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

Aoju Chen
Utrecht University & Max Planck Institute for Psycholinguistics

Sonia Frota
Universidade de Lisboa

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Theoretical background

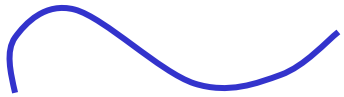
The traditional approach to children's intonation

- 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

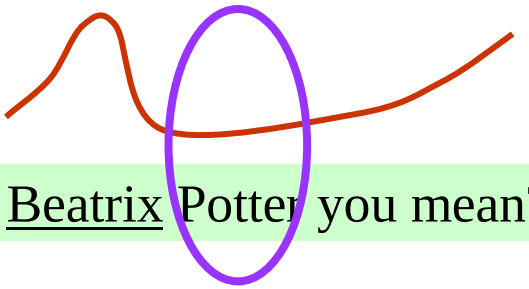
Drawbacks of the traditional approach (1)

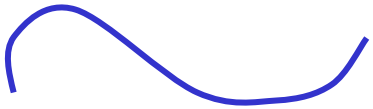
- No insights into internal structure of whole-utterance contour

A: I'm reading Beatrix Potter.

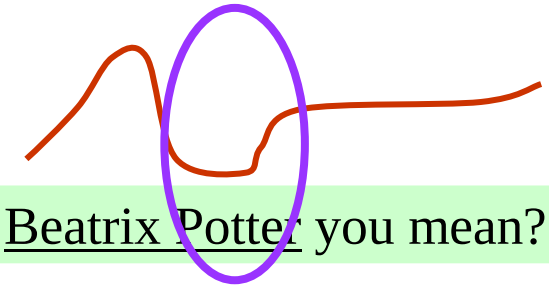


B1: Beatrix Potter (not Harry Potter)?





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



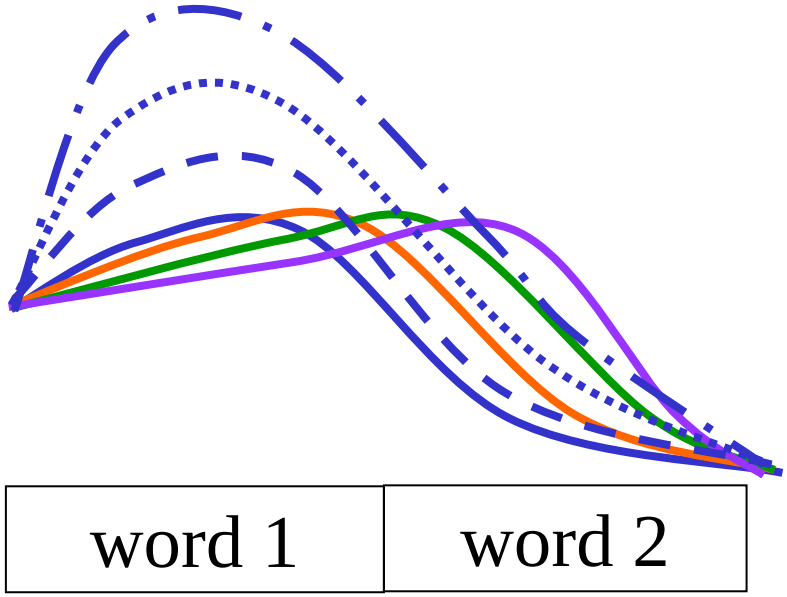
rise-fall-rise

different intonation in 'Potter'

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 & Vigàrio)
  - 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-developping monolingual children
  - Dutch: 3 children (1;4 ~ 2;1) (Fikkert 1994, Levelt 1994)
  - European Portugese: 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)

EP: Results (1)

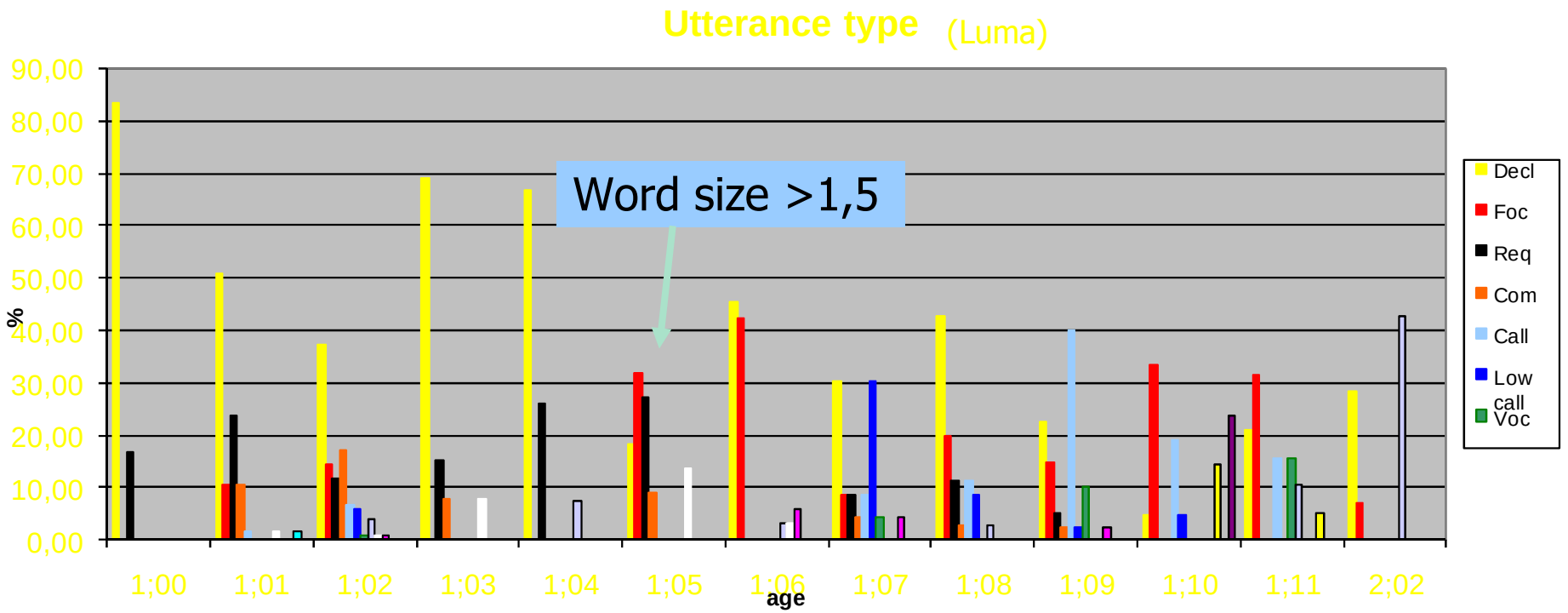
- Inventory of nuclear accents and boundary tones adult-like at 1;09
  - Nuclear accents
  - Boundary tones

