The use of prosody and gestures for the production of contrastive focus in French-speaking 4 and 5 year olds

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Information structure: narrow focus

- Highlighting an element that is new in the discourse to distinguish it from possible alternatives

Narrow-focus: "Take a purple SUITCASE [Which purple object?]"
Broad-focus: "Take a purple suitcase" [What should I take?]

Broad-focus   VS.   **Narrow-focus**

[la valise vioLETTE]$_{AP/IP}$ [[la vaLISE]$_{AP}$ [vioLETTE]]$_{AP/IP}$
the suitcase purple   the suitcase   purple

Contrastive focus in children

- **Late** production of adult-like intonation patterns of focus (7-8 years of age) (Chen, 2011; De Ruiter, 2009)

- **Earlier** use of other prosodic cues to mark new/given (at 4-5 years of age) (Romoren & Chen, 2015; Wonnacot & Watson, 2008)

- **Existing results**:
    - From Germanic languages
    - Using either imitation games or story-telling tasks
    - Only acoustic correlates of focus (no multimodal analyses)

Interaction prosody ↔ body gestures in production

Esteve-Gibert, Borràs-Comes, Asor, Swerts, & Prieto, in press; Krahmer & Swerts, 2007; Leonard & Cummins, 2011; Rochet-Capellan et al., 2008; Roustan & Dohen, 2010; Yasinnick et al., 2004

Look at the CROcodile!
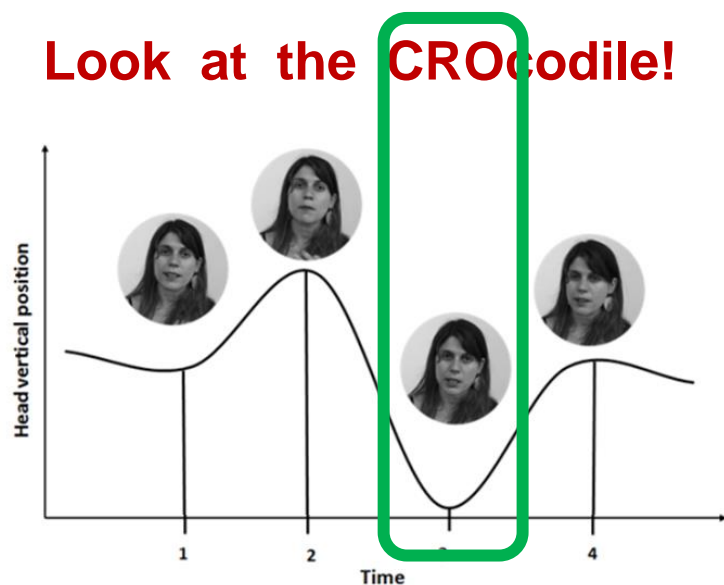
Prosodic heads attract the prominent intervals of body gestures.

Prosodic edges determine the specific alignment of gesture apex with respect of the prosodic head.

In development…

- Early temporal synchronization of prosodic heads and pointing gestures in infants (Butcher & Goldin-Meadow, 2000; Esteve-Gibert & Prieto, 2014).

- Beat gestures seem to accompany child's speech only much later, at around 5-6 years of age (Colletta et al., 2015; Mathew et al., 2014)

Aims & research questions

How prosody and body gestures interact in the development of focus marking in first language acquisition

1. Do preschool children mark focus with adult-like **prosodic** cues?

   > H1: Children might be better at using some prosodic cues like phrasing, while adults use both phrasing and intonation.

2. Do preschool children use **gestures** to signal focus, and are these gestures temporally aligned with speech in an adult-like way?

   > H2: Children will align gestures with the focused element, as adults do.

3. Do prosodic and gesture strategies **interact** to mark focus in development?

   > H3: If children produce a gesture to signal focus, they will also prosodically mark that element.

Methods

Participants

4-year- old French-speaking children (N = 10) [N=20 tested]

5-year-old French-speaking children (N = 10) [N=20 tested]

French-speaking adults (N = 6) [N=18 tested]

Materials

article + disyllabic noun + disyllabic adjective

Prends   la   valise   violette

Take   the   suitcase   purple

Variables:

- Position of focus:
    1. article + NOUN + Adjective
    2. article + noun + ADJECTIVE

- Focus type:
    1. Broad-focus
    2. Contrastive narrow-focus
    3. Corrective narrow-focus

