Cross-linguistic research on early intonational development: current findings and future directions

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The 2nd DEPE workshop, 27 June, 2013
Theoretical background
The traditional approach to children’s intonation

- A holistic approach with two separate lines of research:
  - inventory of whole-utterance contours
    - e.g. fall, rise, rise-fall, rise-fall-rise
  - variation in pitch, duration and intensity
    - mean pitch, highest and lowest pitch, pitch span, pitch register
    - duration of whole utterance
    - mean intensity
Drawbacks of the traditional approach (1)

- No insights into internal structure of whole-utterance contour

A: I’m reading Beatrix Potter.

B1: Beatrix Potter (not Harry Potter)?

B2: Beatrix Potter (not J. K. Rowling)?

Examples adapted from Gussenhoven (2004)
Drawbacks of the traditional approach (2)

- No attention to the association between intonation and segments -> little knowledge of phonetic realisation
  - hum a tune vs. sing the lyrics
The Autosegmental-metrical (AM) approach

- The AM approach and child speech
  - Suitable for analysis on structural properties and phonetic details
  - Suitable for cross-linguistic comparisons
The AM approach and children’s intonation

- Seminar on ‘Early intonational development’ at the 15th ICPhS in Saarbrucken
  - Catalan (Pilar & Vanrell 2007)
  - Italian (D’odorico 2007)
  - Dutch (Chen & Fikkert 2007)

- IASCL (2008) seminar ‘Acquisition of word stress and intonation and word stress: cross-linguistic evidence
  - Portuguese (Frota & Vigário)
  - German (Lleó)
  - Catalan (Prieto)
  - Dutch (Fikkert & Chen)
Potential loci for cross-linguistic developmental differences

- Inventory of pitch accents and boundary tones at a certain stage
- When do children acquire adult-like inventory?
- Phonetic realisation of pitch accents
- Choice of pitch contours in communicational situations
EP & Dutch: Data and annotation

- Data from typically-developing monolingual children
  - Dutch: 3 children (1;4 ~ 2;1) (Fikkert 1994, Levelt 1994)
  - European Portuguese: 2 children (Luma, João: 1;0 – 2;04)
- Recorded at home in typical play sessions with one parent/researcher
  - Dutch: Two-word utterances produced at the point of 40-unique recorded words to the point of 230 unique words (N=325)
  - EP: 675 utterances (mostly one-word utterances)
    - From 1;00 to 1;05; all one- and two-word utterances
    - From 1;06 to 2;04: first 20 utterances
- Annotation
  - Orthographically and phonetically transcribed
  - Annotated following ToDI (Gussenhoven 2005) and EP-ToBI (Frota 2009, in press)
  - Reliability check on ToDI/ToBI labels
  - Categorising utterance type according to pragmatic contexts (EP)

(Frota & Vigário 2008, Vigário et al. 2011, Frota et al. in progress)
Inventory of nuclear accents and boundary tones adult-like at 1;09

- Nuclear accents
- Boundary tones

(Frota & Vigário 2008, Vigário et al. 2011, Frota et al. in progress)
EP: Results (2)

- Diversity in utterance types/tunes at 1;04/1;05
  - use of 5 or more tunes
- Neutral statements, Focused statements, Requests, Commands, Calling contours / Questions
  - Choice of tonal events (tonal shape) mostly correct (except for questions and requests)

(Frota & Vigário 2008, Vigário et al. 2011, Frota et al. in progress)
II. Early intonational development

<table>
<thead>
<tr>
<th>Age</th>
<th>1:00</th>
<th>1:01</th>
<th>1:02</th>
<th>1:03</th>
<th>1:04</th>
<th>1:05</th>
<th>1:06</th>
<th>1:07</th>
<th>1:08</th>
<th>1:09</th>
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<td>LH</td>
<td>call</td>
<td>call</td>
<td>call</td>
<td>LH</td>
<td>call</td>
<td>H*L</td>
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</table>

Main deviant patterns (Luma & João)

Word size >1,5
1;05

dá

díá(-me) ?