(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)

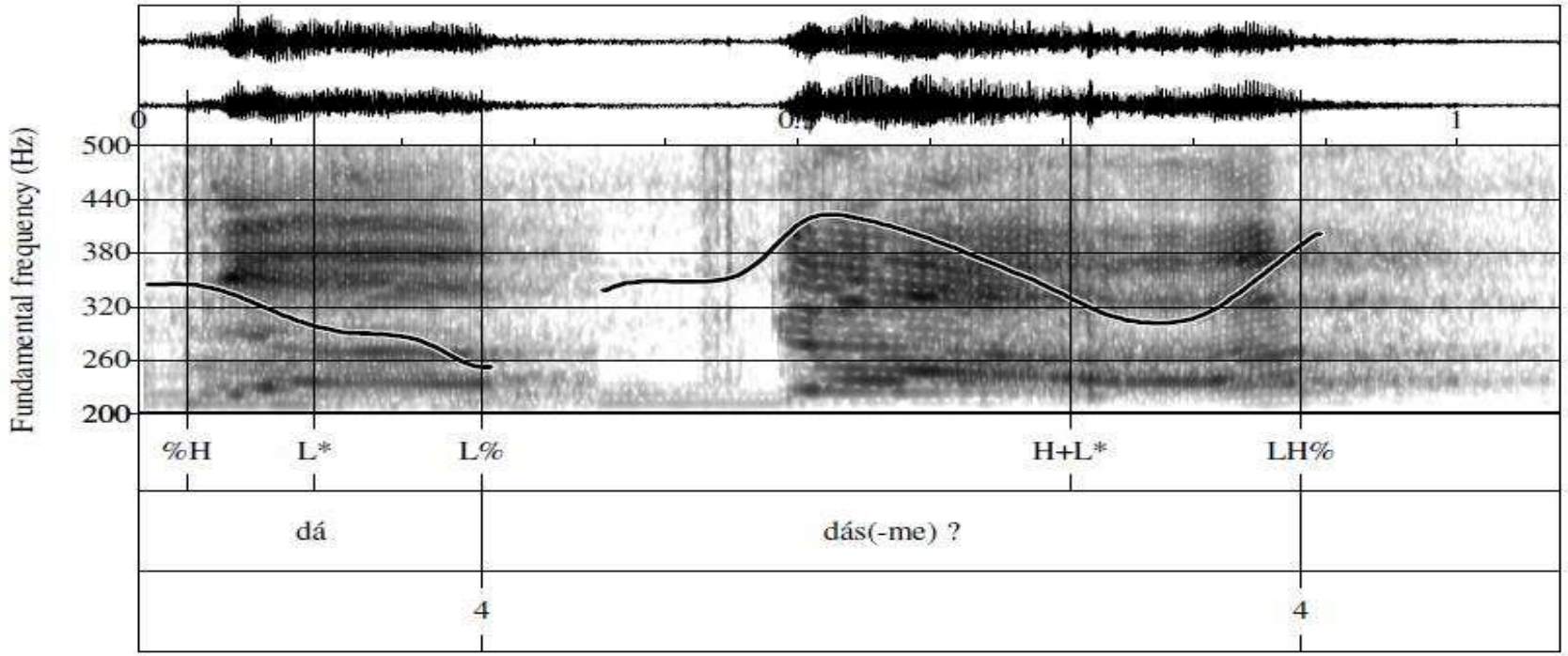


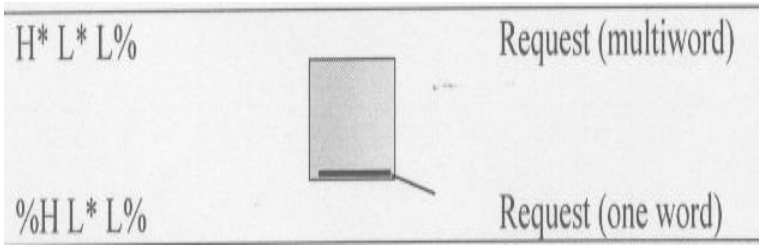
Main deviant patterns (Luma & João)