[la valise violette]$_{broad}$

la [VALISE]$_{contrastive}$ violette
la [VALISE]$_{corrective}$ violette

la valise [VIOLETTE]$_{contrastive}$
la valise [VIOLETTE]$_{corrective}$

Production task
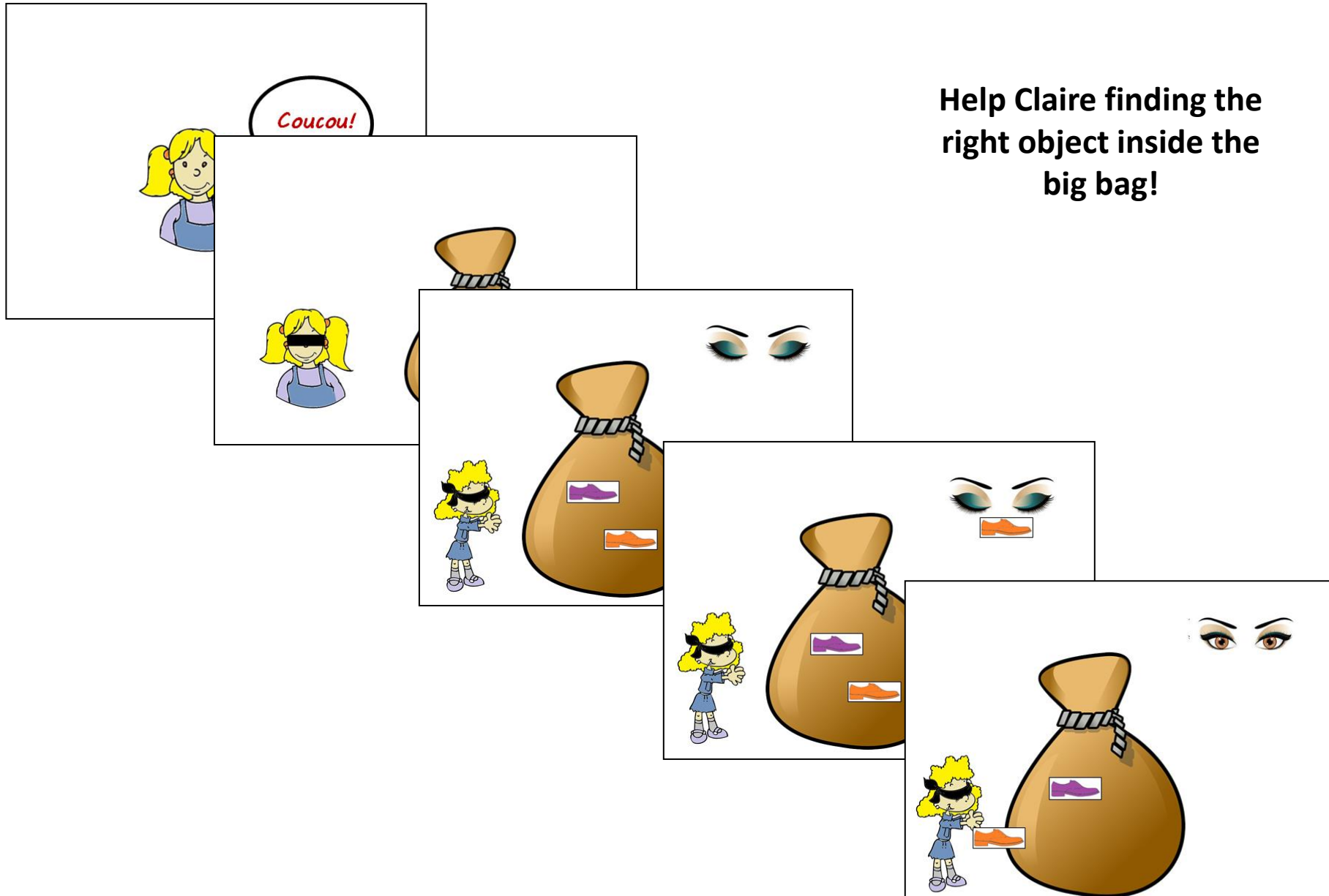
Help Claire finding the right object inside the big bag!

Possible visual displays
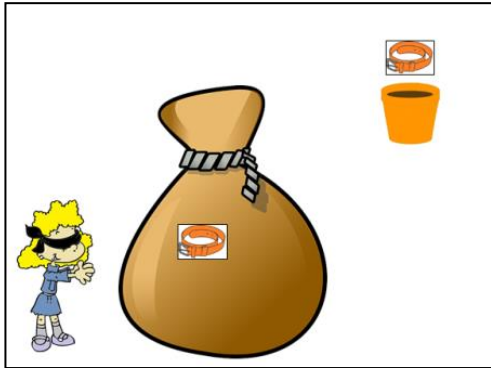
broad focus
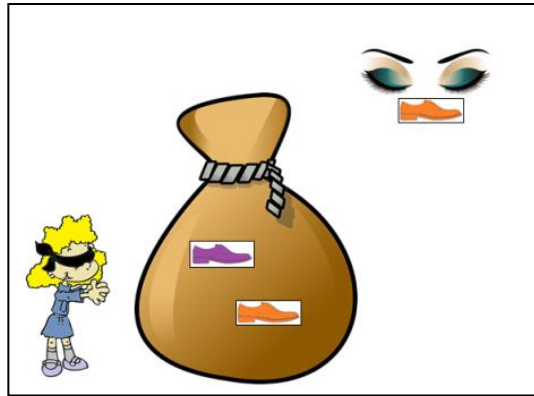
contrastive focus on the adjective
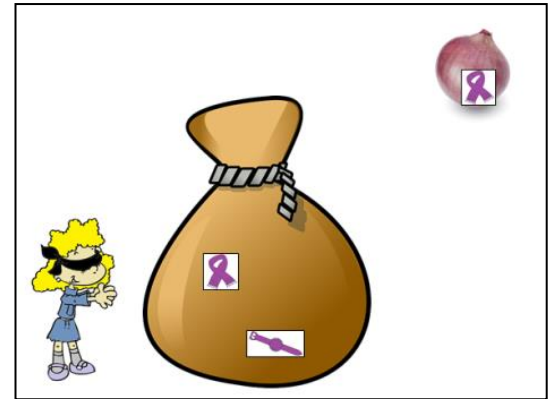
contrastive focus on the noun

12 trials per condition (children)

