THE ACQUISITION OF PROSODIC PATTERNS IN GREEK AND ENGLISH

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Prosody is important part of our language.
Prosody = stress/prominence, rhythm/timing, intonation
⇒ duration, intensity, Fo, etc.

- “cónvict” (noun) VS. “convíct” (verb)
- “Mary ate a pie.” VS. “Mary ate a pie?”
- “I want the RED pen.” VS. “I want the red PEN.”
- happiness VS. irony “That’s great!”

Length: Duration (ms)
Pitch: Fo (Hz)
Loudness: Intensity (dB)
WHY PROSODY?

Prosody is important for language acquisition
  - part of linguistic system
  - prosodic bootstrapping
    (Morgan & Demuth, 1996; van Heugten, Dautriche, & Christophe, 2014; Höhle, 2009)

... thedogisinthekitchen... ⇒ The dog is in the kitchen.

(syntactic boundaries, word order, etc.)
EARLY SENSITIVITY

PROSODIC BOOTSTRAPPING – Underlying hypothesis:

- Young infants are sensitive to prosodic properties (stress, rhythm, and intonation) and their acoustic correlates (duration, pitch, and intensity).
EARLY SENSITIVITY

Newborns

- mother’s voice vs. other voices (Floccia, Nazi, & Bertoncini, 2000)
- their language vs. different rhythmic patterns (Ramus, 2002; Mehler & Christophe, 1995; Nazi, Bertoncini, & Mehler, 1998; Mehler, et al., 1988)

Thus, rhythm is one of the first components of prosody that children are sensitive to (Jusczyk & Thompson, 1978; Weber, Hahne, Friedrich, & Friederici, 2004)

By 5 months of age

- trochaic (bába) vs. iambic patterns (babá) (Höhle, Bijeljac-Babic, Herold, Weissenborn, & Nazi, 2009)

https://www.youtube.com/watch?v=_JmA2ClUvUY
LATE ACQUISITION

How early is the internalization of the prosodic patterns into the child’s phonology completed?

At 2 years
- produce word stress – F0 (Kehoe, Stoel-Gammon, & Buder, 1995)

At 6 years
- cannot distinguish compounds from phrases (Vogel & Raimy, 2002)
- cannot use prosody to disambiguate syntactic ambiguities (Snedeker & Trueswell, 2001)
- cannot produce the rhythm rule (Shport & Redford, 2014)
PROBLEMS

Why the discrepancy between early sensitivity & late acquisition?

Methods

• sensitivity vs. use with intentional meaning
• perception vs. production
• use of impressionistic measures vs. acoustic measures

What counts as acquisition

• discrimination between contrastive categories
• similarity to adults – using adult listeners
• similarity to adults – using acoustic measurements
• reduction of variability

contradictory results
<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>participants</strong></td>
<td>2.5-year-olds</td>
<td>5- to 11-year-olds</td>
<td>4- to 6-year-olds</td>
</tr>
<tr>
<td><strong>task</strong></td>
<td>production</td>
<td>comprehension</td>
<td>production &amp; comprehension</td>
</tr>
<tr>
<td><strong>structures</strong></td>
<td>compounds</td>
<td>compounds &amp; phrases</td>
<td>compounds &amp; phrases</td>
</tr>
<tr>
<td><strong>results</strong></td>
<td>correct: at age 2.5</td>
<td>correct: at age 11</td>
<td>not correct: at age 6</td>
</tr>
</tbody>
</table>
| **limitations**  | • impressionistic adult scorings  
• compound stress = focus  
• productions in isolation  | • no production data  
• task might have been hard for the younger children  | • impressionistic adult scorings  
• no adult or older children data  
• production in isolation       |
PROBLEMS

Why the discrepancy between early sensitivity & late acquisition?

Different levels of prosodic structure

- Majority of previous research focuses on smaller prosodic units: syllable, foot, word (Kehoe, 2013)
- Larger, more complex, prosodic patterns? (interaction with syntax, etc.)

Few models for prosodic development

- Order of acquisition of different prosodic structures
- Cross-linguistic variation in prosodic development
PROSODIC HIERARCHY

HYPOTHESIS:
Children’s prosodic system develops according to the Prosodic Hierarchy (Demuth & Fee, 1995)
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Stage IV. **Phonological Words**
- Extrametrical syllables permitted

Stage III. **Stress-Feet**
- a. One Stress-Foot per word
- b. Two Feet per word

Stage II. **Minimal Words/Binary Feet**
- a. Core Syllables - (C)VCV
- b. Closed Syllables - (C)VC
- c. Vowel length distinctions - (C)VV

Stage I. **Core Syllables**
- CV
- No vowel length distinctions
PROSODIC HIERARCHY

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- English & Greek phrasal prosody
- Greek clitic & English compound prosody
- Greek compound prosody
METHOD

Participants
- Children: 11-year-olds, 8-year-olds, 6-year-olds
- Adults

Stimuli
- novel compounds and simple phrases produced in sentences
PROCEDURE

Short games: match pictures / complete a poster

a) name target item

Ena kókino dhódi.
‘A red tooth.’

b) say where item is (i.e., name background picture)

Ine sti gefira.
‘It’s on the bridge.’

c) tell the experimenter how to complete the poster

Vale to kókino dhódi sti gefira.
‘Put the red tooth on the bridge.’
ANALYSIS

Acoustic Measurements

Length
- duration (ms)

