Measuring tempo: a descriptive analysis of the development of durational patterns in EP

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Outline

- Background
- Subjects
- Database
- Goals
- Methodology
- Results:
  - Final Lengthening
- Summary and conclusion
Background

- **Adult temporal patterns** show ≠s from language to language:


  - Segmental FL domain (Frota, 2000; Byrd et al., 2006; Turk & Shattuck-Hufnagel, 2000, 2007)

- We looked at development of temporal patterns during acquisition, taking into account:

  a) Importance of biological factors, motor and neuromuscular phenomena (Leenneberg, 1967; Locke, 2004; Moore, 2004)

  b) Role of native language (Robb & Saxman, 1990; Nathani et al., 2003 vs. Snow, 2004; Vihman et al., 2006)

  c) Development of prosodic structure (Gerken, 1996 Nathani et al., 2003)
Subjects

Luma (L):
- Monolingual EP child;
- Analysis at 1;01, 1;04, 1;06; 1;08-09, 2;02, 2;03-04, 2;06, 2;08, 3;00 years old.

João (J):
- Monolingual EP child;
- Analysis at 1;01, 1;04, 1;06, 1;08, 1;10, 2;00, 2;02, 2;04, 2;06, 2;08, 2;10 years old.

Inês (I):
- Monolingual EP child;
- Analysis at 1;01, 1;04, 1;06, 1;08, 1;10, 2;00, 2;02, 2;04, 2;06, 2;08, 3;00 years old.
Database

2 Longitudinal corpora:
   Luma (L):
   - Audio and video diary corpus recorded in the child family environment
     (www.fl.ul.pt/LaboratorioFonetica/LumaLiDa.htm)
   
   João (J) e Inês (I):
   - PhonBank (http://childes.psy.cmu.edu/media/PhonBank/),
   - Video corpus recorded in the children family environment (Correia et al., 2013; Matos, in progress)
   
Orthographic and phonetic transcription of target and L, J, I+adults productions
We observed the evolution of duration patterns in EP, with 2 main goals (extension of Frota & Matos, 2009, Matos, 2010, Frota et al., accepted):

1. To contribute to the debate on the relative importance of biological factors and native language (similarities and differences between languages);

2. To contribute to the study of the emergence and development of prosodic structure in production ($\sigma, PW$ e $U$);
Methodology

- **Materials**: all meaningful and acoustically identifiable sequences (sound quality, no noise or speech overlapping), defined according the following criteria:
  - Identifiable target;
  - Relation with adult word;
  - Context: appropriate use;
  - Consistency in the use;
  - Adult confirmation (interaction).
Methodology

- Segmentation of sequences using PHON 1.6.2

- Acoustical analysis: using PRAAT 5.3.14
  - Based on spectrograms, waveforms and pitch contour;
  - The silence of initial voiceless stops was not included

- Duration measures (Turk et al., 2006):
  - Syllable = σ
  - Prosodic Word = PW
  - Utterance = U (=IP, in this work)

We measured U including and excluding internal silences; the results here presented include silences.
Methodology

File name: 0206AVERconversa_longa_7
Period: 2;03-2;04
Methodology

File name: 1994-05-30_Ines_35
Period: 1;06

é o balde

“E u “ba

“E u”“ba

“Eu”ba

é o balde
Methodology

File name: 2006-09-11_Joao_63
Period: 2:04
Methodology

- Other measures: each σ was analysed taking into account:
  - U and PW position (1=initial/2=medial/3=final/5=monosyllable)
  - PW size in terms of nº of both segments and syllables
  - U size in terms of nº of segments, σ’s and PW’s

- Statistical analysis
  Statistical analysis was made by means of SPSS 21.0:
  - Variance (ANOVA) and Correlation analysis (Pearson correlation coefficient)
  - Significance level: p<.01
Results
Final Lengthening (Luma)

Syllable duration within PW, Luma doesn’t show consistent durational patterns among Initial, Medial and Final positions in all periods;

Syllable duration within U, Luma shows longer final syllables and monosyllables than initial and medial syllables at 2;00.
Results
Final Lengthening (Inês)

Syllable duration within PW, Inês doesn’t show a consistent durational patterns among Initial, Medial and Final positions in all periods;

Syllable duration within U, Inês shows longer final syllables and monosyllables than initial and medial syllables at 1;06.
Results
Final Lengthening (João)

On Syllable duration inside PW, João doesn’t show a consistent durational patterns among Initial, Medial and Final positions in all periods;

On Syllable duration inside U, João shows longer final syllables and monosyllables than initial and medial syllables at 2;04 years old.

Syllable duration within PW
Syllable duration within U

João: Evolução da Sílaba por Posição na PW

João: Evolução da Sílaba por Posição no E

Average (ms.) of the evolution of Syllabic duration by position inside PW
Average (ms.) of the evolution of Syllabic duration by position inside U
Results
Final Lengthening

- Until 2;02 for Luma, 1;04 for Inês and 2;02 for João, there is a similar pattern between PW and U;

- After 2;02 for Luma; 1;04 for Inês and 2;02 for João, **Final Lengthening emerges**; at the same time we observe a reduction of duration Initial and Medial Syllables inside U;

- Separation between PW and U, caused by final lengthening at U (IP) VS. PW in EP (Frota, 2000)
The emergence of FSL in the three children is found to correlate with the beginning of the COMBINATORIAL SPEECH STAGE

2-Word stage, that is the moment ≥ 1,5 MLU-w (Frota et al., accepted)

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Summary and Conclusion

- U Final Lengthening Emergence and reduction of duration of Initial and Medial syllables, with separation between PW and U durational patterns (Frota, 2000)
- In the 3 children FSL was not found from the beginning of speech production and emerged at different points in development.
- The emergence of FSL, in the 3 children, was found to correlate with the beginning of the COMBINATORIAL SPEECH
  
  Luma 2;02 → MLU- 1,67
  João 2;04 → MLU-1,54
  Inês 1;06 → MLU-1,72
- Evidence for the role of native language
- Durational evidence for prosodic structure construction
What was the contribution for the debate about biological factors and native language?

→ The emergence of FSL points to NATIVE LANGUAGE weight (different behaviours in the development of English, French, Japanese and Galish, according to Vihman et al., 2006)

→ Our results support the view that FSL depends on language experience and appears to be related to the production of combinatorial speech.
Summary and Conclusion

- What was the contribution to the understanding of the development of prosodic structure?

  Our findings demonstrate that there is a temporal reorganisation in the utterance towards a strengthening in the realisation of FSL, revealing an approximation to the adult European Portuguese Pattern.

  - **PW≠U final durations** (Frota, 2000)


References

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