Developmental and Linguistic Factors of Audiovisual Speech Perception Across Different Masker Types

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BACKGROUND

- Classroom noises compete with target speech at the auditory periphery through energetic maskers, which overlap with auditory signals in their spatiotemporal profile (e.g. loud heating and cooling units); and at more central auditory processes through informational maskers, which cause difficulty in the segregation of the target signal from the features of similar-sounding distracters (e.g. children chatting in the back of the classroom during a lesson).
- There is ample support that temporal and phonemic cues in audiovisual (AV) speech assist in segregation of a target auditory stream from competing background maskers.1,2
- Our current knowledge of AV benefit to speech intelligibility is limited to monolingual child and adult listeners in predominately energetic masking conditions.
- The impact of bilingualism on speech in noise is unclear. While there is ample support that temporal and phonemic cues in audiovisual speech perception in noise (AVSP) tasks, the relationship between bilingualism and speech intelligibility in noise is less clear.3

HYPOTHESES

1) We predicted that children would perform significantly poorer than adults in informational masking, two-talker conditions when compared to performance in energetic masking conditions on audiovisual speech perception in noise (SPIN) tasks.
2) Overall AV benefit would also be considerably lower in children relative to adults, especially in informational masking conditions.
3) Both child and adult monolingual and simultaneous bilingual participants would perform comparably across all conditions.

METHODOLOGY

Participants

- All bilingual speakers were simultaneous bilingual with L2 proficiency and daily use ≥ 20%
- Socioeconomic status & IQ controlled across all participants.

Procedure

- Participants were instructed to listen for the target sentence, which was presented 500 milliseconds after masker onset, and report what they heard.
- After completing the SPIN task, participants or their guardians filled out a language history questionnaire and completed a nonverbal intelligence test (KBIT-2).

RESULTS

Effect of age on speech perception in noise by monolingual participants

- Participants were instructed to listen for the target sentence, which was presented 500 milliseconds after masker onset, and report what they heard.
- After completing the SPIN task, participants or their guardians filled out a language history questionnaire and completed a nonverbal intelligence test (KBIT-2).

- Intelligibility: Adults = Children in both AO and AV conditions
- Child-adult gap larger in informational masking conditions at more difficult SNRs
- No significant difference was found among the monolingual and bilingual groups.

CONCLUSION

1) In line with our predictions, children experienced greater difficulty in segregation of target speech in informational maskers relative to energetic masking conditions.
2) The child-adult gap in AV benefit was greater in informational masking conditions. This may shed light on children’s less developed higher-level cognitive strategies in dealing with speech-in-noise (e.g. selective attention).
3) Results suggest that despite two competing lexicons, simultaneous bilinguals do not experience greater deficit in audiovisual speech perception in noise relative to monolingual age-matched peers.

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