The effect of impaired speaker's voice and noise on children's spoken language processing

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BACKGROUND

Listening to speech in noise may compromise children's spoken language processing at different linguistic levels [1]. The same has been shown for dysphonic speech [2]. To date, little is known about how a combination of noise and impaired voice may affect speech perception and listening comprehension in young school-children.

OBJECTIVES

To investigate isolated and combined effects of noise and impaired voice on first-grade primary school children's spoken language processing using a minimal-pair discrimination task and a sentence-picture matching task.

H1 – Task performance decreases when listening to either an impaired voice or against noise.
H2 – Task performance is lowest when listening to a combination of an impaired voice and noise.
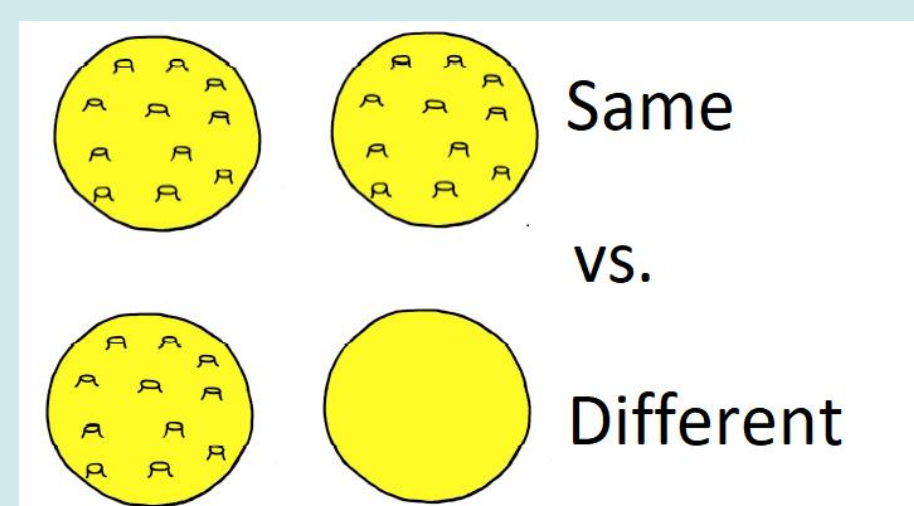
METHODS

Participants: 53 typically-developing children (f = 29, m = 24) aged 5-6 years

Listening Tasks (presented via headphone):

Minimal-Pair Discrimination

„*l*orse – *p*orse"

Same
vs.
Different

Sentence-Picture Matching

„*The bear sleeps*"

Listening conditions (signal-to-noise ratio = 0 dB):
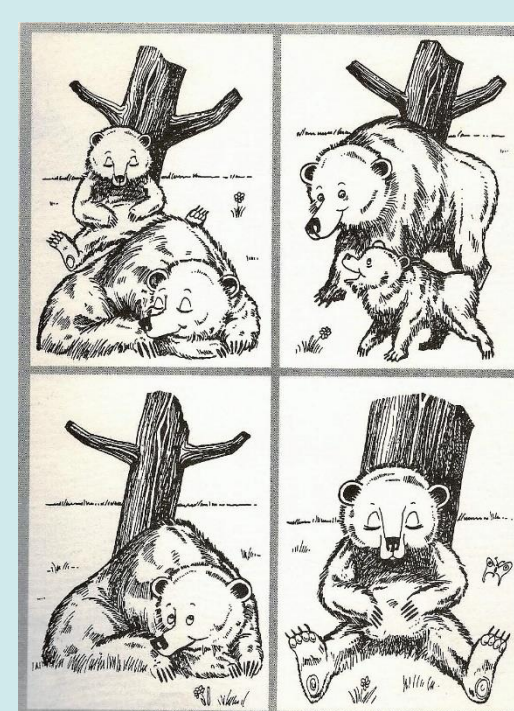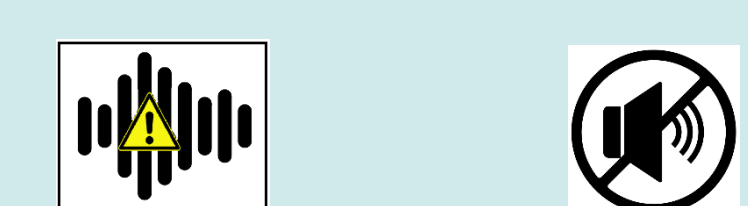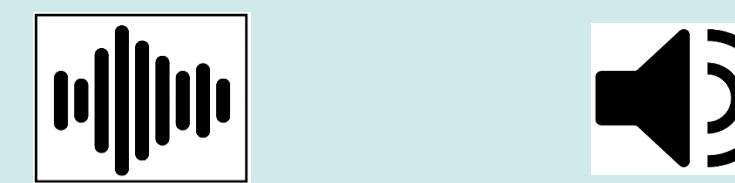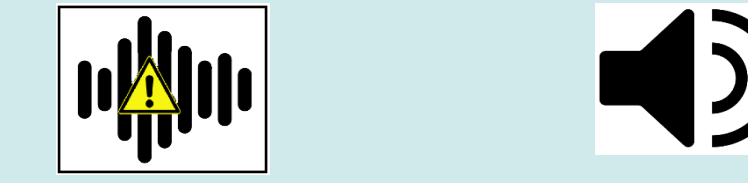
C1 – Normal voice / No noise
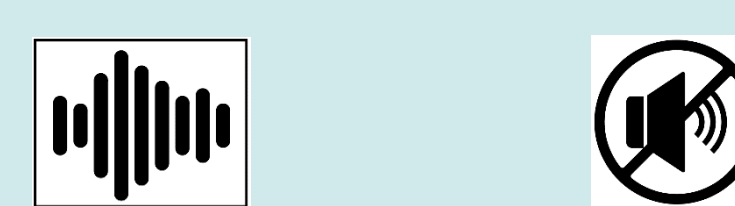
C2 – Impaired voice / No noise

