Interventions following hearing screening in adults–
A systematic review

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Hearing loss:

- Highly prevalent
  - 10-40% of older adults (Davis 1990; Duijvesteijn et al. 1999; Pope & Sowers 2000; Smits et al. 2006)

- Causes serious disability and impaired quality of life
  - Depression (e.g., Cacciatiore et al. 1999), loneliness (e.g., Strawbridge et al. 2000), anxiety (e.g., Tambs 2004), work-related fatigue (e.g., Nachtgeaal et al. 2009)

However,

- Large degree of underdiagnosis
  - e.g., 37-57% individual with moderate-severe hearing loss own a hearing aid (Davis 1997)

- Large degree of undertreatment
  - e.g., 25-40% of hearing aid owners show significant underuse or abandonment (Hanratty & Lawlor 2000)
• Solution: Large scale screening program?

Work packages working on:
- Aetiological assessment and epidemiology of age-related hearing loss
- Main effects of age-related hearing loss
- Classical screening devices: quality standards and minimum requirements
- Newly proposed screening technologies
- Intervention Strategies

Coordinators: F. Grandori, M. Parazzini
Screening research with hearing aid interventions

- Improved communication and quality of life (e.g., Mulrow et al. 1990; Davis et al. 2007)
- Unwillingness to start with hearing aids (e.g., 30-51% [Davis et al. 2007; Davis et al. 1992; Wilson et al. 1993])
- Abandonment at 12 year follow-up (57% [Davis et al. 2007])

Is it acceptable that a considerable proportion of the screen positives does not accept the intervention??

Maybe the solution is: offering (additional) interventions other than hearing aids,

- Non-technical solutions, with attention for social, emotional and psychosocial wellbeing (Kiessling et al. 2003; Boothroyd 2007)
- Examples: training in hearing tactics, coping strategies, lipreading
  - Effective interventions: less communication difficulties and improved wellbeing in hearing-impaired adults (e.g., Kramer et al. 2005; Hickson et al. 2007)
• Very little is known about interventions other than hearing aids offered to screen-positive adults.

Which interventions have ever been used in the context of hearing screening??

Objective:
To systematically review the scientific literature on hearing screening and list the interventions that were offered to screen-positive adults.
Systematic Review

Inclusion criteria articles:

- **Types of studies (design):** no restrictions

- **Screening instruments:**
  - Screen hearing ability
  - Exclusion: screening for ototoxicity, eardrum perforations, otitis media, auditory tumors, genetic abnormalities
  - No restrictions to nature (e.g., self-report, pure tone audiometry)

- **Participants:**
  - Adults (≥ 18 years)
  - General population

- Exclusion: specific populations (e.g., Alzheimer patients, ENT patients, institutionalized persons, people at risk specifically for noise-induced hearing loss)
Methods: Outcome measures

- **Primary:** nature of intervention (e.g., hearing aid provision, coping, skills training)

  *Interventions:*
  - offered to screen-positives
  - part of the study protocol

- **Secondary** (if reported):
  - Intervention:
    - *setting*
    - *assessor*
    - *duration and frequency*
  - Screening instrument:
    - *name*
    - *nature*
    - *cut-off*
    - *setting*
    - *assessor*
  - Screened population:
    - *age*
    - *nationality*
    - *source of population*
Methods: Searches

Main search:

- Electronic databases (MEDLINE/Pubmed, EMBASE.com, Cochrane Library, CINAHL)
  - Developed search strategy together with search specialist

Additional searches:

- Asked experts in the field for relevant articles
- Searched on author names of screening instrument developers
- Reference checking of relevant articles

n=3025
Preliminary Results

- N=3025 → 171 possibly eligible
- Today: first 25 articles found eligible

Interventions categorized on intervention type:

1) Hearing aid provision only
2) Primarily hearing aids,
   - Complementary: other intervention aspects
3) Other intervention aspects (in addition to/ without hearing aids)
4) Advice to visit/ referral to hearing specialist
5) Other
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Age sample</th>
<th>Screening instrument</th>
<th>Hearing aids only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stephens et al. (1991)</td>
<td>UK</td>
<td>50-65</td>
<td>Self report questionnaire</td>
<td>Hearing aid provision</td>
</tr>
<tr>
<td>Davis et al. (2007)</td>
<td>UK</td>
<td>50-74</td>
<td>Self report questionnaire and Pure tone audiometry (portable audiometer)</td>
<td>Hearing aid provision</td>
</tr>
<tr>
<td>Baltussen et al. (2009)</td>
<td>India</td>
<td>N.m. ('adults')</td>
<td>Not mentioned.</td>
<td>Hearing aid provision</td>
</tr>
<tr>
<td>Mulrow et al. (1990)</td>
<td>USA</td>
<td>≥65</td>
<td>Pure tone audiometry (portable audiometer)</td>
<td>Hearing aid provision</td>
</tr>
<tr>
<td>Wilson et al. (1993)</td>
<td>UK</td>
<td>≥65</td>
<td>Pure tone audiometry (portable audiometer)</td>
<td>Hearing aid provision</td>
</tr>
<tr>
<td>Yueh et al. (2006)</td>
<td>USA</td>
<td>≥50</td>
<td>Self-report questionnaire and/or Pure tone audiometry (portable audiometer)</td>
<td>Hearing aid provision</td>
</tr>
<tr>
<td>Davis et al. (1992)</td>
<td>UK</td>
<td>50-65</td>
<td>Self-report questionnaire or Pure tone audiometry (audiograms)</td>
<td>Hearing aid provision. Some cases: hearing therapist (not standardized)</td>
</tr>
</tbody>
</table>
## Preliminary Results: Interventions 2

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Age sample</th>
<th>Screening instrument</th>
<th>Primarily hearing aids, secondary: other intervention aspects</th>
</tr>
</thead>
</table>
| Stephens et al. (1990)       | UK      | 50-65      | Self report questionnaire     | Primarily: Hearing aid provision. If:  
- Hearing loss < pure tone cut-off and reporting hearing complaints /  
- Unwilling to have hearing aids:  
  → Advice on hearing tactics and environmental aids (referral social services). |
| Stephens & Meredith (1991)   | UK      | ≥66        | Self report questionnaire     | Primarily: Hearing aid provision. If:  
- Hearing loss < pure tone cut-off and reporting hearing complaints /  
- Unwilling to have hearing aids:  
  → Advice on hearing tactics and environmental aids (referral social services). |
| Hildesheimer & Muchnik (1992)| Israel  | ≥65        | Pure tone audiometry (portable audiometer) | “Rehabilitation program (?) including hearing aid provision” |
## Preliminary Results: Interventions 3

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Age sample</th>
<th>Screening instrument</th>
<th>Other intervention aspects, in addition to or without hearing aids</th>
</tr>
</thead>
</table>
| Gussekloo et al. (2003)| NL      | 85         | Pure tone audiometry (portable audiometer)               | - Informed about opportunities of auditory rehabilitation  
                           - Advised on hearing tactics and environmental aids  
                           - Hearing aid provision                                |
| Milstein & Ventry (2002)| USA    | ≥65        | Self-report questionnaire and Pure tone audiometry (portable audiometer) | - **Informative videotape** hearing loss and rehabilitation  
                           - **Recommendation to see an audiologist**               |
## Preliminary Results: Interventions 4