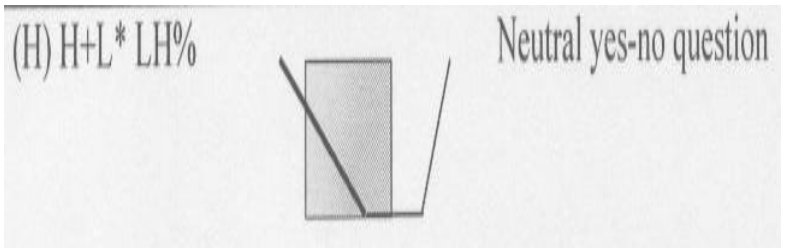
	1;00	1;01	1;02	1;03	1;04	1;05	1;06	1;07	1;08	1;09	1;10	1;11	2;02
dec		lev	lev										
req	LH	call	call	call	LH	call		H*L	call	call			
com		H*	HL*										
call		L*H ^L	^H+ L*								H%		
int		LH*	L*H	L*H		L*H	H*L		L*H				

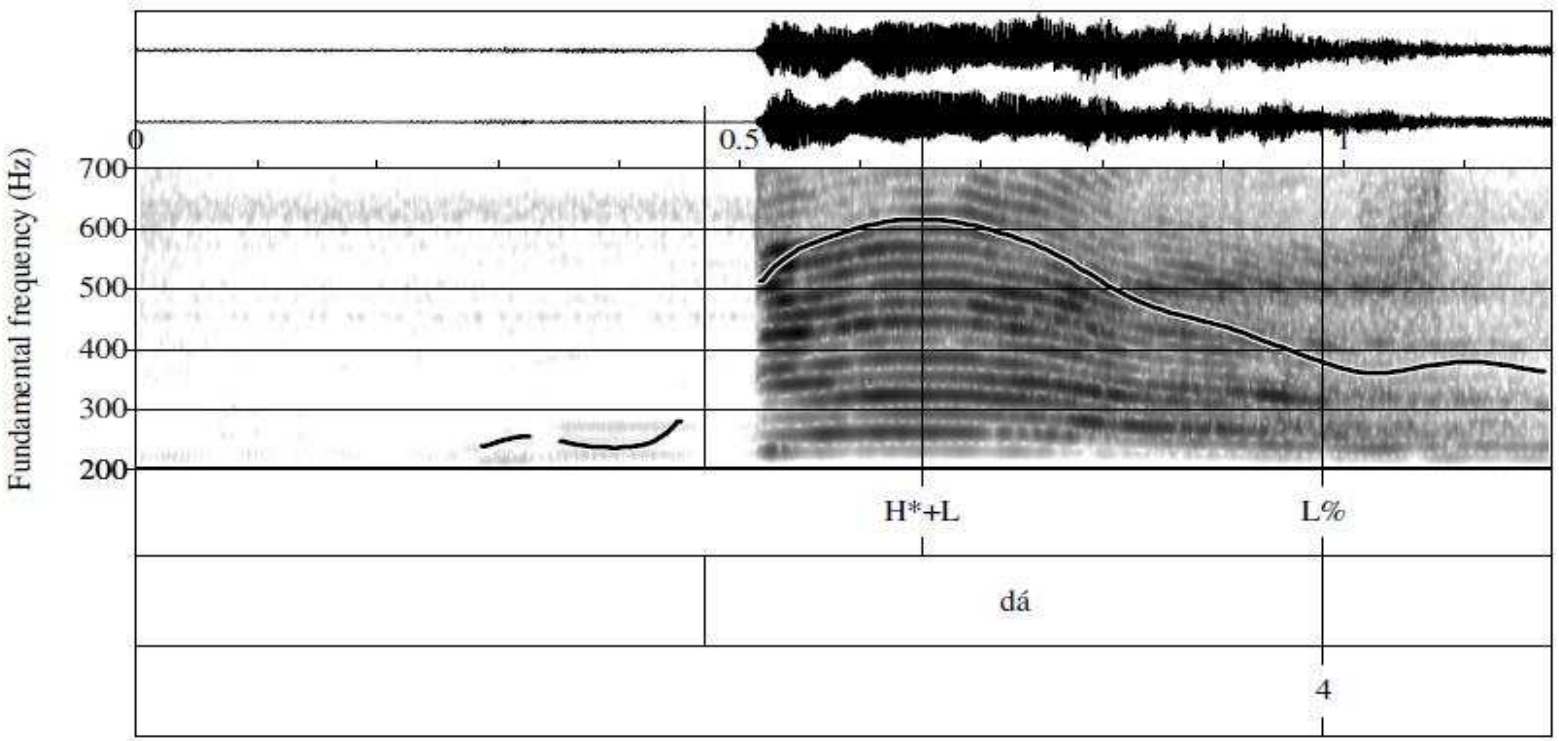
12

1;05


Fundamental frequency (Hz)
500
440
380
320
260
200
0
0.
1
%H
L*
L%
H+L*
LH%
dá
dás(-me) ?
4
4


H* L* L%
Request (multiword)
%H L* L%
Request (one word)

