The effects of noise and impaired voice quality on spoken language processing in school-aged children: Preliminary results of a systematic review

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Introduction

- Classroom noise levels ~70 dB(A) (recommended: ≤55 dB(A))
- To be understood, teachers speaking level is ~80 dB(A) lower than the noise level
- >50% of teachers develop voice disorders
- Acoustic degradations interfere with children’s speech processing

Objective

To review the effects of noise and/or speaker’s impaired voice quality on spoken language processing in school-aged children

Methods

- PRISMA-informed systematic review
- Study search: PsycINFO/Ovid, Medline/Ovid, Eric/Ovid, and Scopus searched up to August 2018 (example in Table 1)
- Eligibility: studies assessing 6-18 year old children’s performance and response times (RT) in listening tasks presented in noise and/or impaired voice
- Findings classified and summarized regarding speech perception, listening comprehension, and auditory working memory
- Study quality assessment: shortened version of Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies of the National Heart, Lung, and Blood Institute

Results

- 24 studies included (14 on noise effects; 8 on impaired-voice effects; 2 on combined effects)
- Negative effects of noise and impaired voice on speech perception, listening comprehension, and auditory working memory (see Table 2)
- Study quality: good = 67%, fair = 33% (see Figure 2)

Table 2. Effects of noise and impaired voice on children’s spoken language processing

<table>
<thead>
<tr>
<th>Effect</th>
<th>Noise</th>
<th>Impaired voice</th>
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<tbody>
<tr>
<td>Speech perception</td>
<td>Lowered performance</td>
<td>Lowered performance</td>
</tr>
<tr>
<td>Listening comprehension</td>
<td>Veracity judgments and passage comprehension</td>
<td>Acceptability judgments and passage discrimination</td>
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<tr>
<td>Auditory working memory</td>
<td>Forward digit recall</td>
<td>Word recall performance</td>
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</table>

Conclusions

- Noise and impaired voice may disrupt children’s perception, comprehension, and memory of spoken language
- Research on combined effects of noise and impaired voice still scarce
- Study quality generally good, but more rigorous reporting required

Recommendations

- Enhancing classroom listening conditions (e.g. noise insulation, voice-care programs, voice amplification)
- Investigating combined effects and potential interactions of noise and speaker’s impaired voice
- Improving study quality (e.g. reporting participation rate, effect estimates, and blinding methods)

References


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