Hearing Screening Tests by Telephone and Internet

HearCom Implementations in Several Countries

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Hearing Screening

• Importance for general public
  – undiscovered hearing loss
  – acknowledge possibility of own hearing loss
  – pave the way for professional care (hearing aids or other)

• Requirements
  – Quick, easy, anonymous
  – Reliable for telescreening
    • no need for absolute calibration
    • independence of equipment and situation
    • foolproof explanation
  – Accessible from at home
  – Low demands on technology
  – Sensible guidance and presentation of test results
HearCom Screening Procedures

• Speech in noise
  – Digit Triplets Test
• Sound localisation
  – Minimum Audible Angle Test
  – AVE Based Localisation Test
• Subjectively perceived handicap
  – HearCom Questionnaire

Telephone and Internet

• Telephone
  – easy to use, widespread
  – landline phones provide consistent quality standard
  – drawbacks: monaural; limited spectrum; no visual feedback
• Internet
  – no costs for end user
  – better audio quality possible
  – enhanced audiovisual interaction
  – makes explanatory texts and graphics possible
  – drawbacks: uncertain quality of technical equipment; too complicated for inexperienced users
Telephone and Internet

- Telephone hearing screening test:
  - Digit Triplets Test
- Internet hearing screening battery:
  - Digit Triplets Test
  - Minimum Audible Angle Test
  - AVE Based Localisation Test
  - HearCom Questionnaire

Digit Triplets Test by Telephone

- Speech in noise test
- Estimates speech reception threshold (SRT)
- Pseudorandom triplet combinations of spoken digits
- Relatively small impact of presentation level on SRT
Digit Triplets Test by Telephone

<table>
<thead>
<tr>
<th>Country</th>
<th>Telephone Number</th>
<th>Providing Organization</th>
<th>available since</th>
<th>Internet page</th>
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<td>United Kingdom</td>
<td>0844-8003838</td>
<td>Royal National Institute for Deaf People</td>
<td>December 2005</td>
<td><a href="http://www.breakingthesoundbarrier.org.uk">www.breakingthesoundbarrier.org.uk</a></td>
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<td>Germany</td>
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<td>France</td>
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### Accumulated Data: SRTs

<table>
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<th>Language</th>
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### Accumulated Data: Age Structure

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<td>English</td>
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</table>
Accumulated Data: SRT and Age

unpublished data

unpublished data

unpublished data

unpublished data

Workshop Hearing Screening and Technology, Brussels 28 January 2009

Telephone Test: Test Results

- **Good**
  Your hearing is within the normal range. If in future you notice any problems with your hearing, please see your GP.

- **Insufficient**
  Your hearing is below normal. This is very common. However, you may wish to see your GP for a more detailed assessment of your hearing.

- **Poor**
  Your hearing is well below normal and you are likely to benefit from a hearing aid. Please see your GP and ask to be referred to an audiologist for a full hearing assessment.
**Internet Screening Test Battery**

**Internet: Digit Triplets Test**

- Assesses speech intelligibility in noise
- Very similar to telephone test
- Better sound quality
- Binaural stimulus presentation
- Available languages:
  - English
  - Dutch
  - German
  - Swedish
  - Polish
  - French
Internet: Digit Triplets Test

- Unpublished data

Internet: Minimum Audible Angle Test

- Assesses smallest detectable angle differences from front
- Uses virtual acoustics (crosstalk cancellation)
- Stimuli: noise bursts (300 Hz – 3400 Hz)
- Adaptive 2AFC procedure (1-up-2-down)
- Language independent. Instructions available in English, Dutch, German, Swedish, and Polish
Internet: AVE Based Localisation Test

- Virtual acoustics using headphones
- Sounds generated in real time on a server according to the user’s line of sight
- One of several telephones is ringing. User has to indicate the ringing phone.
- Language independent. Instructions available in English, German, Dutch, Swedish, and Polish

Internet: HearCom Questionnaire

- 18 questions relating to everyday hearing experience
- Questions cover the areas
  - Speech perception in quiet
  - Speech perception in noise
  - Sound localisation
  - Recognition of sounds
  - Detection of sounds
- Five possible answers:
  - not applicable
  - almost never
  - occasionally
  - frequently
  - almost always
- Available in English, Dutch and German
Guidance After the Tests

- HearCompanion
- Intended as eRehabilitation service
- Will supplement, not replace, existing audiological provisions
- May be especially valuable in countries having less developed audiological services
- Information is presented in the form of staged guidance as users undertake their personal aural rehabilitation 'journey'

Contributing Partners
Demonstrations

Telephone Test

- Welcome
  - age
  - gender
- Instructions
- Triplets
- Test result
  - good
  - insufficient
  - poor
Typical Course of the Telephone Test

![Graph showing typical course of the telephone test]

Screening Tests by Telephone:
Partners and Contacts

<table>
<thead>
<tr>
<th>Country</th>
<th>HearCom Partners</th>
<th>Providing Organization</th>
<th>Available since</th>
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<td>The Netherlands</td>
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<td>Nationale Hoorstichting</td>
<td>01/2003</td>
<td><a href="http://www.hoortest.nl">www.hoortest.nl</a></td>
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<td>Germany</td>
<td>DE-LLD, DE-GH</td>
<td>HöTech gGmbH</td>
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<td>Poland</td>
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<td>Uniwersytet im. Adama Mickiewicza w Poznaniu</td>
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<td>Switzerland</td>
<td>DE-UNI, UK-RSIV</td>
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</table>
Digit Triplets Test

- Open test in browser
- Very similar to telephone tests

Minimum Audible Angle Test

- Open test in browser
- Two consecutive noise bursts
  - left → right
  - right → left
Minimum Audible Angle Test

- Adaptive 2AFC procedure (1-up-2-down)

HearCom Questionnaire

- Open questionnaire in browser
- 18 questions relating to
  - Speech perception in quiet
  - Speech perception in noise
  - Sound localisation
  - Recognition of sounds
  - Detection of sounds
AVE Based Localisation Test

- **Open test in browser**
- Find a ringing telephone
<table>
<thead>
<tr>
<th>Test Procedure</th>
<th>HearCom Partners</th>
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<td>Digit Triplets Test</td>
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