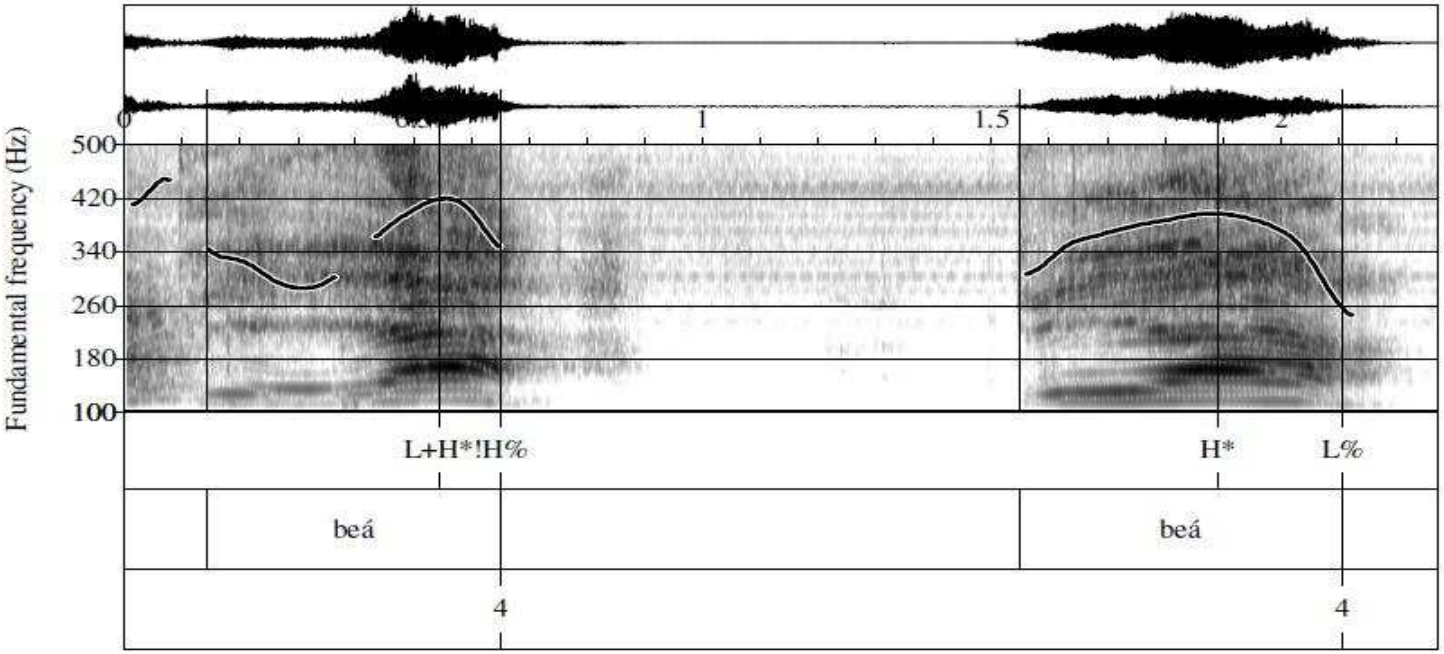

(H) H+L* LH%
Neutral yes-no question

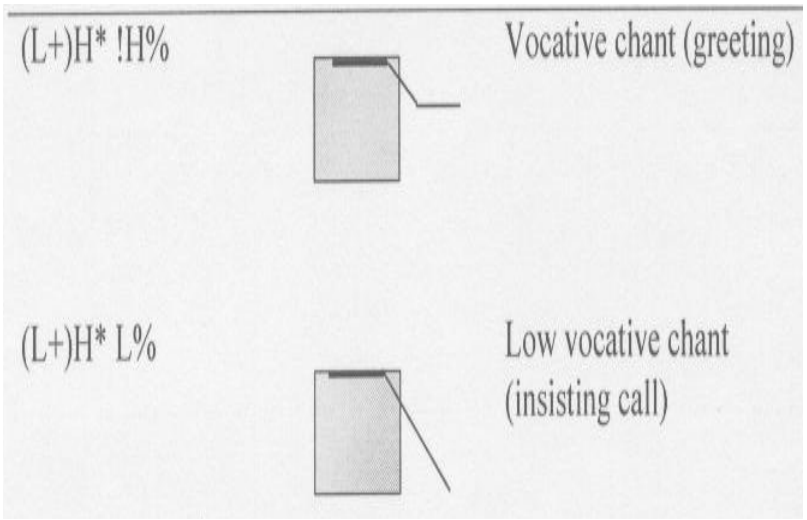


Command

´da ‘give’

