Association of Children's Coarticulatory Sensitivity with Language and Reading Skills Revealed by Eyetracking

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Introduction

Anticipatory coarticulation occurs when articulation of a phoneme is influenced by features of an upcoming phoneme.

In adults, lexical access is disrupted in the presence of incongruent coarticulatory cues.

- Word recognition is weakened when incongruent coarticulatory cues are inserted into a speech stream [1, 2]

Coarticulatory cue sensitivity remains largely unexamined in children, and it is unclear how children use these cues during spoken word recognition.

While there is some evidence that use of phonetic information during spoken word recognition is related to reading and oral language proficiency[3, 4, 5], this too is underexplored.

Research Questions

- Are school-aged children sensitive to coarticulatory information to a similar degree as adults?
- Is sensitivity to coarticulatory information related to reading and language proficiency in children?

Method

Participants

- 19 adults (mean age 24;1; 13 female)
- 29 children (mean age 6;7; 21 female)

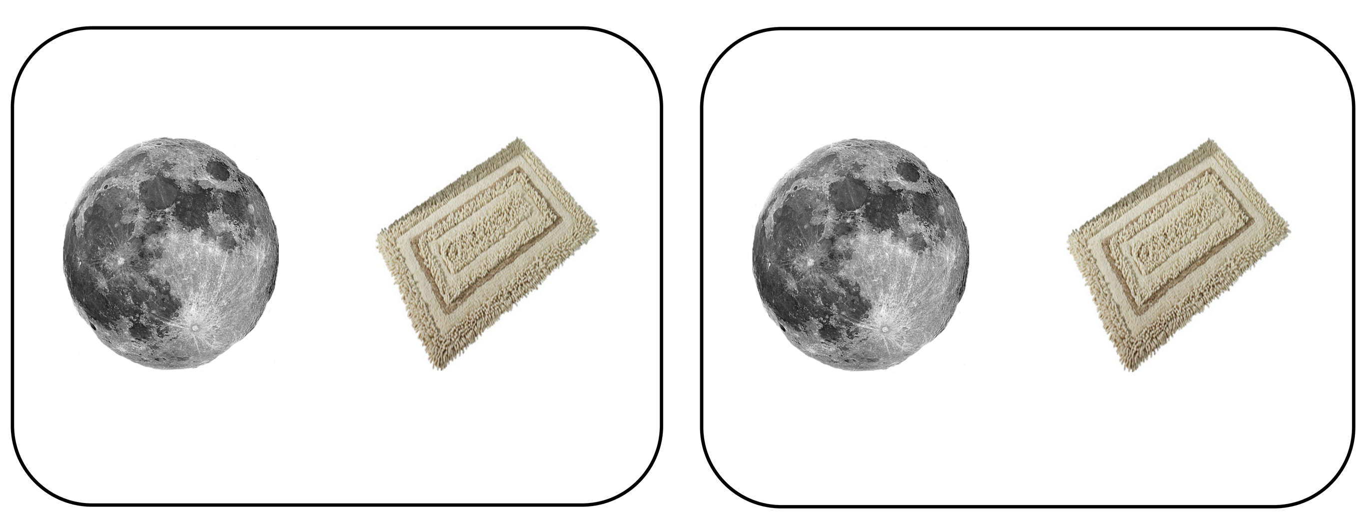
Stimuli

- Monosyllabic words cross-spliced to contain congruent or incongruent coarticulatory cue in initial consonant
- *Congruent trials*: spoken word paired with target picture matching word and coarticulatory cue
- *Incongruent trials*: spoken word paired with target picture matching word and competitor picture matching incongruent coarticulatory cue

Procedure

- Tobii T120 Eye Tracker measured rates of fixations to target and competitor pictures
- Participants identified picture matching the word via key press

Congruent Trial "m^{u}oon" | **Incongruent Trial** "m^{a}oon"



Behavioural Measures

- sentence recall
- letter knowledge
- word and nonword reading (TOWRE)
- rapid automatized naming (RAN)

