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Perceptual abilities in relation with motor development during the first year of life

Marjorie Dole, H el ene Loevenbruck, Olivier Pascalis, Jean-Luc Schwartz,
Anne Vilain

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Dole, M.¹, Loevenbruck, H.², Pascalis, O.², Schwartz, J.L.¹, Vilain, A.¹.

¹ GIPSA-lab, Département Parole & Cognition, CNRS & Université Grenoble Alpes, Grenoble, France

² Laboratoire de Psychologie et NeuroCognition, CNRS & Université Grenoble Alpes, Grenoble, France

Introduction

Phoneme categorization

- Infants show discrimination of syllables as soon as 1 month of age despite speaker variability (Eimas et al., 1971; Eimas, 1974).
 - **Problem of invariance:** ability to detect a consonant in ≠ syllable contexts despite acoustic variations: argument for the Motor Theory (Lieberman et al., 1967).
 - A recent study claimed that 6-month olds but not 3-month olds solve the invariance problem (Hochmann et al., 2014) and argue against a motor interpretation since babbling occurs later.
 - Standard: (baseline) *bead-bad-boat* (target) *boo*
 - Deviant: (baseline) *bead-bad-boat* (target) *due*
- Greater pupil dilatation for the deviant target than for the standard target.

However

- Are infants detecting invariance or just acoustic differences between stimuli?
- Does babbling only start at 6 months?

Goals of the present study

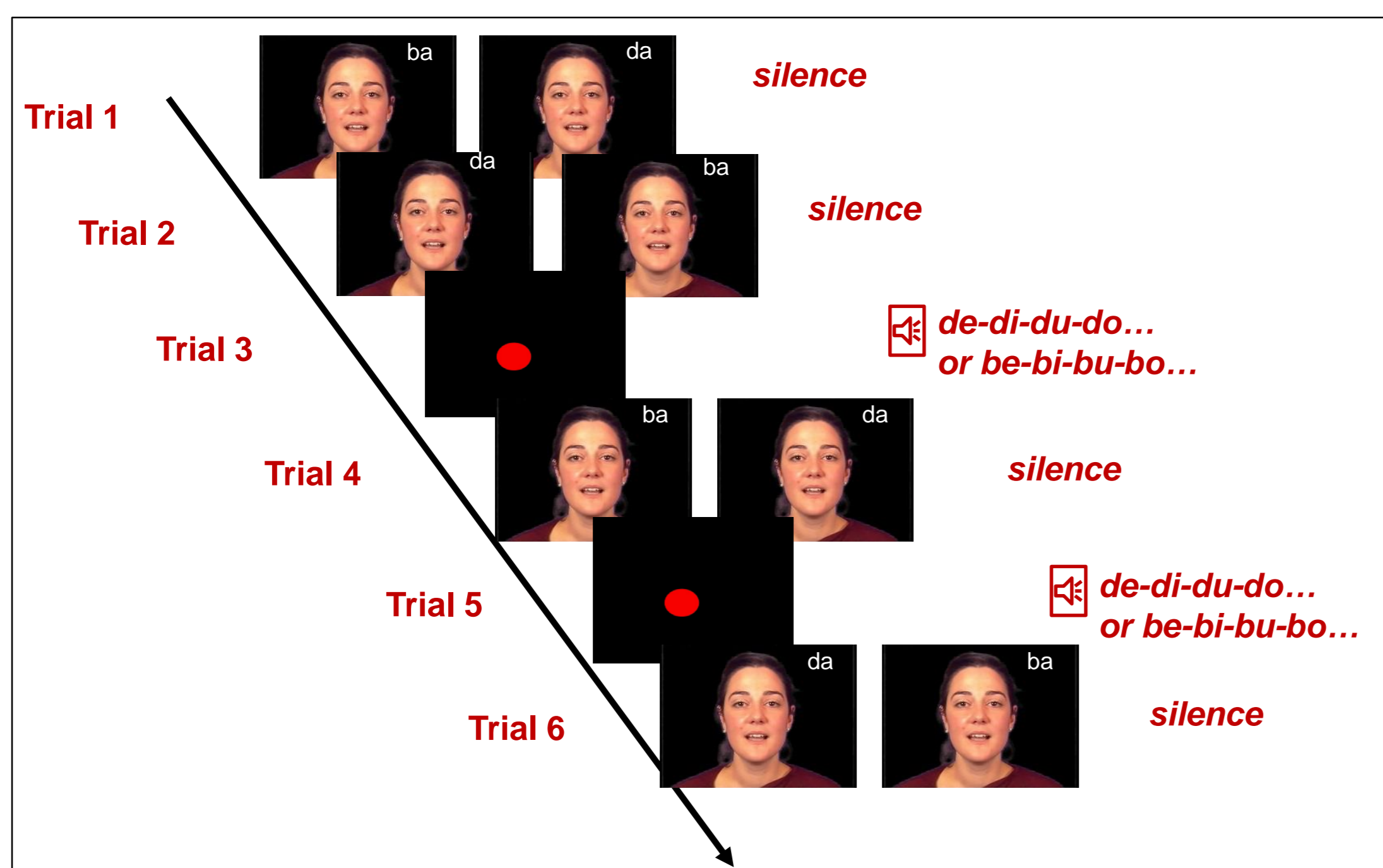
- Assess the ability to detect invariants and the role of motor knowledge in 6- to 12-month old infants.