1;07



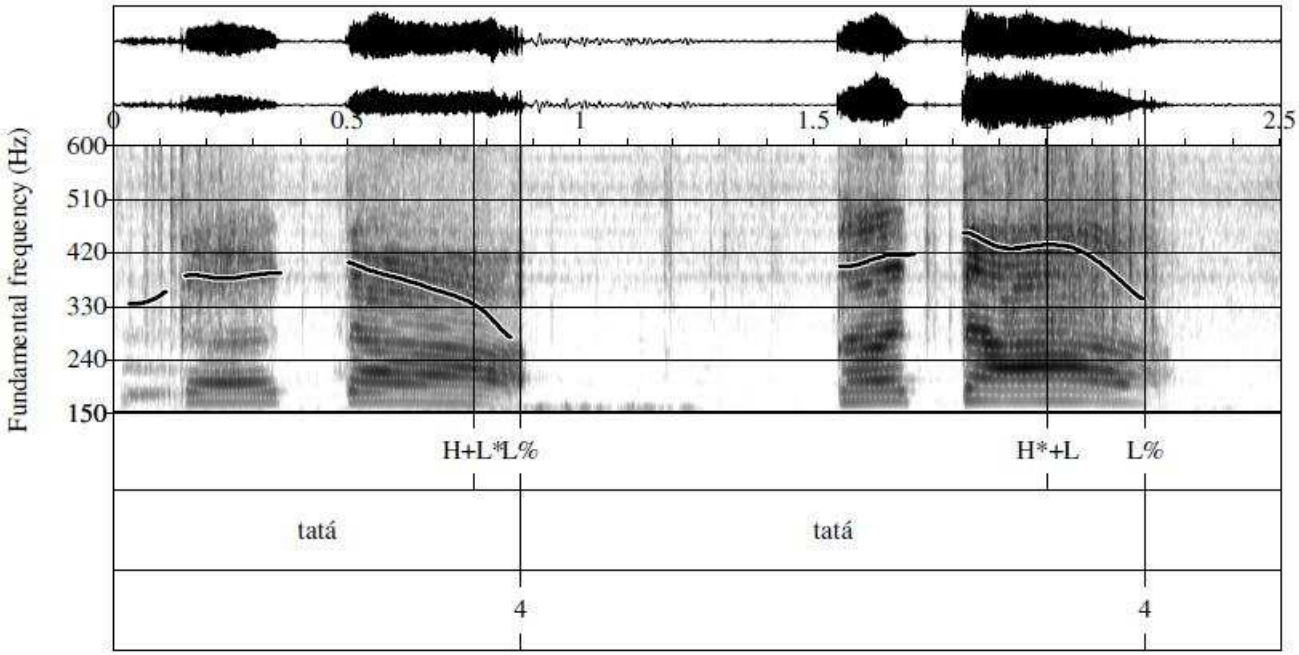


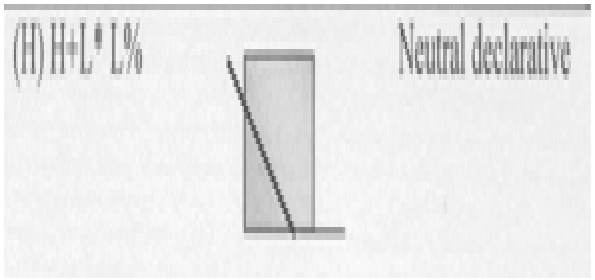
Call

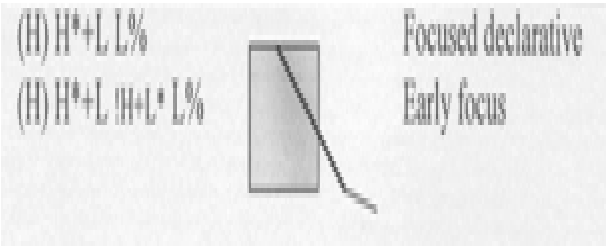
Low call

be´a be´a ‘Mami, Mami’

1;09







Decl

Foc

ta´ta ta´ta

'Tata,Tata'

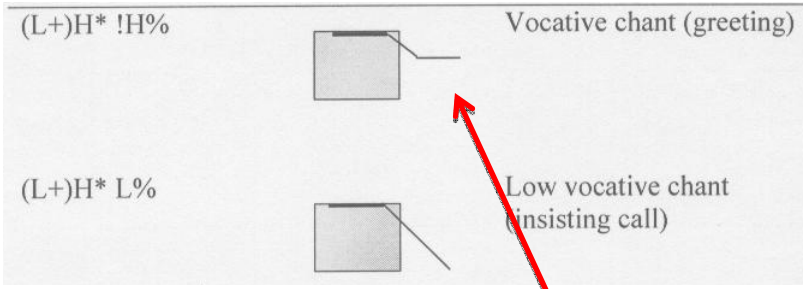
EP: results (3)

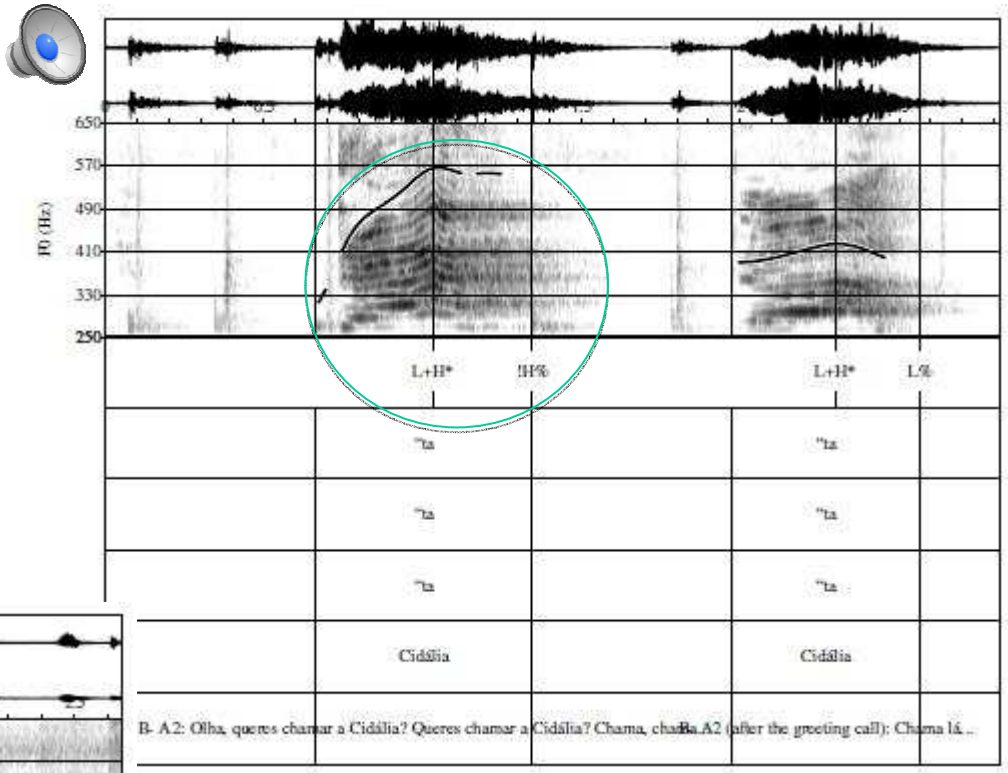
- Development in the production of scaling and alignment patterns
  - At 1;04/05:
    - Scaling and alignment not adult-like:
      - fall to a mid level (L%), step down in calls,
      - later peak alignment (H+L*)
  - At 1;09:
    - Adult-like in both but earlier in scaling