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Age range</th>
<th>Screening instrument</th>
<th>Recommendation to visit/ referral to hearing specialist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smits &amp; Houtgast (2005)</td>
<td>NL</td>
<td>10-84</td>
<td>Speech-in-noise test</td>
<td>Recommended to visit hearing specialist</td>
</tr>
<tr>
<td>Jee et al. (2004)</td>
<td>Australia</td>
<td>≥65</td>
<td>Pure tone audiometry (portable audiometer)</td>
<td>Recommended to visit hearing aid providers or an audiologic clinic</td>
</tr>
<tr>
<td>Smith et al. (1992)</td>
<td>USA</td>
<td>≥18</td>
<td>Self-report questionnaire</td>
<td>Recommended to ‘go for a complete audiological evaluation’</td>
</tr>
<tr>
<td>Lavizzo-Mouray et al. (1994)</td>
<td>USA</td>
<td>? ‘Elders’</td>
<td>Pure tone audiometry (portable audiometer)</td>
<td>List of local specialists and clinics provided</td>
</tr>
<tr>
<td>Koike et al. (1989)</td>
<td>USA</td>
<td>58-92</td>
<td>Self-report questionnaire and Pure tone audiometry</td>
<td>List of licensed near-by audiologists provided</td>
</tr>
<tr>
<td>Schow et al. (1990)</td>
<td>USA</td>
<td>≥18</td>
<td>Self-report questionnaire</td>
<td>Recommendations (not specified) and List of local audiology services and ear specialist services provided</td>
</tr>
<tr>
<td>Hands (2000)</td>
<td>UK</td>
<td>65-74</td>
<td>Self-report questionnaire</td>
<td>Referral to ENT clinic</td>
</tr>
<tr>
<td>Sangster et al. (1991)</td>
<td>Canada</td>
<td>≥65</td>
<td>Self-report questionnaire and Pure tone audiometry</td>
<td>Referral to Speech and Hearing Clinic for standard audiologic evaluation.</td>
</tr>
<tr>
<td>Hoek et al. (1997)</td>
<td>USA</td>
<td>38-101</td>
<td>Self-report questionnaire</td>
<td>Referral to Audiological Centre.</td>
</tr>
<tr>
<td>Moore et al. (1997)</td>
<td>USA</td>
<td>≥70</td>
<td>Pure tone audiometry (portable audiometer)</td>
<td>Physicians instruction: audiometer retest, then Referral to a care facility providing pure tone audiometry</td>
</tr>
<tr>
<td>Eichler et al. (2007)</td>
<td>Switzerland</td>
<td>≥70</td>
<td>Self-report questionnaire and Whisper test</td>
<td>Physician discussed with patient if and which actions were undertaken: <strong>additional exams and/or specialist referral</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(protocollized)</td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>Age sample</td>
<td>Screening instrument</td>
<td>Intervention (other)</td>
</tr>
<tr>
<td>-----------------------</td>
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<td>-----------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Abutan et al. (1993)</td>
<td>NL</td>
<td>≥60</td>
<td>Pure tone audiometry (portable audiometer)</td>
<td>Provide screening outcome to participants and the GP</td>
</tr>
</tbody>
</table>
Summary Preliminary Results

• Interventions reported so far:
  – Hearing aid provision only
    n=7
  – Primarily hearing aids, Complementary: other intervention aspects
    n=3
  – Other intervention aspects in addition to/ without hearing aids
    n=2
  – Advice to visit/ referral to hearing specialist
    n=11
  – Provision of screening results to GP
    n=2
• The preliminary results of this review show that:
  – The literature does report on interventions other than hearing aids!
  – Demonstrate a lack of consensus

• The (preliminary) results of this review:
  – Provide a basis for the discussion about what to consider as an ‘acceptable treatment’ following screening for hearing in adults
  – Identify what potentially effective intervention types have received little attention so far, yet deserve more attention in future research
  – Are needed when developing a large scale hearing screening program in adults aiming to provide an effective intervention that is accepted by all screen positives

We’ll keep you posted!

Check: http://www.ahead.polimi.it/
Topics

» Epidemiology of hearing loss in adults
» Prevalence of hearing loss and auditory dysfunction
» Basic research: auditory neuroscience, anatomy and physiology of the auditory system, acoustics and psychoacoustics, speech perception: psychophysical and physiological issues, cognition, language, neural plasticity, neuroscientific advances: relevance to clinical assessment and intervention, modeling of the ear and hearing, signal processing
» Aging factors and degenerative neurologic disorders

» Behavioural, physiologic & aetiological assessment
» Screening methods and techniques
» Risk factors & Susceptibility
» Changes in speech, language and cognitive abilities associated with HL and aging
» Assessment and treatment of speech and communication disorders
» Hearing & balance problems
» Intervention strategies
» Development of hearing devices and instrumentation: Development of Hearing Aids, fitting strategies
» Issues on education and training

www.AHS2010.polimi.it
• Thank you for your attention!

• Questions/ remarks?

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Sophia Kramer: se.kramer@vumc.nl

Please visit:  
AHEAD III:  
http://www.ahead.polimi.it/  
Adult Hearing Screening Conference:  
http://www.ahs2010.polimi.it/
References