16 trials per condition (adults)
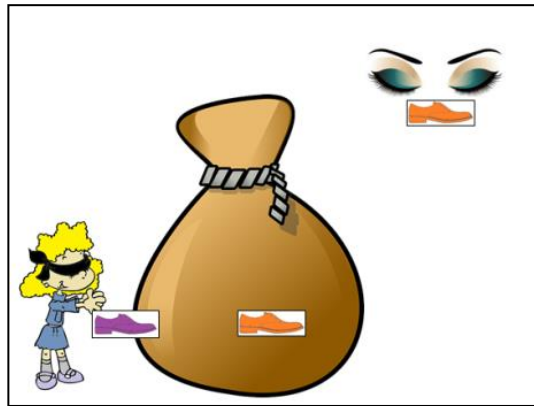
corrective focus on the adjective

corrective focus on the noun

Data recordings

Children

Video recording (1 camera)

Audio recording (1 microphone)

Adults

Video recording (1 camera)

Audio recording (1 microphone)

EMA sensors for head gestures

- 🔴 Head movements
- 🟡 References
- 🟢 Articulatory gestures
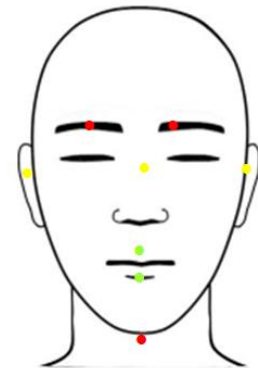
Example, child recordings

Example, adult recordings

Data analysis, prosody

Praat:

- Duration (words, syllables) → automatic segmentation with SPPAS (Bigi, 2012)
- Pitch max (within the target NP)
- Pitch min (within the target NP)
- Intonation (ToBI)

prends	la	ceinture		orange	
pRa~	la	sU~	tyR	o	Ra~Z

prends la ceinture orange

corrective narrow focus on adjective (ca)
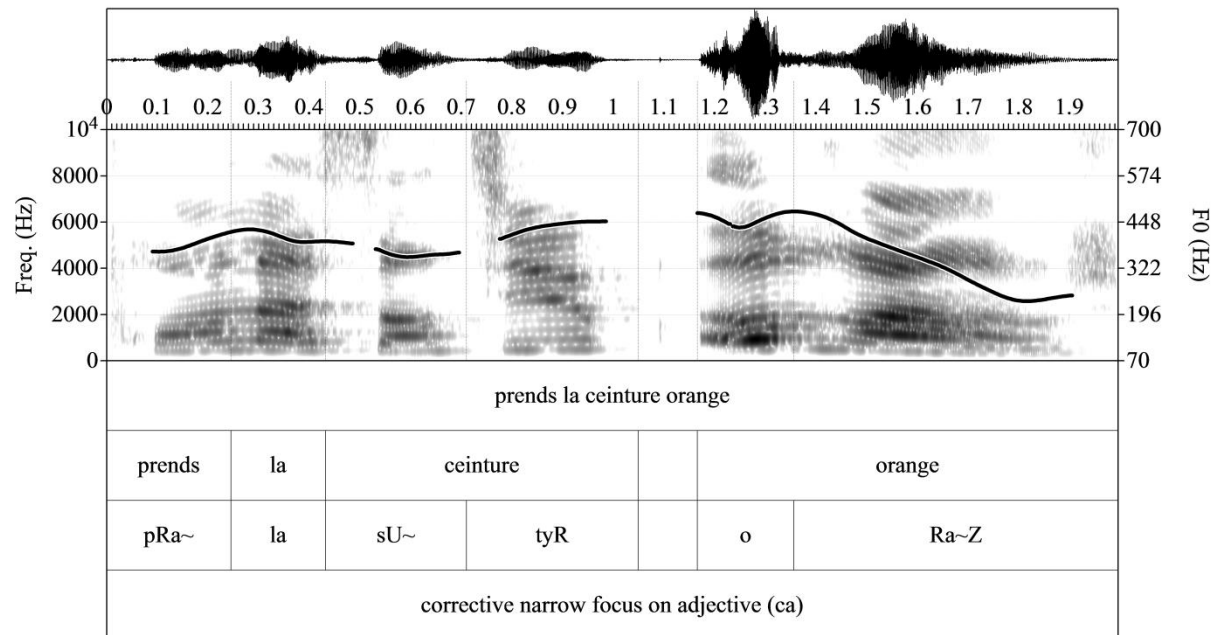
Data analysis, gestures

ELAN annotation tool:

- Gesture during the NP: yes/no

- Type of gesture: head nod, head tilt, eyebrow raising, chin forward, body movement, finger pointing

- Gesture-speech alignment: gesture on the noun, gesture on the adjective, primary on the noun, primary on the adjective