Methods

Participants: 41 6- to 12-month old infants.

- 12 6months (8M), mean age= 6.45, sd= 0.1.
- 14 9mo (7M), mean age= 9.47, sd= 0.16.
- 15 12mo (6M), mean age= 12.48, sd=0.19.

Intersensory matching procedure (Pons et al., 2009)



Parental questionnaire assessing infants' production abilities
29 infants out of 41: 6 6mo, 11 9mo, 12 12mo

Hypotheses

- If infants have plosive categories they should associate the sound in one vocalic context with the visual gesture in another vocalic context
- If motor knowledge plays a role this should vary according to babbling abilities

Analysis: intersensory matching.

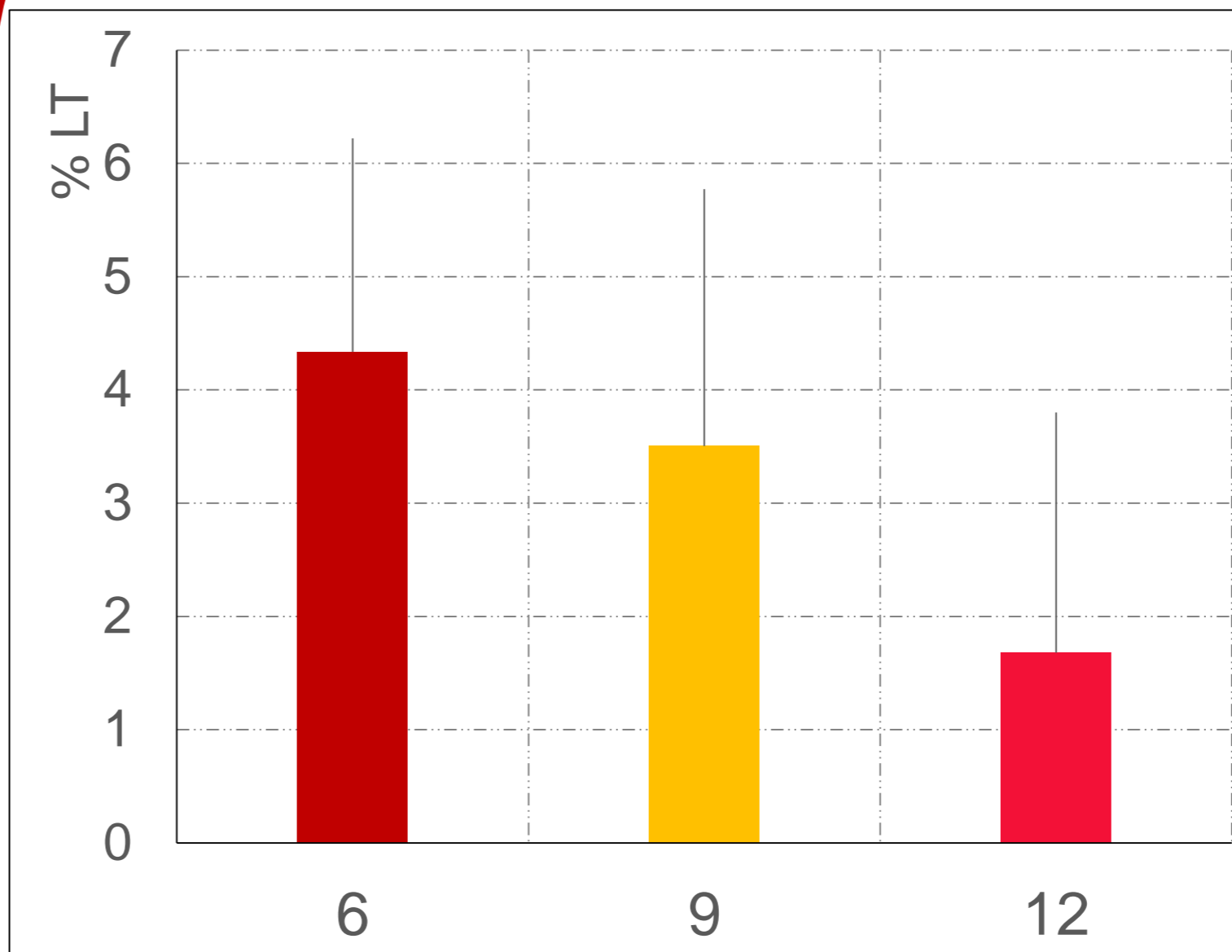
- % Looking Time (LT) for Baseline (1&2) and for Test (4&6).
- **Difference score** = %LT Test – %LT Baseline.

