Average frequency of attendance at the discotheque actually increased following the education campaign, whilst there were no differences observed on any of the other parameters. The authors conclude that other methods of encouraging adolescents to adopt hearing-protective behaviours should be investigated.

**Comment:** Excessive exposure to loud music by young people is a huge concern for audiologists and people working in the public health arena. The risk of suffering a permanent hearing loss increases with each repeated exposure. There are various public education programs in place in North America and Australia for elementary and secondary school students, and most have reported varying degrees of success. This study has shown that a public education campaign primarily aimed at adolescents may not always lead to the outcomes we would like to achieve.

**Reference:** *Int J Audiol.* 2007; 46(3):128-33

**PMID:** 17365066

### Central auditory processing disorder (CAPD) in children with specific language impairment (SLI) central auditory tests

**Authors:** Dlouha O et al

**Summary:** Children with specific language impairment (SLI) are unable to create simple sentences from two words that are heard separately but simultaneously. The authors used diagnostic tests for central auditory processing disorder (CAPD) to explore the relationship between speech-language impairment and central auditory processing. Three specific dichotic binaural tests (modified for younger children) were employed in 90 children aged 6-7 years. The tests consisted of dichotic listening to two-syllable words presented like binaural interaction tests. Test results for children with SLI (56, 64 and 63%) were significantly lower than those for normal controls (92, 93 and 92%;  $p < 0.001$ ). The authors suggest their results show a relationship between disorders of speech-language perception and central auditory processing disorders.

**Comment:** It has been reported that children with Specific Language Impairment (SLI) may also have APD. This study, based on a fairly large number of pre-school children, provides evidence of a possible link between SLI and APD. Results of the study suggest that children with SLI should also be assessed for APD as any intervention for this group of children should include the auditory modality to be meaningful.

**Reference:** *Int J Pediatr Otorhinolaryngol.* 2007; Mar 21; [Epub ahead of print]

**PMID:** 17382411

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