Results

Prosodic cues for focus marking, expectations
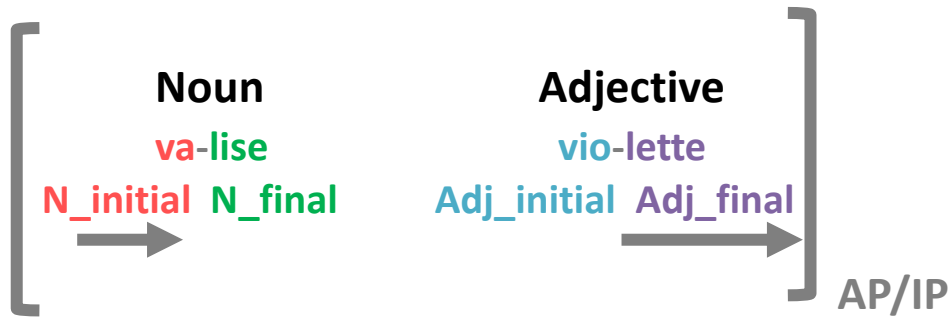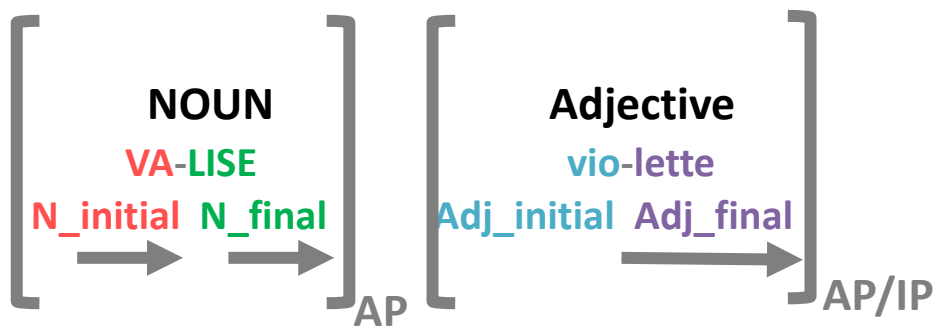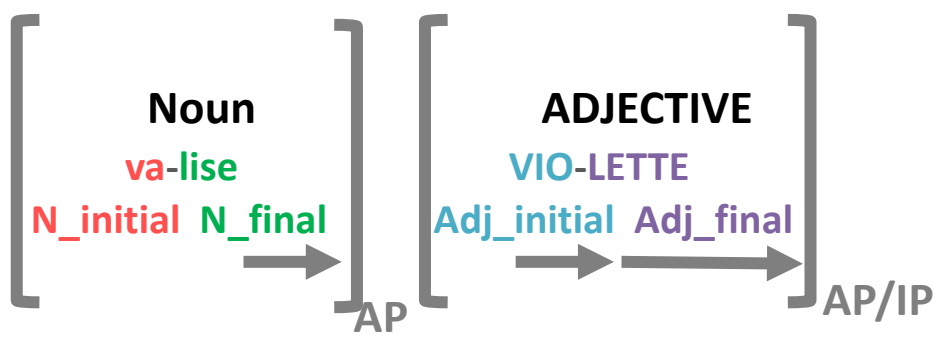
Noun va-lise N_initial N_final →	**Adjective** vio-lette Adj_initial Adj_final →	BROAD-FOCUS
NOUN VA-LISE N_initial → N_final → (AP)	**Adjective** vio-lette Adj_initial Adj_final → (AP/IP)	NARROW-FOCUS ON NOUN
Noun va-lise N_initial N_final → (AP)	**ADJECTIVE** VIO-LETTE Adj_initial → Adj_final → (AP/IP)	NARROW-FOCUS ON ADJECTIVE