Analysis: production.

- Infants were classified as:
- **No Babbling:** no syllable or monosyllable
 - **Canonical Babbling:** reduplicated CVCVCV with /a/
 - **Variegated Babbling:** CVCVCV with different vowels

Preliminary Results

Effect of Age



- **Plosive categorization abilities** ($p < 0.05$): preference for stimulus presented during familiarization (Trials 3&5).
- Significant for 6-mo ($p < 0.05$), trend toward significance for 9-mo olds. ($p = 0.07$).
- No significant between-groups difference.

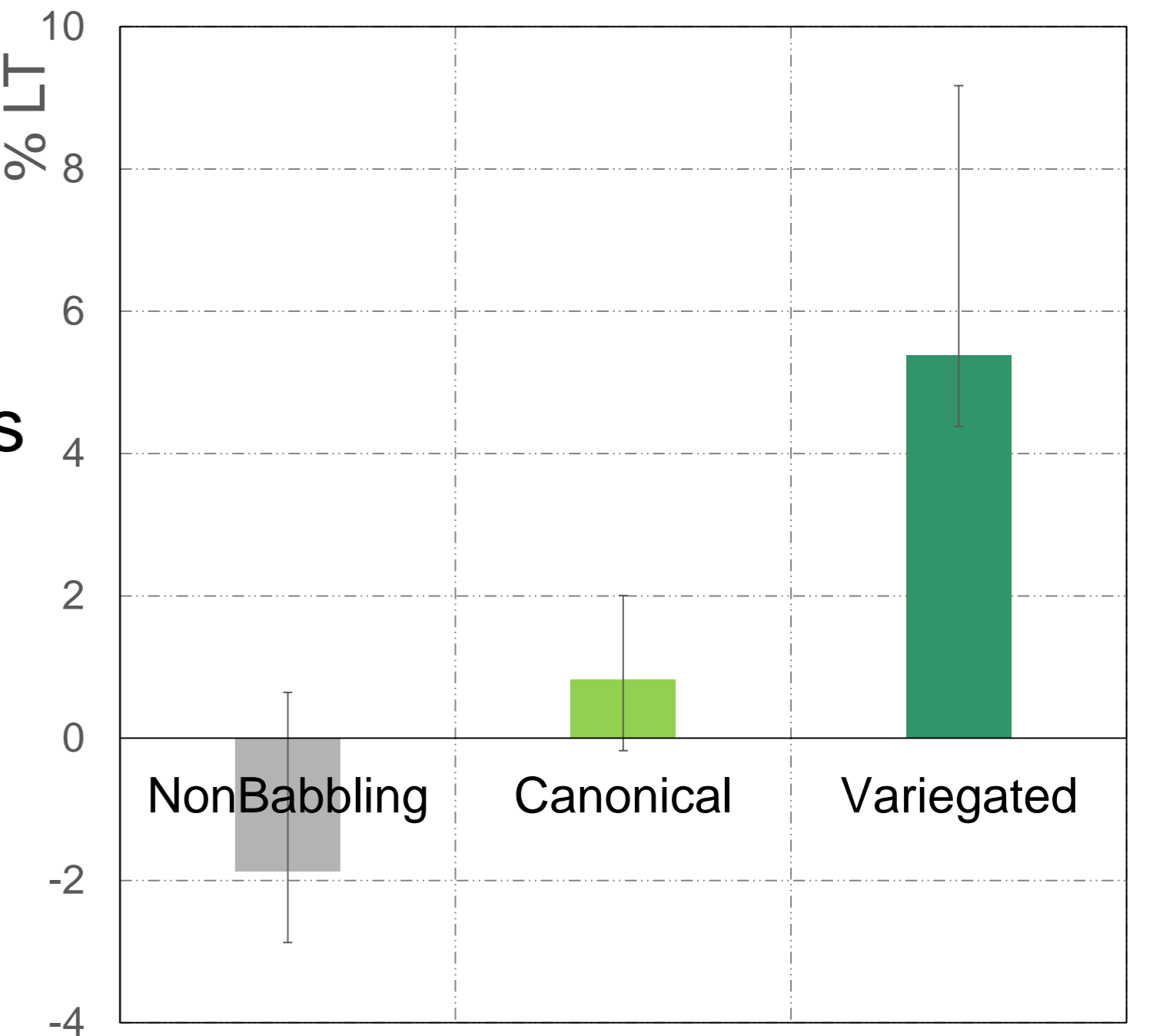
Effect of Production abilities

Non Babbling: 7 infants (4 6mo, 2 9mo, 1 12mo).

