Early prosodic development in European Portuguese:
Proso-Quest, a parental report of infant prosodic skills

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Universidade de Lisboa

DEPE Project (PTDC/CLE-LIN/108722/2008)
Outline

- Proso-Quest – General features
- Proso-Quest – Details and background
- Method for collecting the 440 questionnaires
- Results and discussion
- Concluding remarks
Proso-Quest (Frota, Vigário & Cruz 2012) – general features

- A questionnaire developed to assess infants’ prosodic skills;
- To be filled by parents or infants’ caregivers
- A single page, quick response questionnaire
- Age of application – children about 24 months old
- Unique in assessing prosodic development
Proso-Quest – general features

- A description of typical prosodic development in European Portuguese (comprehension and production), which goes beyond the few case studies analyzed from the production viewpoint.

- Ultimately, it is expected that Proso-Quest will provide a reference for prosodic development in Portuguese

- A pilot based on 53 filled questionnaires resulted in improvements in the instructions given, question formulation and in form layout
Basic information about the child
Name
Date of birth
Sex

Date of questionnaire filling
Short list of instructions

Parental report based on parents' recall

Vocabulary age of acquisition – levels of accuracy based on adult estimation similar to actual observations of children’s productions (Cameirão & Vicente 2010)
A. Comprehension – the child:

- understands a statement, a question, a command, a request, a call
- understands better a word in isolation, at the end of a sentence, inside a sentence.
- understands when one talks about a specific object as opposed to others (contrastive focus context given)
A. Comprehension

1. The child comprehends:

<table>
<thead>
<tr>
<th>Idade (meses)</th>
<th>3</th>
<th>6</th>
<th>9</th>
<th>12</th>
<th>15</th>
<th>18</th>
<th>Outro</th>
</tr>
</thead>
<tbody>
<tr>
<td>uma afirmação</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>uma pergunta</td>
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<td>um pedido</td>
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<td>um chamamento</td>
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</table>

2. The child perceives better if:

<table>
<thead>
<tr>
<th>Idade (meses)</th>
<th>3</th>
<th>6</th>
<th>9</th>
<th>12</th>
<th>15</th>
<th>18</th>
<th>Outro</th>
</tr>
</thead>
<tbody>
<tr>
<td>a palavra for dita isolada (ex.: a bolacha)</td>
<td>0</td>
<td>0</td>
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<tr>
<td>a palavra estiver no fim da frase (ex.: olha a bolacha)</td>
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<td>a palavra estiver no meio da frase (ex.: a bolacha está aqui)</td>
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</tr>
</tbody>
</table>

3. The child comprehends when it is asked to say the name of a specific object in contrast to others (ex.: A conjunto completo de brinquedos, a criança aponta para o livro, mas o adulto quer antes chamar a atenção para a bola e diz “a BOLA”, de forma a mostrar que é a bola e não com outro brinquedo que o adulto quer brincar).

<table>
<thead>
<tr>
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- Results from a discrimination experiment showed that 5-month-old infants acquiring Portuguese are able to discriminate statement and question contours (Frota, Butler & Vigário submitted).

- Around 1;05 L produces a diversity of nuclear contours - L (F&V2008)
A. Comprehension

> Sentence position may affect infants’ perception

- Infants are able to segment word forms at 6mo if aligned with IP boundaries (Shukla, White & Aslin, 2011).
- Word detection at 8mo is faster at beginning or end of sentence than in sentence medial position (Seidl & Johnson, 2006).
- Recognition of familiar words is disfavored in sentence internal position before 17mo (Plunkett, 2005).
- More accurate perception of English 3rd person singular –s sentence-finally than sentence-internally at 22mo & 27mo (Sundara, Demuth, Kuhl, 2011).
A. Comprehension

> Comprehension precedes production: a general tendency in language acquisition (e.g. Clark & Hecht 1983, a.o.)

✓ Segmental contrasts
✓ Perception of functional categories
✓ Lexical development...