Pitch
- $F_0$ (Hz)
EXPERIMENTS

Experiment 1: English compound & phrasal prosody

Experiment 2: Greek compound & phrasal prosody

Experiment 3: Greek clitic prosody
EXP1: ENGLISH COMP & PHR PROSODY

Compounds

Phrases
**EXP1: ENGLISH COMP & PHR PROSODY**

### Compounds

word + word

- e.g., [hót dóg]_{CG}

- CG

### Phrases

word + word

- e.g., [hót dóg]_{PP}

- PP

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**Phonological Utterance (PU)**

- Phonological Phrase (PP)

- Composite Group (CG)

- Phonological Word (PW)

- Syllable (σ)
**EXP1: ENGLISH COMP & PHR PROSODY**

**Adults**

1) **Compound Prosody (CG):**
   - *duration* – no differences
   - *Fo* – no differences

2) **Phrasal Prosody (PP):**
   - *duration* – final lengthening
   - *Fo* – falls at end of phrase

3) **Comparison:**
   - no differences in word 1
   - differences in word 2 (duration & Fo)
**EXP2: GREEK COMP & PHR PROSODY**

**Compounds**

**Phrases**
**EXP2: GREEK COMP & PHR PROSODY**

### Compounds

- root + root + ending
  - e.g., \([\text{xris-\text{o-xér-a}}]_\text{PW}\)
  - ‘gold-handed’ (= ‘good housewife’)

### Phrases

- word + word
  - e.g., \([\text{xris-\text{o-xér-i}}]_\text{PP}\)
  - ‘gold hand’

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**Phonological Utterance (PU)**

- **Phonological Phrase (PP)**
- **Composite Group (CG)**
- **Phonological Word (PW)**

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**Syllable (σ)**
**EXP2: GREEK COMP & PHR PROSODY**

**Adults**

1) **Compound Prosody (PW):**
   - duration – reduction in C1 vs. final lengthening in C2
   - $F_0$ – reduction in C1

<table>
<thead>
<tr>
<th>6yo</th>
<th>8yo</th>
<th>11yo</th>
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<tbody>
<tr>
<td>✓</td>
<td>✓</td>
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2) **Phrasal Prosody (PP):**
   - duration – final lengthening
   - $F_0$ – rising $F_0$ contour at the end of the phrases

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<tr>
<td>✓</td>
<td>X</td>
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3) **Comparison:**
   - duration differences in word 1
   - $F_0$ differences in word 1

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Clitics are weak forms that do not bear stress or stand by themselves and thus, they get attached to a word (noun, verb).

Greek clitics are:
- pronouns e.g., [to] ‘it’
- prepositions e.g., [se] ‘to’
- grammatical particles e.g., [θa] marker for future tense (Joseph & Philippaki-Warburton, 1987)
EXP₃: GREEK CLITIC PROSODY

Non-Clitic

Clitic
**EXP3: GREEK CLITIC PROSODY**

**Clitic**

noun + clitic: ὅσο

e.g., [àlogó tis]_{CG}  
‘her horse’

CG

**Non-Clitic**

noun / clitic: ὅσο

e.g., [álogo]_{PW} tis...

‘the horse of...’

PW

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**Phonological Utterance (PU)**

- Phonological Phrase (PP)
- Composite Group (CG)
- Phonological Word (PW)
- Syllable (ο)

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**EXP3: GREEK CLITIC PROSODY**

**Adults**

1) **Non-Clitic Prosody (PW):**
   - duration – NC3 < NC1
   - F0 – NC3 < NC1

2) **Clitic Prosody (CG):**
   - duration – CL3 > CL1
   - F0 – CL3 > CL1

3) **Comparison:**
   - duration differences in syll 3
   - F0 differences in syll 3

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<tr>
<td>F0</td>
<td>✓</td>
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Phonological Phrase (PP)
Composite Group (CG)
Phonological Word (PW)
SUMMARY

English Compound & Phrasal Prosody
• main difference is in word 2
• 11-year-olds have adult-like patterns for compound but not for phrasal prosody

Greek Compound & Phrasal Prosody
• main difference is the number of stressed syllables
• all three age groups were adult-like for compound prosody but not for phrasal prosody

Greek Clitic Prosody
• main difference is in the final syllable of the noun
• only 11-year-olds have adult-like patterns

| ??? | • English phrase
| 11-year-olds | • English comp
| 8-year-olds | • Greek clitic
| 6-year-olds | • Greek comp

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ACOUSTIC PROPERTIES

When we study the speech of children with more quantifiable measures, the pattern of development is different than that found in auditory measures.

- English compound prosody and Greek clitic prosody are not fully developed until the age of 11 years
- Contrary to previous studies that used adult ratings and found an early (2-3 years) acquisition (using adult perceptions)
PROSODIC HIERARCHY HYPOTHESIS

Prosodic development of high level constituents follows the Prosodic Hierarchy.

Children differentiate the various prosodic structures but only mature structures are produced with adult-like properties.

Young infants are sensitive to some prosodic patterns but, the internalization of these same patterns into the child’s phonology develops until much later.

Like any other phonological domain (e.g., segments), prosody develops gradually, influenced by the complexity of its units.

**PP** - Greek and English phrasal prosody (after 11 years)

**CG** - English Compound and Greek Clitic prosody (11 years)

**PW** - Greek Compound prosody (6 years)
THANK YOU!