H* L* L%
Request (multiword)

%H L* L%
Request (one word)

(H) H+L* LH%
Neutral yes-no question
Command

´da  ‘give’
Call
Low call
be´a be´a ‘Mami, Mami’
1;09

Decl
Foc

ta´ta ta´ta
`Tata,Tata`
Development in the production of scaling and alignment patterns

- At 1;04/05:
  - Scaling and alignment not adult-like:
    - fall to a mid level (L%), step down in calls,
    - later peak alignment (H+L*)

- At 1;09:
  - Adult-like in both but earlier in scaling
SCALING

Call

Low call

1:06

(L+)H* !H%

Vocative chant (greeting)

(L+)H* L%

Low vocative chant (insisting call)

Call

1:10

João
Although the peak is aligned later, the alignment contrast is produced!
Summary: Early intonation in EP

- Diversity in nuclear contours at 1;05 (word size > 1.5)
- Inventory of nuclear accents and boundary tones is adult-like at 1;09, coincides with 1st major jump in lexicon size
- Development in the production of alignment and scaling patterns (1;09)
- Intonational development largely independent of the onset of the two-word stage (2;02 for Luma; 2;04 for João)
3 developmental stages

- Two-word utterances expressing a semantic relation frequent at the 100-word point in Italian (D’Odorico & Carubbi 2003)
- A substantial increase of the production of two-word utterances at the 160-word point in our data
Results: Dutch (2)

- adult-inventory of nuclear pitch accents in place at stage 2 (100 word – 160 word)
Results: Dutch (3)

- Alignment
  - Nuclear H*L: earlier fall in children than in adults even at stage 3
    - e.g. (poes) huilen
  - Pitch range: roughly twice as wide as in adults at stage 3
Cross-linguistic similarities & differences

- EP vs. Dutch (D) (the first two years)
  - Adult-like inventory of pitch accents and boundary tones before the onset of the two-word stage in EP but not in D
  - Alignment: not adultlike in D, and EP (until 1;9)
  - Pitch scaling: not adult-like in D and EP (until 1;6)
- Development in intonational phonology is independent of onset of two-word stage in EP, not true for D
- EP-learning children seem to be different from children learning Catalan and Spanish in being slower in acquiring phonetic details
- Possible cause for differences: prosodic system of L1s
Cross-linguistic similarities & differences

- Problems with comparing cross-linguistic data
  - Limited comparability of the data and analysis available
  - A rather small data set with substantial individual variation (raised by Pilar Prieto during discussion)
  - Conclusions need to be taken with a grain of salt
    - For example: Dutch children have developed adult-like inventory of nuclear pitch accents in the late two-word stage, much later than EP-learning children
      - Problems with this conclusion: we compared intonation in Dutch children’s two-word utterances with EP children’s one-word utterances; we do not know what Dutch-learning children are able to do in one-word utterances in the one-word stage and what EP-learning children can produce in two-word utterances in the two-word stage.
<table>
<thead>
<tr>
<th>L1</th>
<th>age</th>
<th>Lex/prag analysis</th>
<th>utterance</th>
<th>position</th>
<th>into.event</th>
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<tr>
<td></td>
<td>2;2-2;8</td>
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<td>lex.prag</td>
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<td>pitch accents, boundary tones</td>
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</tbody>
</table>

Lex: lexical development; prag: analysis on pragmatic uses of intonation
into.event: intonational analyses available
Ideas for future research
Comparability of cross-linguistic data

- Methodological decisions
  - Complexity of utterances
    - one-word utterances vs. two-word utterances
  - Developmental stage
    - one-word stage, two-word stage, multi-word stage
      - 2;5-year-olds producing one-word utterances vs. 1;11-year-olds producing two-word utterances
  - Position (nuclear vs. prenuclear)
Ideas for next steps

- Phonetic realisation of frequent pitch accents in one- and two-word utterances in the first two years
  - Discourse context: information status
- Development in prosodic phrasing
  - Each word is an IP -> grouping several words into one IP (necessary in some languages but not in other languages)
  - Realisation of phrasal boundaries
- Choice of pitch patterns in different communicational contexts in combination of evaluation tests
- Infants’ perception of intonational meaning (raised by the audience during the discussion)
Thank you for your attention!