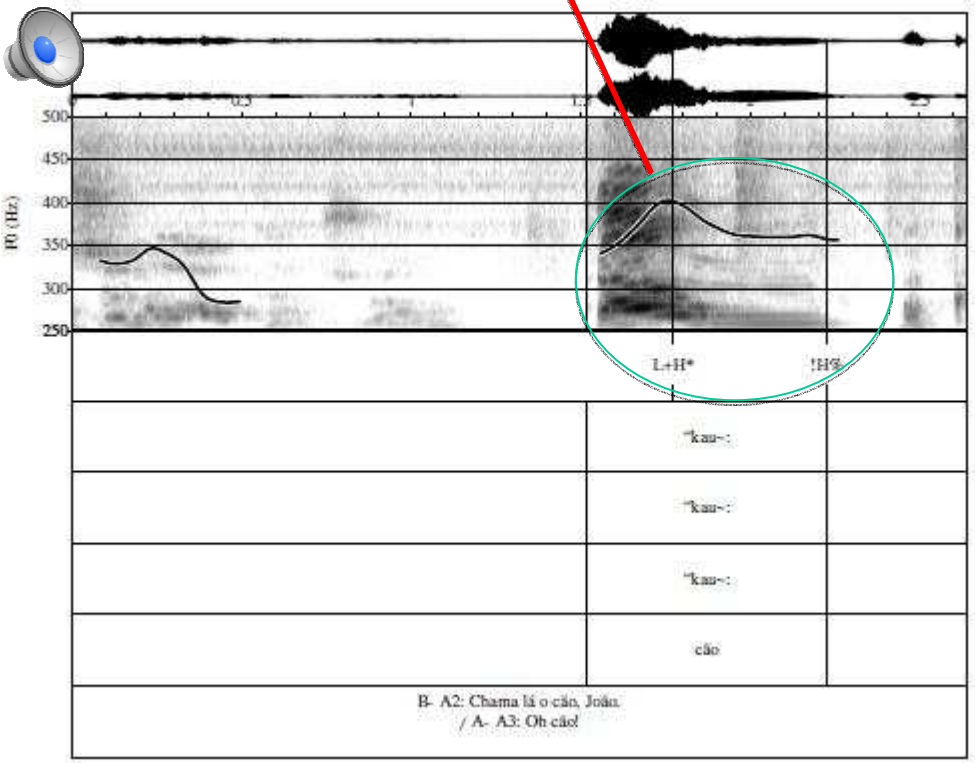
SCALING

Call
Low call

1;06







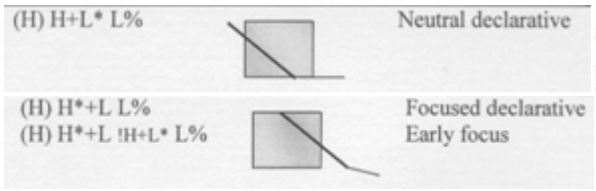
Call

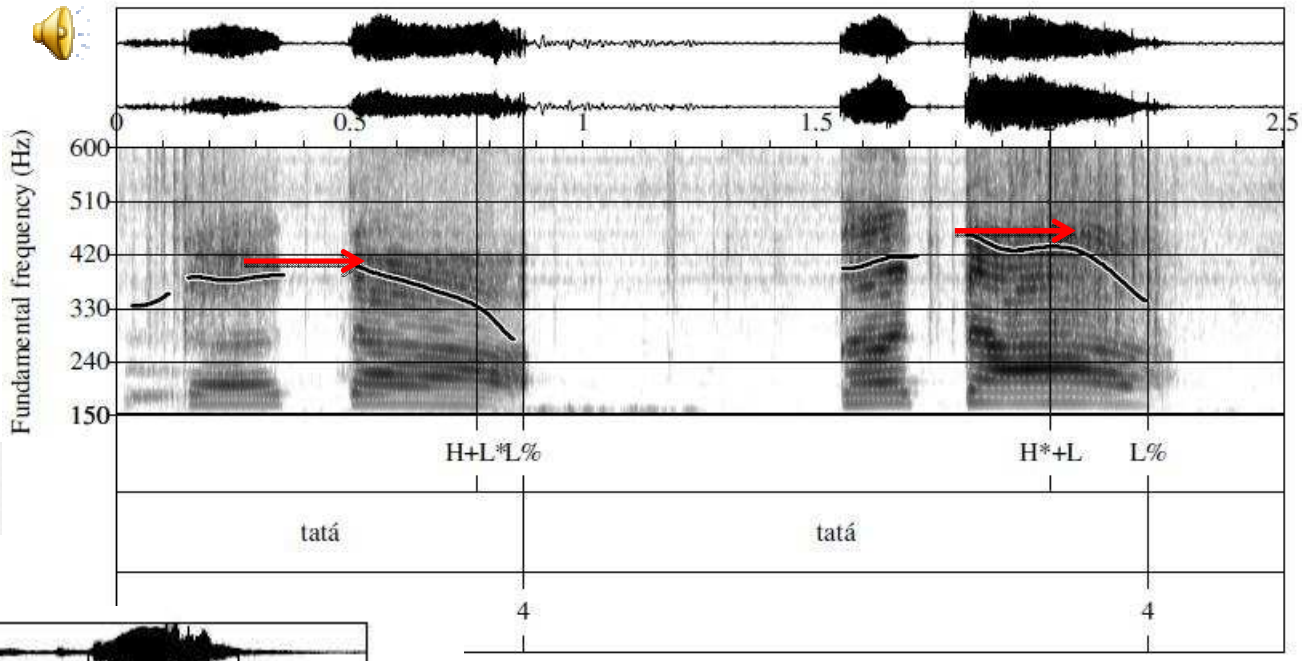
1;10

João

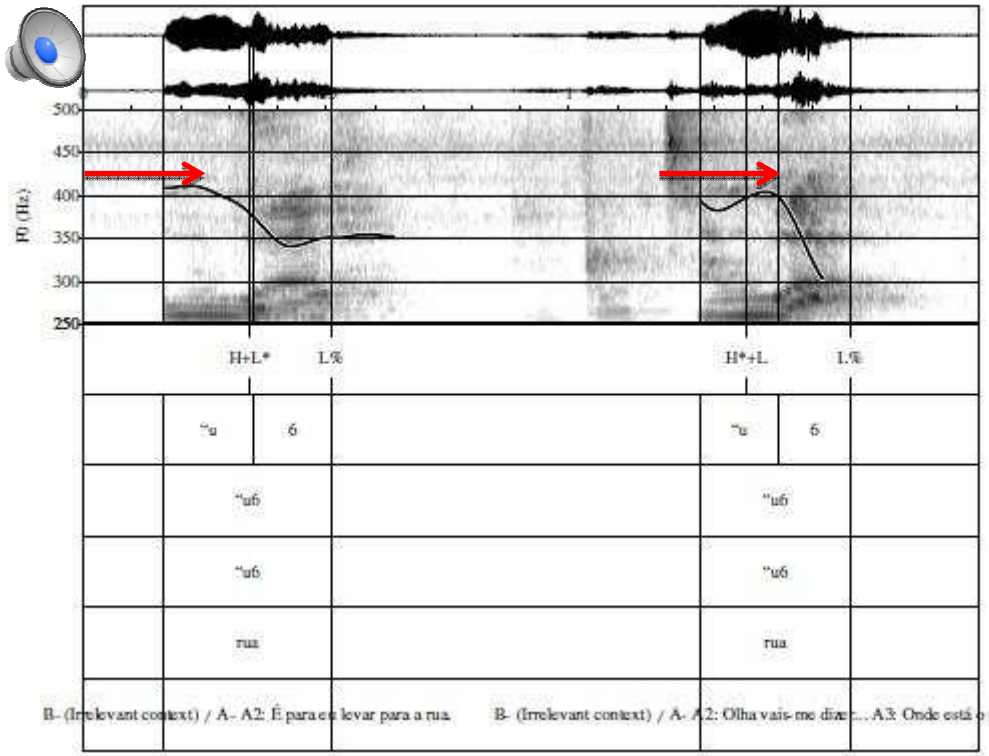
ALIGNMENT CONTRAST

Decl
Foc
1;09





Luma



João

Decl
Foc
1;10

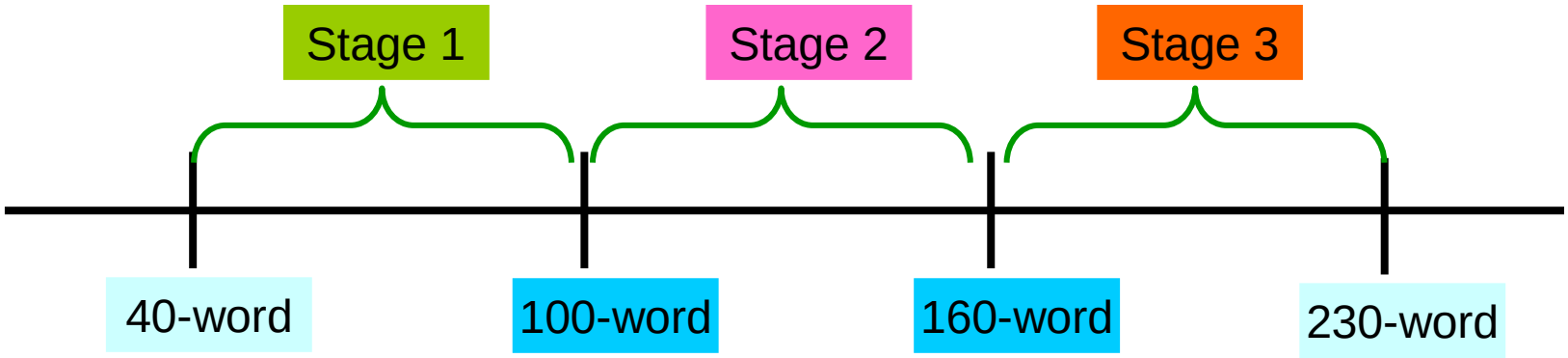
Although the peak is aligned later, the alignment contrast is produced!

Summary: Early intonation in EP

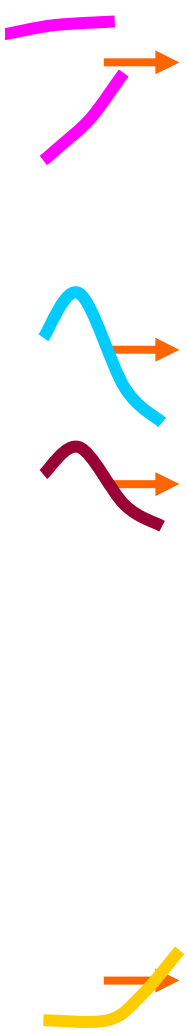
- Diversity in nuclear contours at 1;05 (word size > 1.5)
- Inventory of nuclear accents and boundary tones is adult-like at 1;09, coincides with 1st major jump in lexicon size
- Development in the production of alignment and scaling patterns (1;09)
- Intonational development largely independent of the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

Dutch: Results (1)

- 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)



