

# Development of coarticulation: comparing modalities in beginner readers

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## 1. Introduction

### The development of coarticulation

- has been mainly described in terms of maturation of the speech motor system
- but, alternative approaches based on skills (i.e. phonological awareness, reading proficiency) have been proposed

### Goal

- Investigate the interaction between reading proficiency (RP) and coarticulation degree (CD) for different speech modalities (read vs. repeated speech)

### Hypothesis

- CD in children is subject to intra- and inter-speaker variability
  - Intra-speaker variability is prompted by speech modality manipulation
  - Inter-speaker variability reflects differences in RP

## 2. Predictions

### Across modalities:

- The transparent spelling of German prompts lower CD in read aloud (R) than in repeated (REP) speech
- $CD_R > CD_{REP}$

### Effect of RP within modalities:

- Repetition: better readers exhibit lower CD
- Reading: CD increases with RP for relatively poor readers but shifts to a decreasing pattern for more proficient readers

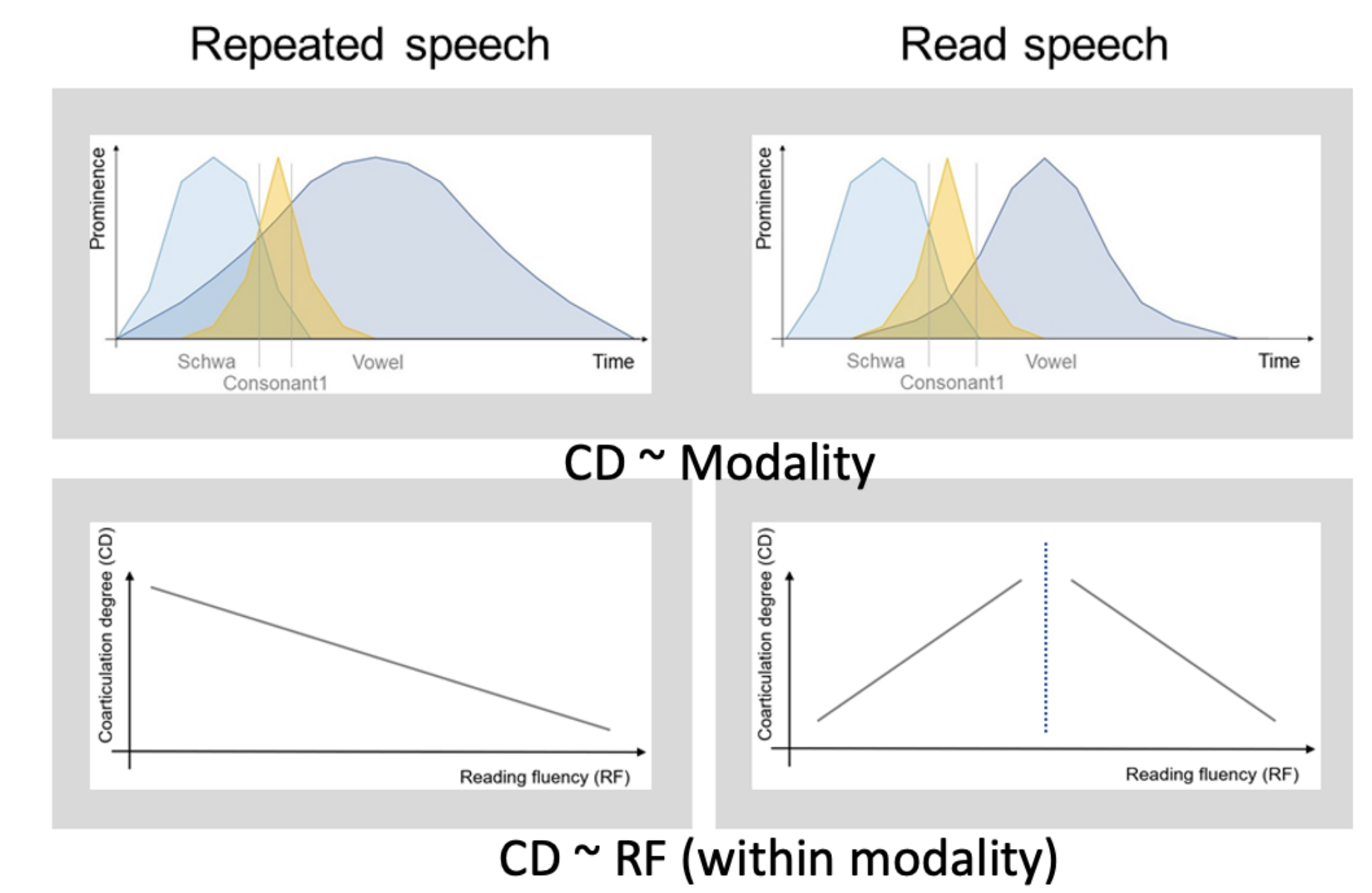


Figure 1: Predictions for CD as a function of speech modality and RP

## 3. Method

### Participants:

- 15 and 12 (mean age 8;03) German native children

### Production task:

- Stimuli /am@C<sub>1</sub>VC<sub>2</sub>@/ pseudowords (V: /i, e, a, o, u/; C: /b, d, g/)
- Two sequential tasks:
  - 1) read aloud written stimuli
  - 2) repeated pre-recorded audio stimuli
- Ultrasound imaging of tongue movements and acoustics were recorded