Prosodic cues for focus marking
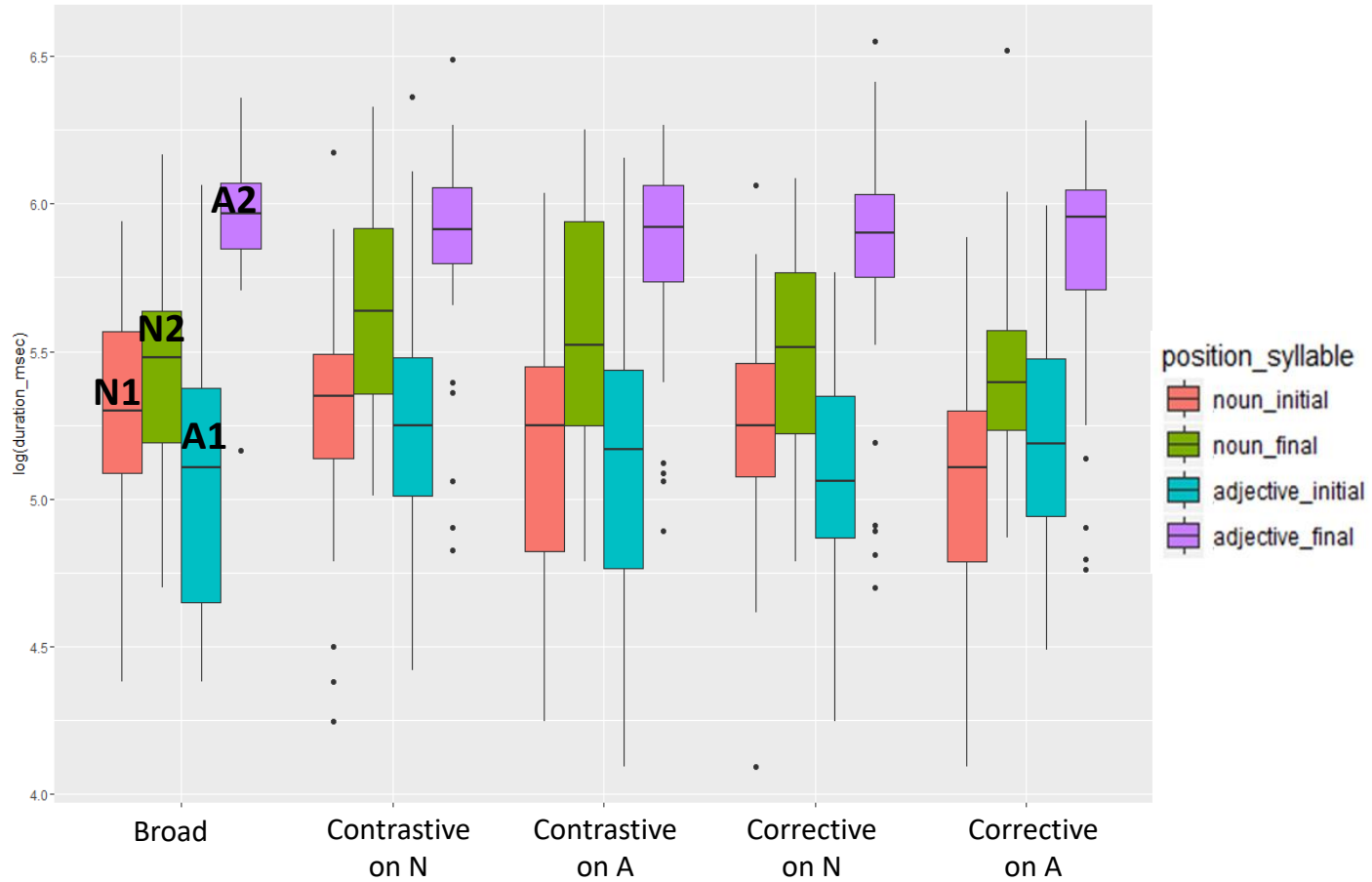
adults

Prosodic cues for focus marking

adults
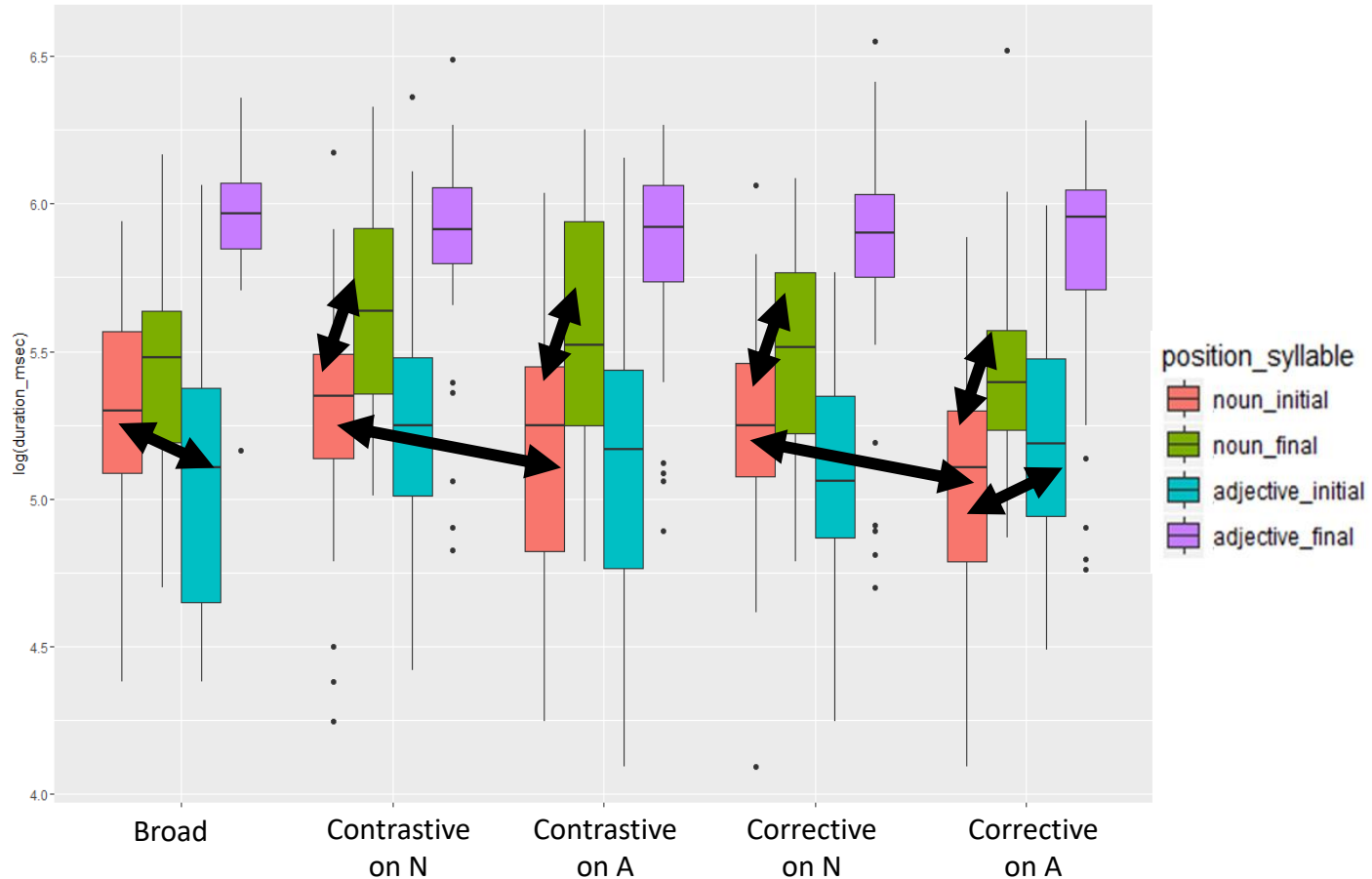
lmer(log(duration_msec) ~ position_syllable * condition + (1|participant) + (1|trial), df)