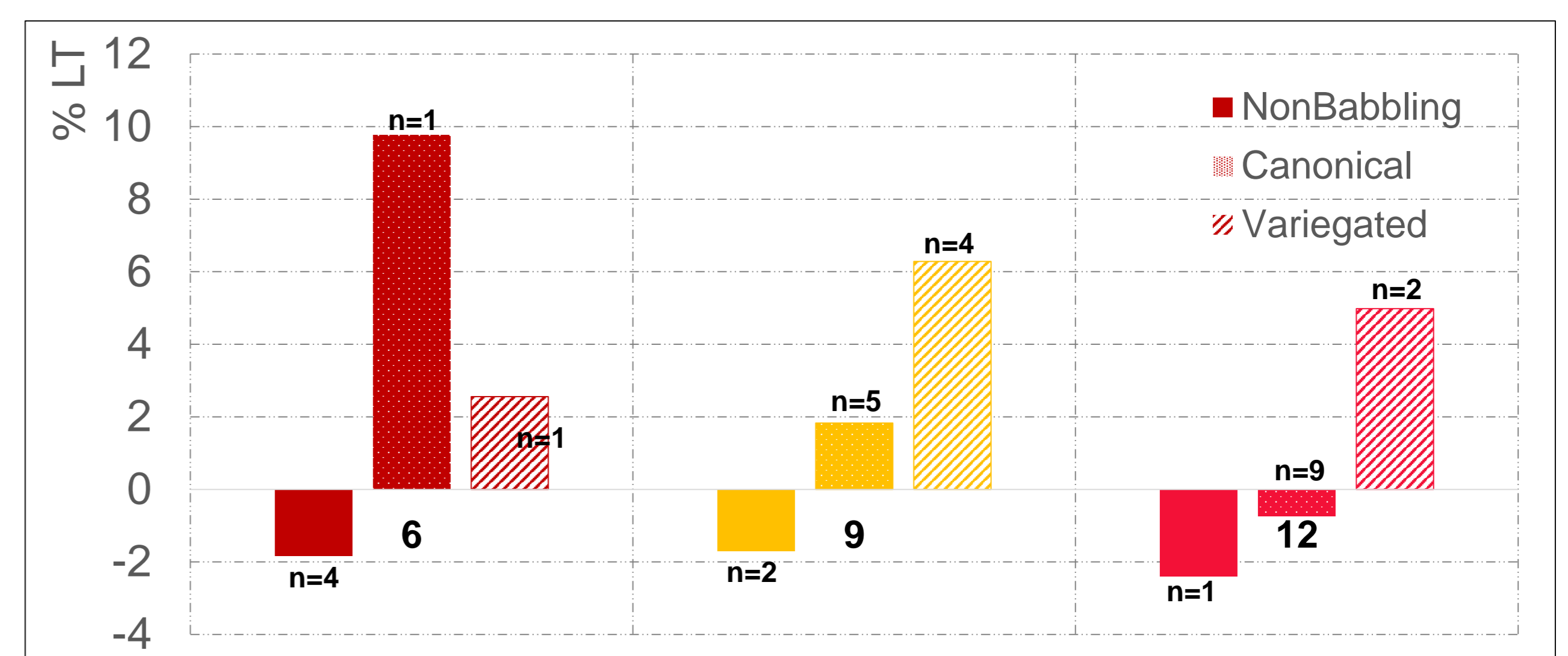
Canonical Babbling: 15 infants (2 6mo, 9 9mo, 4 12mo)

Variegated Babbling : 7 infants (1 6mo, 4 9mo, 2 12mo)

- No matching for NonBabbling & Canonical infants ($p > 0.05$).
- Trend toward significant matching for Variegated infants ($p = 0.09$).
- Trend toward better matching for Variegated than NonBabbling infants ($p = 0.06$).



Interaction Age by Production abilities



Conclusion

- Infants showed a preference for videos pronouncing the consonant with which they had been familiarized.
They performed intersensory matching in spite of the varying vowel context (invariance for plosive place of articulation?)
- This performance seems to be present from 6 months of age comforting Hochmann et al.' results
- **Effect of production abilities:** infants producing [b] and/or [d] with varying vowels are better at matching than infants who don't produce the contrast, or who only produce the contrast with a single vowel.
Role of the perceptuo-motor link in categorization?
- No association in 12-month old infants: inadequate procedure? Emergence of the preference for new stimuli at 12mo?

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