### RP assessment:

- SLRT-II for real and non-words

### RP groups:

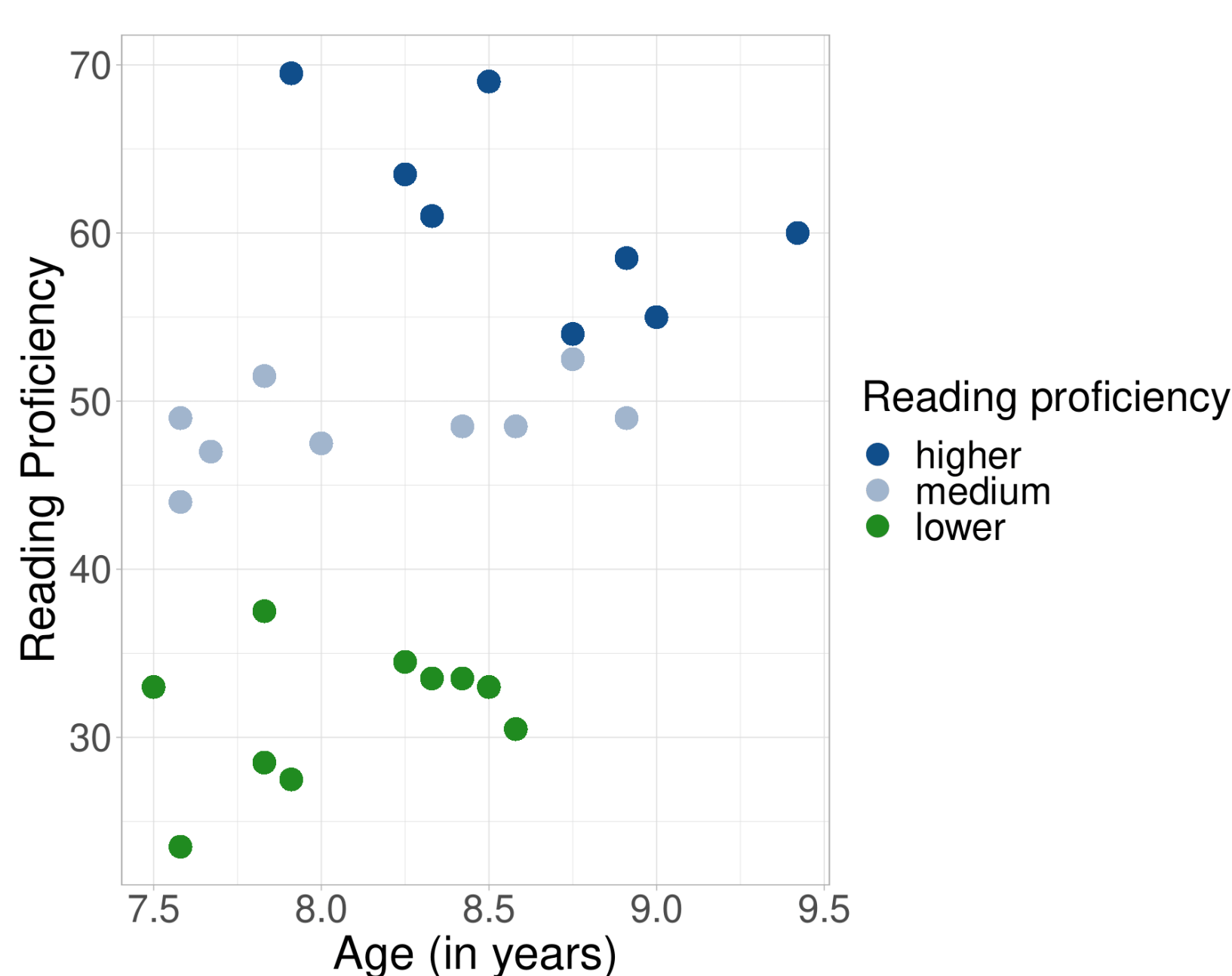


Figure 2: Reading proficiency over Age.

### Data analysis:

- CD is calculated as a regression between the tongue position during the temporal midpoints of the segments @/C<sub>1</sub> and V
- Tongue position: x-coordinate of the highest point of the tongue body