Prosodic cues for focus marking

children

No effect of condition nor age
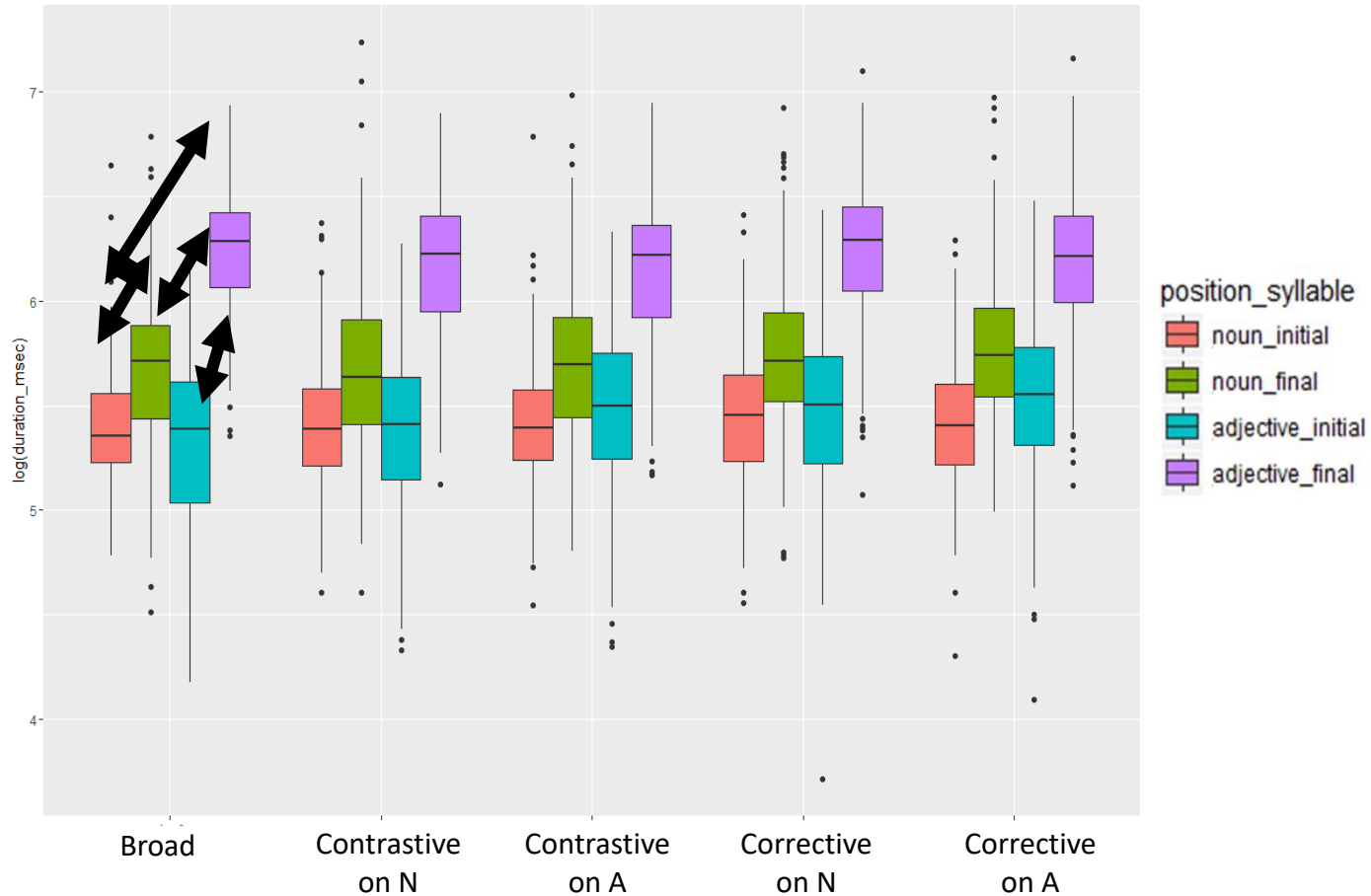
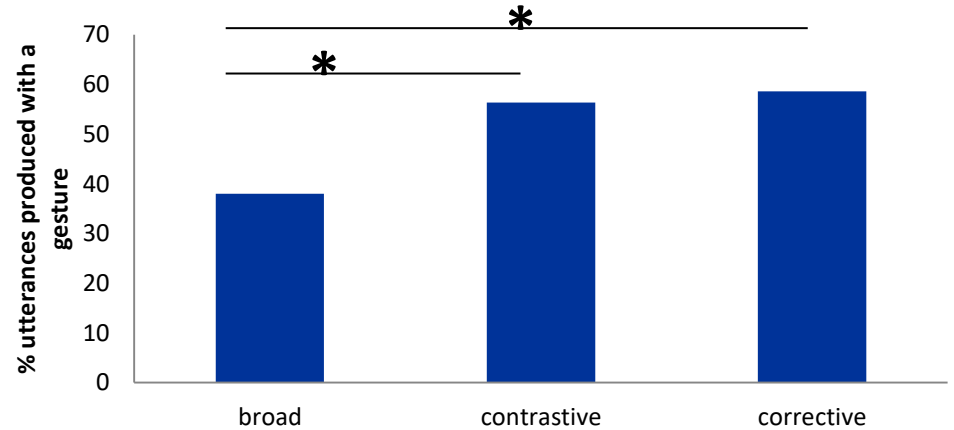lmer(log(duration_msec) ~ position_syllable * condition * age + (1|participant) + (1|trial), df)
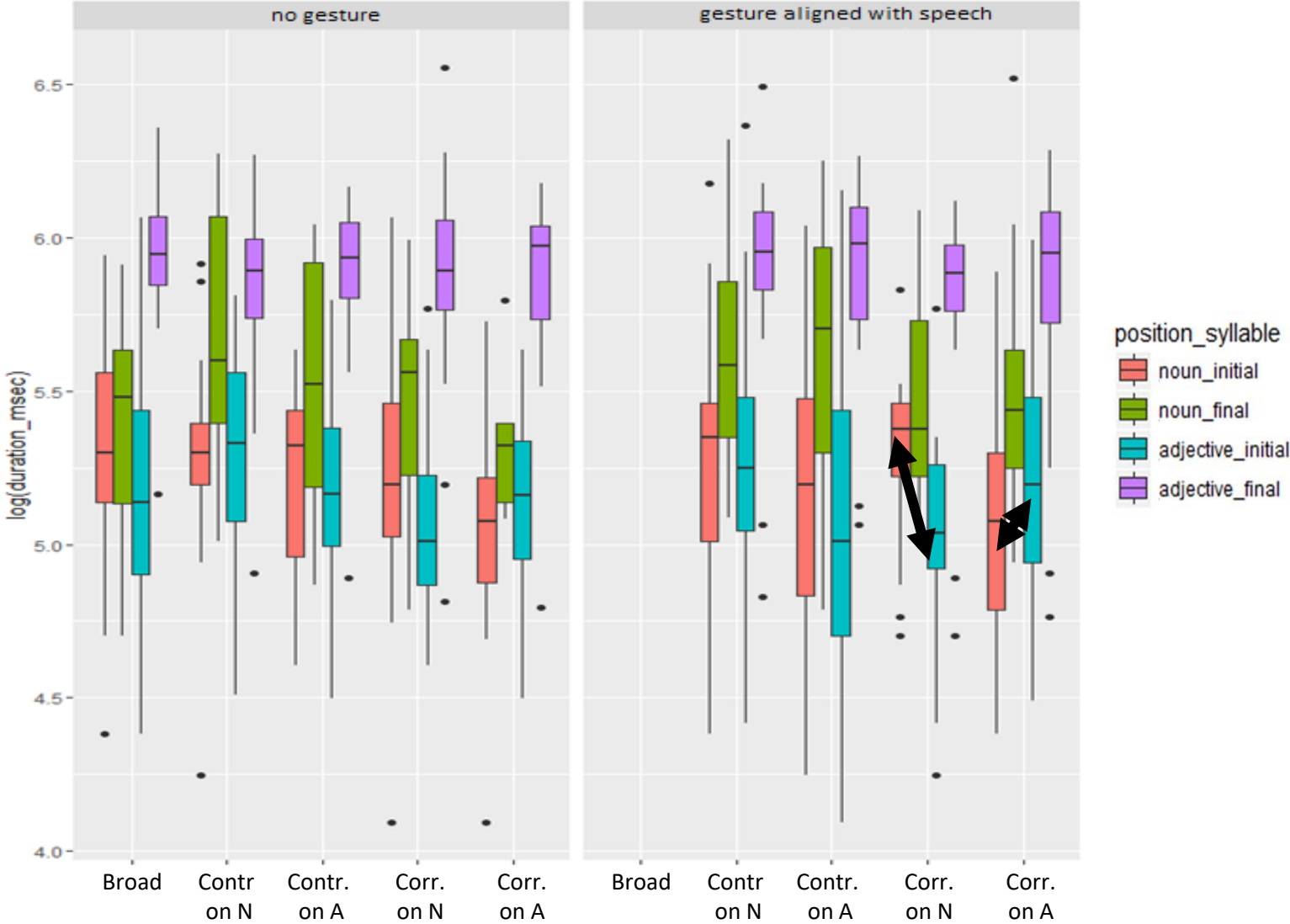
Gestures for focus marking
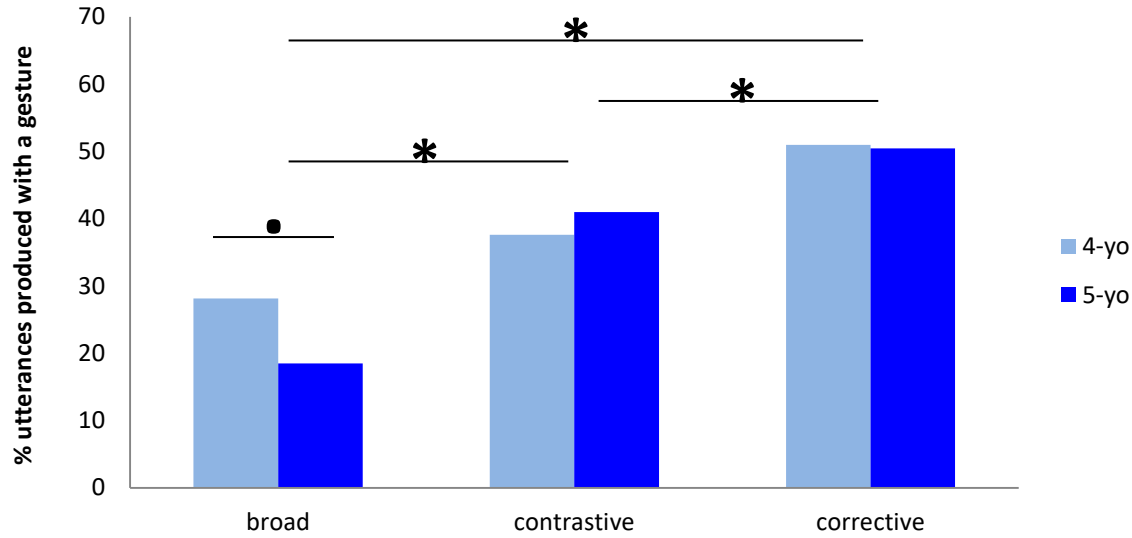
children

