Phoneme categorization depends on production abilities during the first year of life

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Introduction

Phoneme categorization
- Infants show discrimination of syllables as soon as 1 month of age (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 (Liberman et al., 1967).
- A recent study claimed that 6-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

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.

Exp1
31 6 month and 31 9 month-old infants
Intersensory matching procedure: /b/ - /d/
Parental questionnaire: infants’ production abilities (46 infants)

Exp 2: control study
35 6month-old and 47 9month-old infants
Same procedure with contrast /v/-/z/

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 on the tested contrast as:
- Non Babbling: no production
- Canonical Babbling: reduplicated CVCVCV with /a/ for one or both consonants
- Variegated Babbling: CVCVCV with # vowels for one or both consonants

Hypotheses
- If infants have plosive categories they should associate the sound in one vocalic context with the visual gesture in another vocalic context: preference for familiar stimulus
- If motor knowledge plays a role this should vary according to babbling abilities
- AV association for /b/-/d/ contrast in babbling infants

Exp.1
- Effect of Age (p<0.001): preference for familiar stimulus in 9mo olds, not in 6mo olds.
- Production: 18 NonBabbling, 16 Canonical, 12 Variegated
- Effect of Production Stage (p=0.06): better scores in infants who are in the Canonical and Variegated phase than NonBabbling infants.

Exp.2
- No significant preference, for 6mo olds or for 9-mo olds.
- 52 infants did not produce the /v/-/z/ contrast
- Infants who did not produce the /v/-/z/ contrast did not show any preference (t-test vs 0: p=0.42)
- Infants who produced the contrast showed a non significant preference for the familiar stimulus

Conclusion
- For a contrast that they produce, 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).
- For an unknown contrast (/v/- /z/) visually identical, there is no matching in infants

Role of the perceptuo-motor link in categorization?

References

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