Early perception of stress by European Portuguese-learning infants

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Introduction

The perception of word stress is language specific

- Properties of stress in the phonological grammar:
  - variable stress (Catalan, English, Spanish, Russian)
  - fixed stress (Finnish, Polish, Turkish)

- Correlates of stress:
  - particular cues (pitch duration, intensity, vowel quality)
  - the weighting of cues for stress prominence varies across languages

Stress plays a central role in:

- Phonological organisation of prosody
- Language processing and language acquisition

In early language acquisition word stress is suggested to facilitate:

- Segmentation of the speech signal into words
- Word categorization

Stress plays a central role in:

- Suprasegmental cues: duration, but low co-variation between stress and pitch accents
- Segmental cues: vowel quality > reduction of unstressed vowels

Introduction to the study

- No previous infant studies
  - Infants & toddlers sensitive to stress location in a word learning study [milu] / [milu] (Frota et al. 2012)
- No trochaic preference and in fact no preference at all is expected.
- Input frequency prediction is not clear.

Method

Materials:

- Input frequency: varied nonsense words with penult and final stress, uttered by female speaker in CDS (citation forms).
- Suprasegmental cues: only cusses to stress

Procedure:

- Anticipatory Eye Movement (AEM) paradigm (McMurray & Aslin, 2004; Allibanda-Castelli et al., 2011; Richardson & Kirkham, 2004)

Training:

- infants trained to associate each stress pattern (Trochee/lamb) with one image and side of screen
- 6 training trials (3 trochee, 3 lamb, pseudo-randomised)
- 4 nonsense words per trial

Test:

- screen with 2 frames but no images while listening to novel tokens
- 4 nonsense words per trial
- 2 test trials (1 trochee, 1 lamb, counterbalanced)

Results

- No discrimination between trochee/lamb conditions in training trials

- No discrimination:
  - Training phase: no effect of trained side (F(1,20) = 1.96, p = .18, η² = .09), no interaction (F(1,20) = 1)

- Window: 500ms after onset to 2000ms
  - ANOVA: no effect of target side (F(1,20)=2.55, p=.23)
  - No effect of order (F(1,20)<2.55, p=.32), or stimulus (F(1,20)=1), and no interactions

- Interaction between target side and r/s/l > suggest a preference for one of the stress patterns, possibly shown by an asymmetry in looking behaviour

Discussion

- Recent findings show an advantage for lambs in adult perception of stress (Lu et al., see P33).

Stress in European Portuguese (EP)

- EP has variable stress (= Catalan, Spanish, English)
- stress falls within last 3 syllables of the prosodic word
- stress is lexically contrastive (bambo/bambu, bâbu/’bambo”)

Correlates of stress – diverse set of cues

- Suprasegmental cues: duration, but low co-variation between stress and pitch accents
- Segmental cues: vowel quality > reduction of unstressed vowels

Frequency data (% trochaic disyllabic tokens: “bambu, “bambo”)

- English 74%, 78%; EP 66%, 74% Spanish 60%-70% (EP in CDS 63%, 70% (Pons & Bosch 2010, FrePoP database http://frepop.letras.ulisboa.pt)

Rhythmic – mixed properties:

- Mix of stress-timed and syllable-timed rhythm, but NOT perceived as a stress-timed (Frota et al. 2001, 2002)

No previous infant studies

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Total of 8 blocks

- Side/image associated with stress pattern counterbalanced between infants
- Colour of the images alternated between blocks

Results

- No discrimination between lamb/trochee conditions in training trials

- NO Discrimination:
  - Training phase: no effect of trained side (F(1,20) = 1.96, p = .18, η² = .09), and no interaction (F(1,20) = 1)

- Window: 500ms after onset to 2000ms
  - ANOVA: no effect of target side (F(1,20)=2.55, p=.23), order (F(1,20)=2.55, p=.32), or stimulus (F(1,20)=1), and no interactions

- Interaction between target side and r/s/l > suggest a preference for one of the stress patterns, possibly shown by an asymmetry in looking behaviour

- Window: 500ms after onset to 2000ms
  - ANOVA: significant effect of trained side (F(1,20)=5.7,p<.05, η²= .23)
  - No effects of order (F(1,20)=2.55, p=.23), or stimulus (F(1,20)=1), and no interactions

Discussion

- New pattern added to the dichotomy between Trochaic preference and No preference – Lambic preference in a language with mostly trochaic input.

This new finding is in line with two so far unrelated facts in the literature on EP:

- Early children’s productions: (0;11-2;06)
- More iambic targets attempted (Vigário et al., 2006).

What language-specific factors shape early perception of stress?

- Native phonological grammar – variable stress/fixd stress/stress domain
- Rhythmic properties – stress timing, syllable timing, mix
- Input frequency – relative distribution of trochees and lambs
- Other?

A combination of factors > Ambient language cluster of cues

No preference

http://labfon.letras.ulisboa.pt/babylab/EBELab/index.html

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