adults

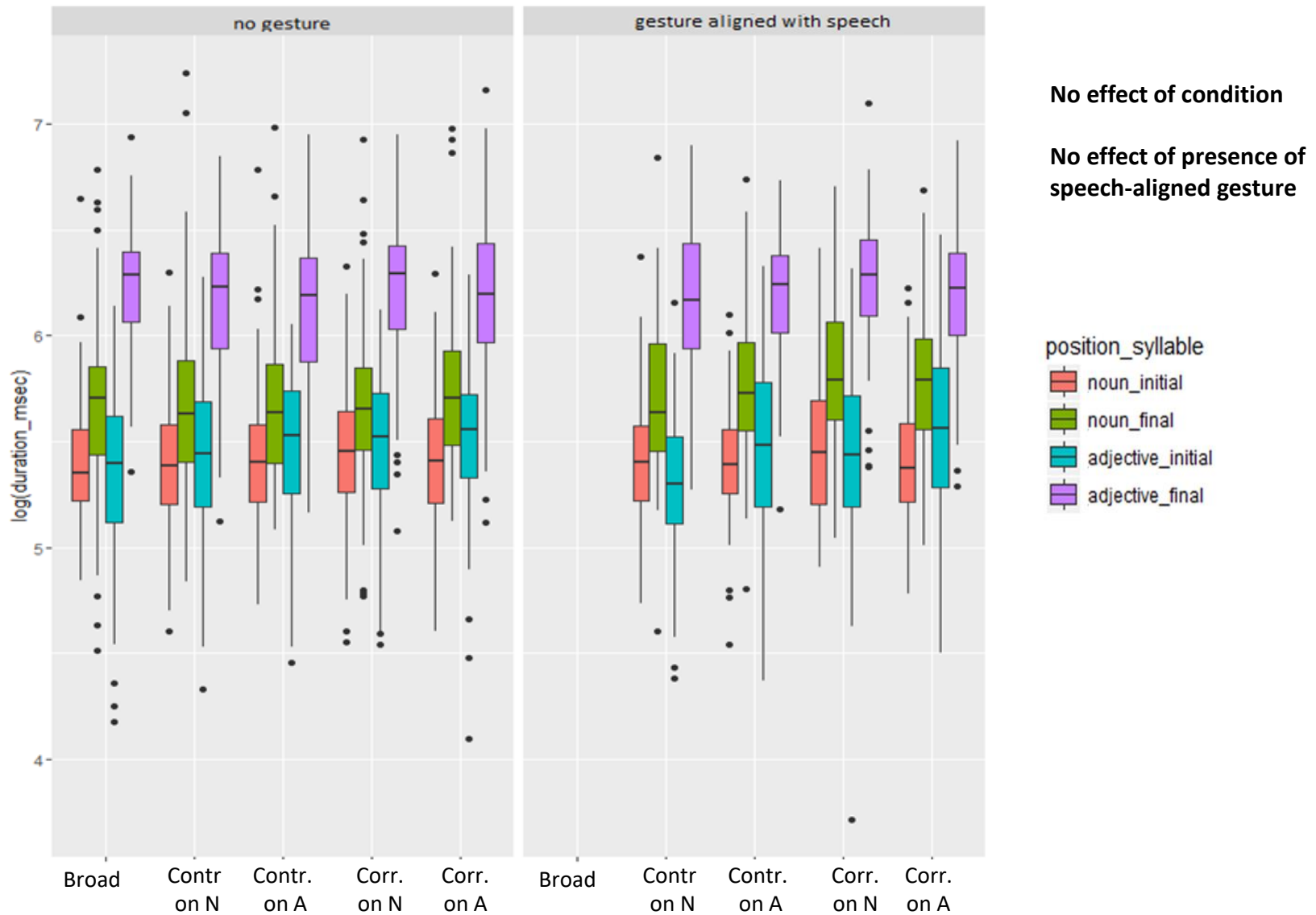**Interaction of prosodic and gesture cues, adults**

Interaction of prosodic and gesture cues, children

No effect of condition

No effect of presence of speech-aligned gesture

Discussion & Conclusion

Summary of the results

	Adults	Children
Use of prosody focus (syllable duration)	✅	❌
Use of body gestures	✅	✅
Interaction prosody-gestures	✅	❌

- Appropriate **task** to elicit spontaneous (but controlled) production of the broad/narrow focus distinction.

- Both adults and children use **body gestures** to focus narrowly one element in the discourse:
  - **Children**: corrective narrow-focus > contrastive narrow-focus > broad-focus
  - **Adults**: corrective and contrastive narrow-focus > broad-focus

- Adults mark focus prosodically through differential **syllable duration**, but preschool children do not master this cue yet.

- Prosodic and gestures cues do not seem to **interact** in the preschool children's marking of focus, while they do in adults.

Preschool children can produce focus but they use visual strategies to do so.

Acknowledgments:

Thanks for your attention!