C3 – Normal voice / Noise

C4 – Impaired voice / Noise

Design: Each child performed both tasks. Within subjects, stimuli were randomly distributed across conditions C1-C4.

Analysis: Task performance (% of correct responses) was calculated per condition per task. Mixed-effects models were used to investigate the effects of impaired voice, noise, and their combination.

RESULTS

- Performance in the Minimal-Pair Discrimination Task (but not the Sentence-Picture Matching Task) decreased in the presence of either impaired voice (C2) or noise (C3).

- For both tasks, performance was lowest in the presence of impaired voice and noise (C4). A significant interaction between the two variables was found for the Sentence-Picture Matching Task.

Minimal-Pair Discrimination

Main effect $p < 0.05*$

Main effect $p < 0.01***$

Sentence-Picture Matching

Interaction $p < 0.05*$
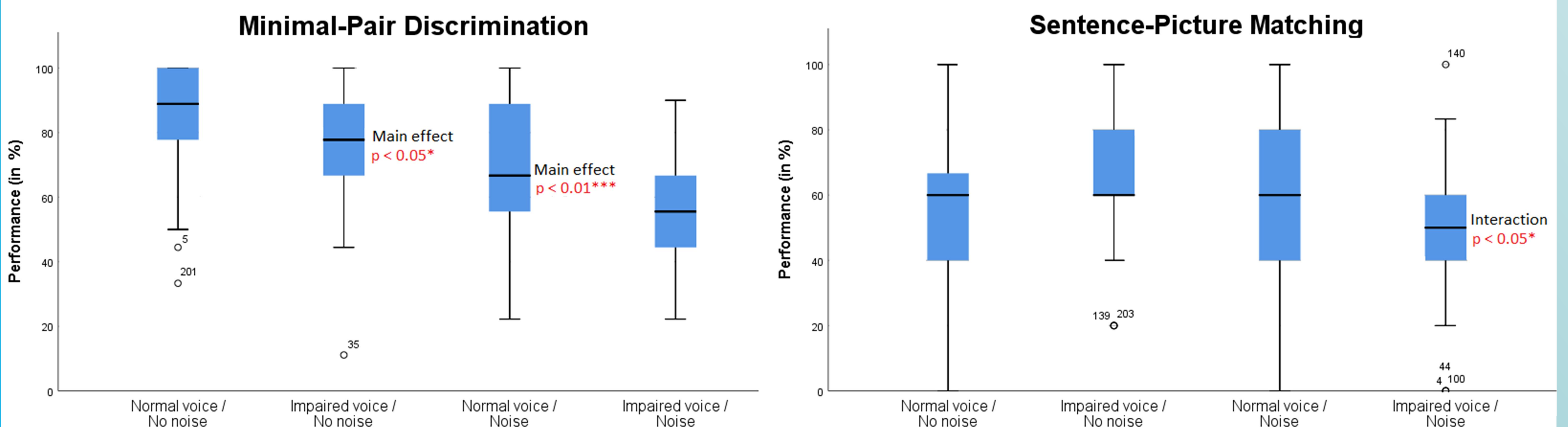
DISCUSSION AND CONCLUSION

Results indicate that young school-children's spoken language processing is negatively affected by a combination of impaired speaker's voice and noise. This is likely due to increased auditory masking and less cognitive capacity available for linguistic processing. Context cues may promote children's decoding of degraded speech signals. This study has implications for the educational sector and show the importance of improving classroom listening conditions.

References: [1] Klatte, Lachmann, & Meis. *Noise and Health.* 2010 [2] Morsomme, Minell, & Verduyckt. *Vocologie: Stem En Stemstoornissen.* 2011