H*

*!H**

H*L

!H*L

L*HL

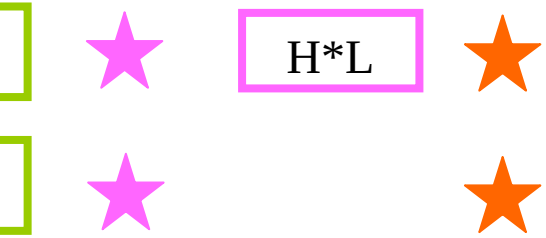
L*!HL

L*

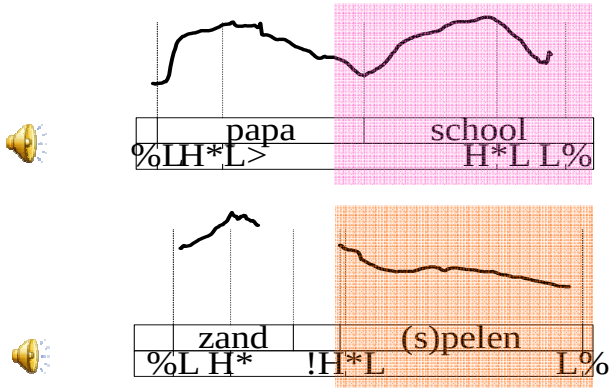
L*H

H*!H

(Non-adultlike)



H*L

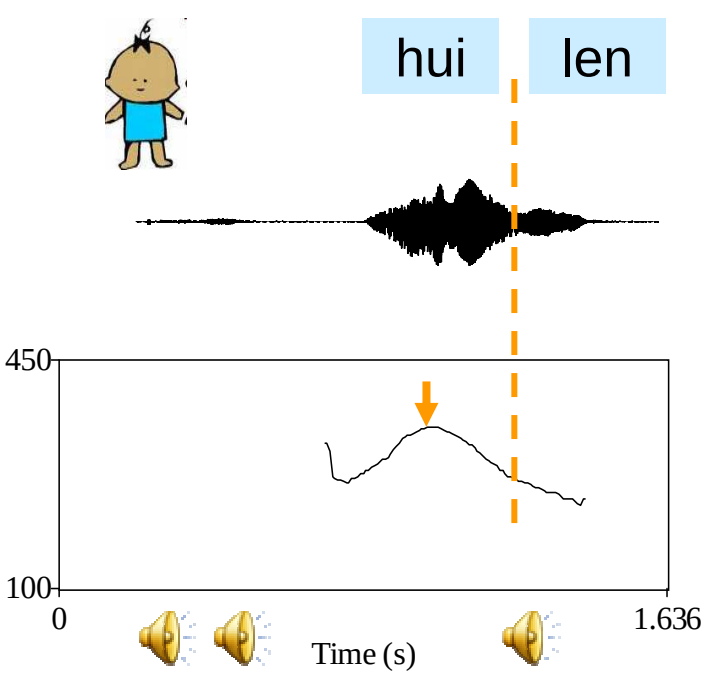


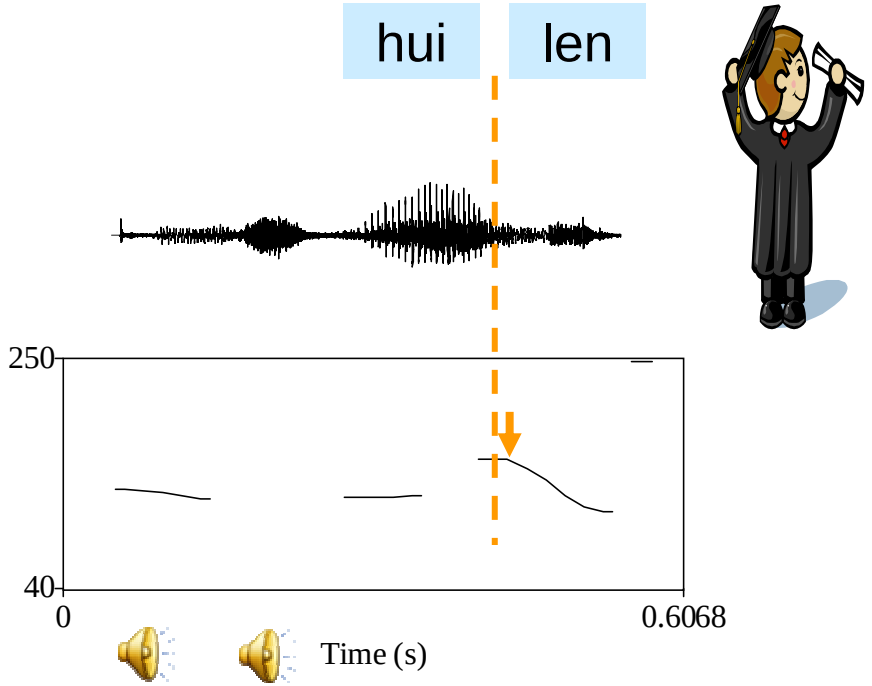
- adult-inventory of nuclear pitch accents in place at stage 2 (100 word – 160 word)

Stage 1 | Stage 2 | Stage 3

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-learing 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-learing 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.

L1	age	Lex/prag analysis	utterance	position	into.event
English	1;11-2;0	no	one-word	nuclear	LH*L
Dutch	1;04-2;03	lex	two-word	pre-nuclear, nuclear	pitch accents, boundary tones
Catalan	1;1-1;8	lex, prag	one-word	nuclear	pitch accents, boundary tones
	2;2-2;8	no	one-word	nuclear	LH*L
Spanish	1;1-1;8 (?)	lex, prag	one-word	nuclear	pitch accents, boundary tones
	2;3-2;7	no	one-word	nuclear	LH*L
EP	1;0-2;04	lex.prag	one-word	nuclear	pitch accents, boundary tones

Lex: lexical development; prag: analysis on pragmatic uses of intonation
into.event: intonational analyses available
(Astruc et al. 2013, Chen & Fikkert 2007, Chen, in progress; Frota & Vigário 2008, Prieto & Vanrell 2007, Vigário et al. 2011, Frota et al. in progress)

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!