An Audiovisual-FM system for students with hearing loss

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Premises underlying the development of AudiSee

- Classrooms are not ideal learning environments --
  - overall noise levels
  - the level of the teachers voice re: background noise (i.e., poor SNR)
  - reverberation
  - poor lighting and/or visual environment
Premises underlying the development of AudiSee

- Children with hearing loss are especially at risk in regular classrooms
- Amplification, especially auditory-FM systems, constitute one way of improving speech-perception in the classroom
Premises underlying the development of AudiSee

- The use of visual cues (speechreading) is another important way to optimize speech perception.
- The visual-speech cues provided by the teacher may not always be available to the student.
Premises underlying the development of AudiSee

- Recently an assistive device that allows a student to speechread the teacher at all times was developed

- I have been involved in evaluating the potential benefits provided by the AV-FM system
Completed Investigations

- Effects of distance
- Effects of illumination
- Effect of head movements
- Observations from a field study
Noise levels in classrooms:
Summary of published data
Noise levels & SNR:
Summary of published data

Average SNR is approx. 5.5 dB
Speech perception in noise (Children): Monosyllabic words @ +6 dB
Speech perception in noise (Children): Normal-hg vs. Minimal hg loss

Taken from Crandell et al., 1995
Effect of noise in nonnative children

From Crandell et al., 1995: Native and nonnative
Speech perception in noise: Children with SNHL @ SNR of +6dB

(Taken from Picard & Bradley,) Open squares are from 3 studies who tested children with hg loss (Finitzo-Heiber et al., 1978; Ross and Giolas, 1971; Gengel, 1971).
REVERBERATION
The effects of Noise and reverberation on speech-perception

Finitzo-Heiber & Tillman, 1978
ASHA’s (1995) Recommended acoustic criteria for classrooms

- Children with normal-hearing
- Children with hearing loss

⇒ Noise levels: \( \leq 30 \text{ dB(A)} \)
⇒ Reverberation: \( \leq .4 \text{ sec} \)

These conditions are seldom met!
Advantages of AV speech perception

Taken from Grant and Braida, 1991
Advantages of AV speech-perception

Reconnaissance des consonnes

<table>
<thead>
<tr>
<th>Audition</th>
<th>Normale</th>
<th>Perte sévère</th>
<th>Perte profonde</th>
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</thead>
<tbody>
<tr>
<td>Audio</td>
<td>99,7</td>
<td>50,4</td>
<td>21,0</td>
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<tr>
<td>Visuel</td>
<td>31,6</td>
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<td>Audio/visuel</td>
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<td>88,0</td>
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</tr>
</tbody>
</table>

+39 %
+35 %

(Taken from Erber 1972)
Advantages of AV speech perception

McCleod & Summerfield, 1990, p. 37
Advantages of AV speech perception

Providing Visual-speech cues is like improving the SNR by 7 to 10 dB!
To optimize speech-perception in classrooms

Meeting acoustic guidelines in a room does not necessarily ensure high speech recognition for all listeners in that room.

To ensure optimal speech recognition:

- reduce the speaker-listener distance (physically or through room amplification systems)
- provide ample visual information
- use clear speech

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Components of AudiSee
Thank you for your time and your attention