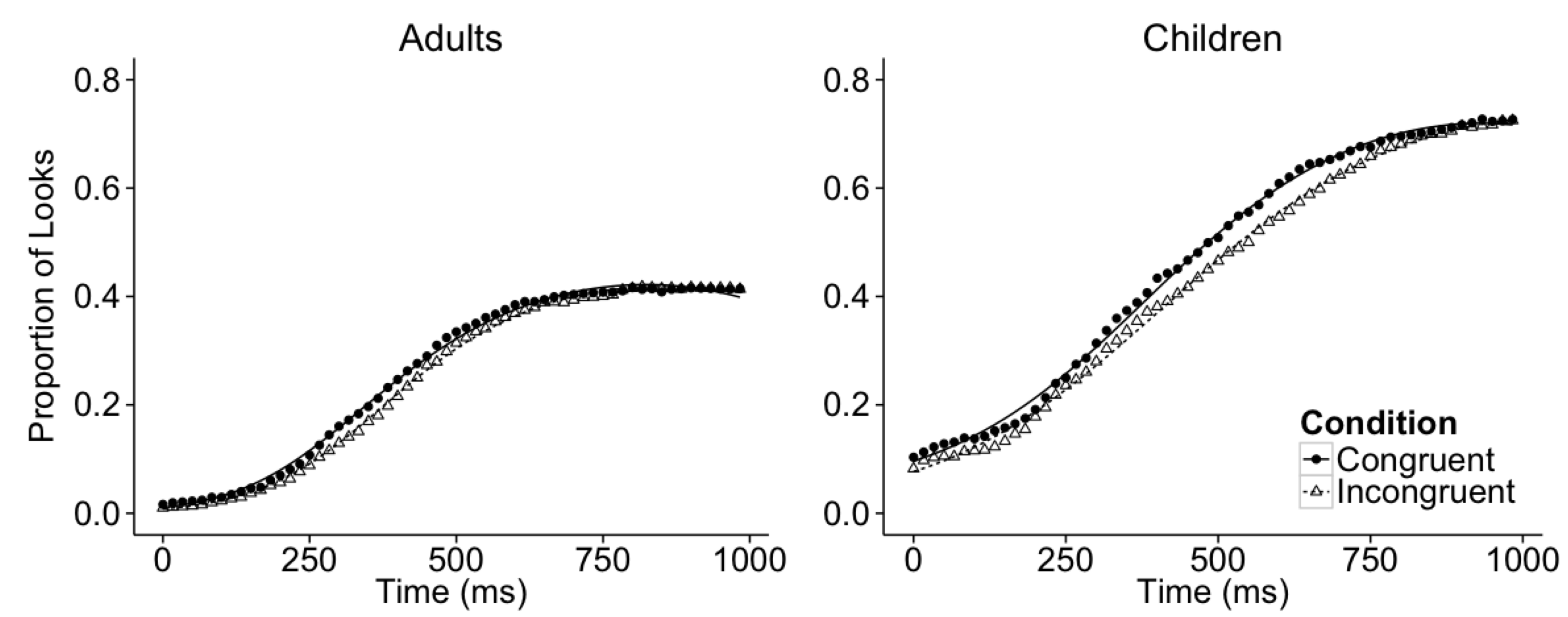
Results

Eyetracking Data

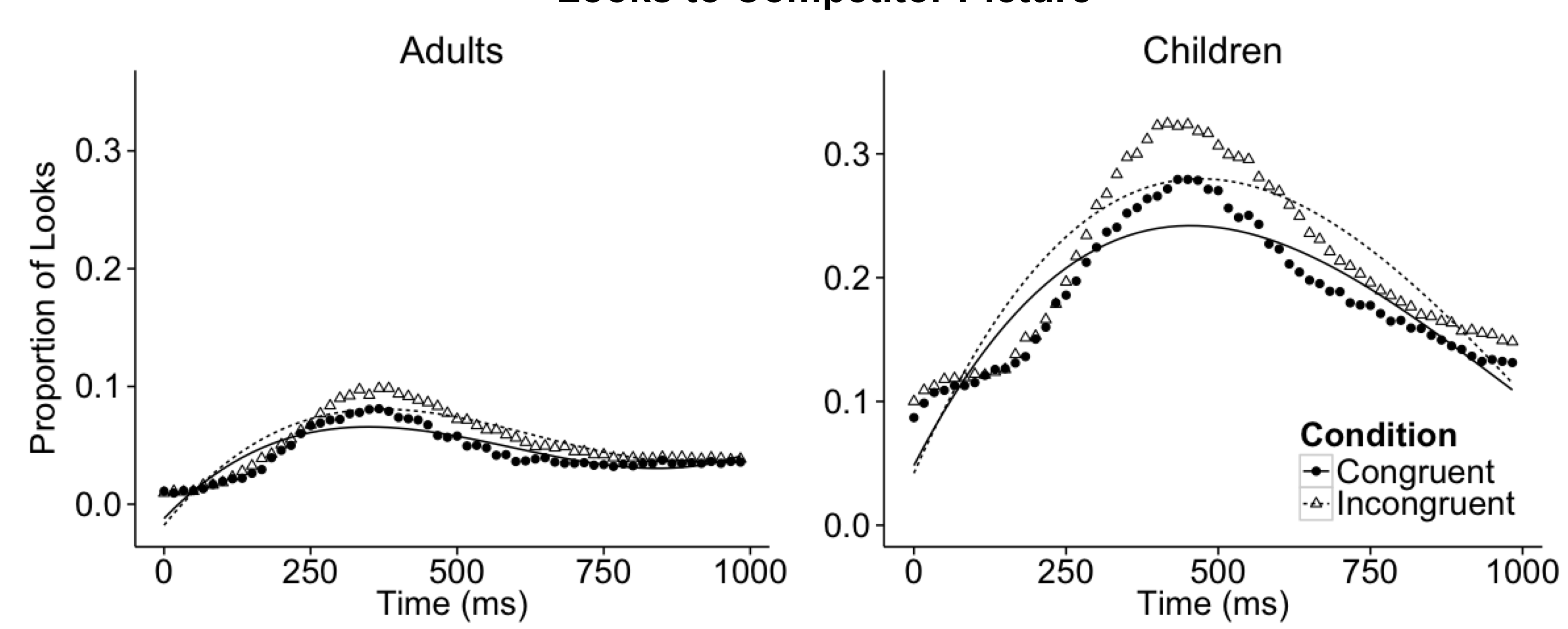
The rate of eye movements was modeled using growth curve analysis (GCA). [6]

- Slowed looks to target and increased looks to competitor on incongruent trials
- Larger difference between congruent and incongruent conditions in children

Looks to Target Picture



Looks to Competitor Picture



Behavioural Correlates of Eyetracking Data

- Baseline word recognition not predicted by any measures of reading or language
- Sentence recall scores predicted overall mean difference between conditions
- TOWRE word reading scores predicted slope of difference between conditions
- Letter knowledge scores predicted curvature of difference between conditions

Conclusions

Both children and adults use coarticulatory information during spoken word recognition.

Children demonstrated a greater congruency effect compared to adults.

- Change in perceptual weighting of acoustic detail with increased experience with speech [7]

Congruency effects, but not baseline spoken word recognition, were predicted by behavioural measures of reading and language.

- Higher scores on the sentence recall, TOWRE Sight Word, and letter knowledge measures were uniquely associated with increased congruency effects
- Individual differences in reading and language proficiency are related to sensitivity to phonetic detail in speech

References

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