Proposed Recommended Procedure for the Use of OAEs in Hearing Conservation: a Delphi Exercise

ENT/SAAA/SASLHA conference
Bloemfontein
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Acknowledgments

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Audiologist

Members of the OAE web-community forum
Various – ENTs, Audiologists, Policy, OHPs, Hearing Conservation, Researchers
Outline

- Introduction
- Methodology
- Results
- Future plans
NIHL = reduced worker quality of life + compensation costs

If we are to prevent NIHL need early identification

The audiogram = subjective method that relies on co-operation from the worker

Alternative or adjunct approach is an objective testing method - OAEs

Metropolitan Police exemption from using HPDs
Delphi technique

- a widely used and accepted method
- has been used in various fields of study such as program planning, needs assessment, policy determination, and resource utilization
- for gathering data from experts in a particular domain
- to develop a full range of alternatives, explore or expose underlying assumptions, as well as correlate judgments on a topic spanning a wide range of disciplines.
Methodology

• designed as a group communication process
• aims to achieve a convergence of opinion on a specific real-world issue
• well suited as a method for consensus-building

• Techniques used - Conference telephonic calls
  Email discussions and records
  Committee meetings
  Formal conference or seminar
  Electronic conferencing
Objective

To develop an agreed upon standardised method of using OAEs in health surveillance for Hearing Conservation

To develop agreed upon criteria to interpret outcomes of OAE levels
Methodology

Expert colloquium UK 2011
Web-community
Literature review
Workshop at CSIR in November 2012
Regular meetings - local and international electronic/in person
  Alison Codling, Clare Forshaw
  Bart Vinck
  David Kemp
  Equipment suppliers
Survey of current methods used
- Circulated to known users and interested parties
- Based on outcome developed a recommended procedure
- Circulated on web-community
OAEs are a feasible alternative

- Large body of research in laboratory - mainly diagnostic
- Clinically sensitive tool for assessing NIHL and the outer hair cells (OHC)
  - repeatable results
  - identify cochlear damage before evidenced on an audiogram – normal audiogram but evidence of OHC loss
- Feasible method of evaluating HPD effectiveness using temporary emission shift (TES)
Reliable OAE test results require:

- Normal middle ear functioning - need tympanogram and reflex arc test
- Relatively quiet room - there should be an acceptable difference between the emission level and the noise floor (SNR)
- Hearing threshold levels impact on results - must use DPOAEs and diagnostic test protocol
Conclusion:
No accepted standardised method of using OAEs part of health surveillance
No agreed upon criteria to evaluate what changes in OAE levels indicate a change in OHC function.

Expert forum in UK in 2011
### Recommended Procedure

<table>
<thead>
<tr>
<th>Reason for activity</th>
<th>Tester requirements</th>
<th>Equipment requirements</th>
<th>Test parameters</th>
<th>Result interpretation</th>
<th>Outcome activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify cerumen</td>
<td>Right and left ear sequentially.</td>
<td>Otoscope. Record result in medical records.</td>
<td>View tympanic membrane.</td>
<td>If obstructed with cerumen arrange for removal.</td>
<td>Proceed to impedance test.</td>
</tr>
</tbody>
</table>
# Recommended Procedure

## Tympanometry

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</tr>
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<tbody>
<tr>
<td>Measure middle ear pressure</td>
<td>Right and left ear sequentially.</td>
<td>Automated tympanometer. Ear nubs of correct size to cause a sealed external ear. Using a 226 Hz probe tone.</td>
<td>Tympanic membrane mobility. Middle ear Impedance.</td>
<td>Type A tympanograms. Peak values comprised from 0.5 to 1.6 ml at ±50 daPa.</td>
<td>Proceed to acoustic reflex.</td>
</tr>
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<tr>
<td><strong>Confirm clear middle ear pathway.</strong></td>
<td>Right and left ear sequentially.</td>
<td>Tympanometer with acoustic reflex test.</td>
<td>1kHz at 100dB.</td>
<td>Reflex present.</td>
<td>Proceed to DP OAE test.</td>
</tr>
</tbody>
</table>
## Recommended Procedure

### DPOAE

<table>
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<th>Test parameters</th>
</tr>
</thead>
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<tr>
<td>Cochlear function.</td>
<td>Right and left ear sequentially.</td>
<td>DPOAE Machine.</td>
<td>L1/L2 = 75/70 dB</td>
</tr>
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<td></td>
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<td>F2 frequencies = 1/8 frequencies per octave i.e. 814Hz, 917Hz, 1000Hz, 1091Hz, 1189Hz, 1297Hz, 1542Hz, 1682Hz, 1834Hz, 2000Hz, 2181Hz, 2378Hz, 2594Hz, 2828Hz, 3084Hz, 3364Hz, 3668Hz, 4000Hz, 4362Hz, 4757Hz, 5187Hz, 5657Hz, 6169Hz, 6727Hz, 7336Hz, 8000Hz</td>
</tr>
</tbody>
</table>
Recommended Procedure

Interpretation guidelines

SNR = 6dBSPL at a minimum of 2 frequencies.

Establish baseline initially.

If >3dBSPL reduction in DPOAE emission strength from previous test, replicate the test in the individual.

This can be at a time period suitable for tester. It can be immediately based on consideration of possible confounding factors for test results i.e. TTS, ill health etc.).

Following re-test; take the better set of results as the outcome of test.
Recommended Procedure

Interpretation guidelines

If 3-5dBSPL reduction in emission from previous test at any frequency counsel client and warn of deterioration.

Review other results on similar exposed workers. If similar or greater deterioration in one or more similarly exposed workers there is a need to review noise management procedures to ensure protection is being ensured (i.e. controls, PPE, supervision etc.).
Recommended Procedure

Interpretation guidelines

If 5-10 dBSPL reduction in emission from previous test at any frequency counsel client and warn of deterioration. Consider referral for PTA/diagnostic testing.

Review other results on similar exposed workers. If similar or greater deterioration in one or more similarly exposed workers there is a need to review noise management procedures to ensure protection is being ensured (i.e. controls, PPE, supervision etc.).
Future plans

Equipment suppliers

Record keeping and use of results
Future plans

Qualitative study in UK

Launch in November
Bart Vinck
UK occupational health practitioners
Future plans

Quantitative study in SA

SA mines
Three commodities
Gold, Platinum and Coal
Process has begun
Longitudinal study of three to four years
Thank You

Questions?

NIHL