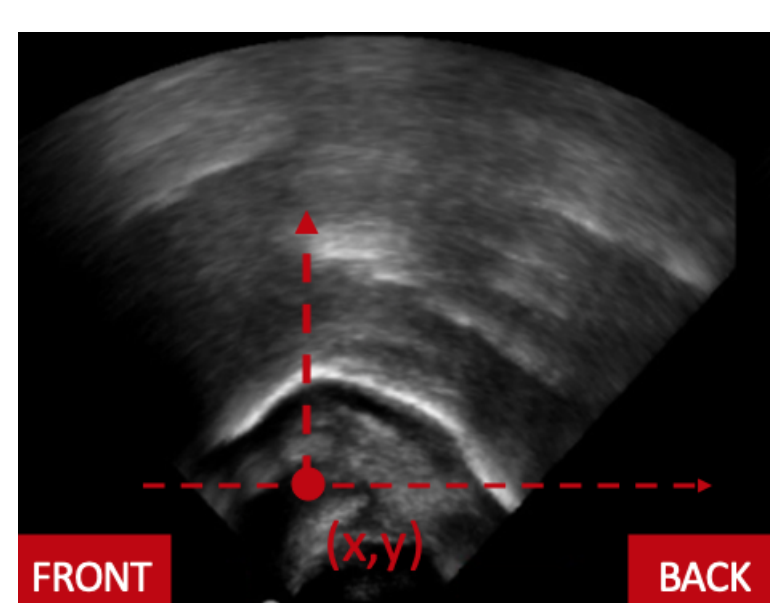


Figure 3: Tongue position measurements

- General additive models (GAM): binary difference smooths

## 4. Preliminary results

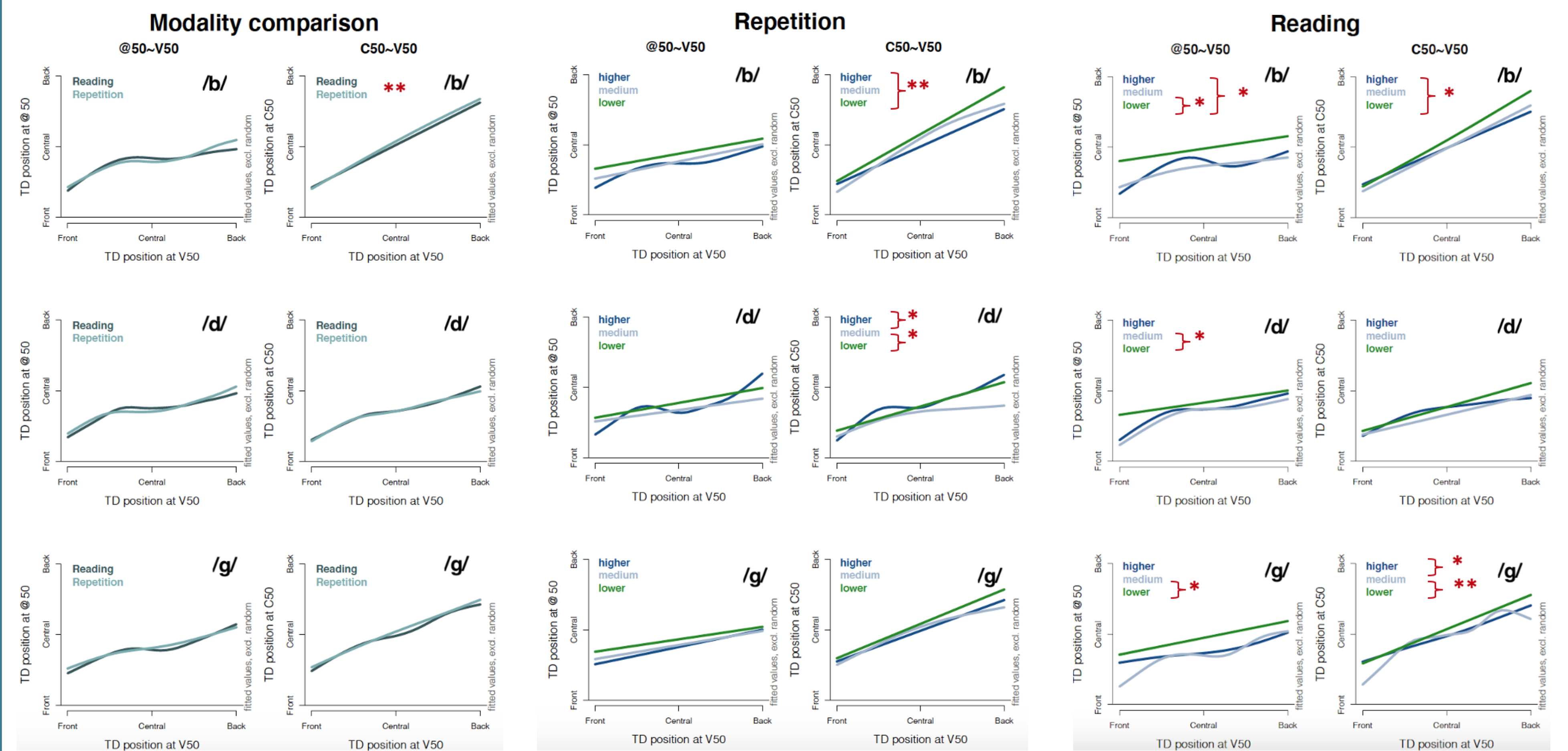


Figure 4: Positions of the highest point of the tongue body at the midpoint of the vowel (x-axis) and schwa/consonant (y-axis) as a function of modality (left) and RP per modality: reading (middle), repetition (right). Steeper slopes indicate a higher CD.

### Summary:

- No overall effect of modality (Fig. 4 - left)
- *but* there might be an interaction effect between modality and RP (Fig. 4 - middle and right)
- RP seems to play a larger role in aloud reading than in repetition

## 5. Ideas and open questions

- Analysis is limited by the high number of involved variables (5D)
- children with lowest RP often exhibit the highest CD → Are all recorded RP scores higher than our predicted shift?
- Use of RP as a continuous variable, instead of reducing RP scores to three groups
- Need for a more dynamical analysis, including more timepoints of the @<sub>1</sub>-C<sub>1</sub>-V sequence

## 6. References and acknowledgments

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