(But not: Focus particles, Contrast accent, Pronouns - e.g. Grimm et al. 2011 and refs therein)

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### A. Comprehension

<table>
<thead>
<tr>
<th>Segmental contrasts</th>
<th>Perception of functional categories</th>
<th>Lexical development...</th>
</tr>
</thead>
</table>

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#### A. Comprehension

1. A criança compreende:

<table>
<thead>
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</table>

2. A criança percebe melhor uma palavra se:

<table>
<thead>
<tr>
<th>Idade (meses)</th>
<th>3</th>
<th>6</th>
<th>9</th>
<th>12</th>
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</table>

3. A criança compreende quando se está a falar de um objecto específico em oposição a outros (ex: Num conjunto de brinquedos, a criança aponta para o livro, mas o adulto quer antes chamar a atenção para a bola e diz “a BOLA”, de forma a mostrar que é com a bola e não com outro brinquedo que o adulto quer brincar):

<table>
<thead>
<tr>
<th>Idade (meses)</th>
<th>3</th>
<th>6</th>
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### A. Comprehension

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<tr>
<th>Idade (meses)</th>
<th>12</th>
<th>18</th>
<th>24</th>
<th>27</th>
<th>Outro</th>
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</thead>
<tbody>
<tr>
<td>multiparametricamente palavras isoladas (ex.: bebê)</td>
<td>0</td>
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<tr>
<td>sequência de palavras mais parecida com a palavra é dita se fosse uma frase (ex.: Bebê, O bebê está a falar e diz)</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>sequência de palavras junta nunca uma frase (ex.: bebê, O bebê está a falar e diz)</td>
<td>0</td>
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B. Production

- the child:

. produces a statement, a question, a command, a request, a call

. produces mainly words in isolation; sequences of words but sounding as if each word is a sentence; sequences of words integrated in a single sentence

. produces sentences such that you know he/she is talking about an object as opposed to others
B. Produção

1. A criança produz:

   **Idade (meses)**
   
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<thead>
<tr>
<th>9</th>
<th>12</th>
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2. A criança produz:

   **Idade (meses)**
   
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<th>21</th>
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</table>

3. A criança, pela maneira como produz uma sequência, consegue mostrar que está a falar de um objecto diferente daquele que o adulto pensa (ex: o adulto pensa que a criança quer o livro e diz 'Toma o livro', mas a criança responde 'o BONECO!', significando com a maneira de dizer que não é o livro mas é o boneco que quer).

   **Idade (meses)**
   
<table>
<thead>
<tr>
<th>12</th>
<th>15</th>
<th>18</th>
<th>21</th>
<th>24</th>
<th>27</th>
<th>Outro</th>
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</table>

Diversity of nuclear contours around 1;05 - L (F&V2008)

- 1;00 – Stat, Request
- 1;05 – Stat, Req, Focus, Command, Call, Question (...) 
- Stat, Req (Focus, Com): more frequent ~1;04
- Calls and Questions less frequent

Prosodic focus attested in L’s productions at 1;05 (F&V2008)
Early production of multiword combinations point to an initial phase of successive single-word utts followed by a multiword phase proper (Behrens & Gut 2005, for a review; Frota 2010).

L’s productions (Frota 2010)

1. 1 pitch accent per word (80%), stress shift, word duration correlated with nº of σ per word; nº pitch accents=nº words, frequent pitch reset/pauses, position of the σ in the IP is irrelevant for σ duration >1;09

2. accentless words, pitch reset/pauses) less frequent, high plateau contour, prenuclear H*, phrase-final lengthening - 1;10>
Method

- Procedure for collecting Proso-Quests extensively, in different regions of Portugal
  - Questionnaires distributed in kindergarten (most often, direct personal contact after telephone call)
  - Kindergarten staff helped in contacting parents, providing them general information, and collecting the forms filled out
  - Prepayed/prefilled postal packages provided, where forms were not collected by our staff/collaborators
  - Partial collection together with the CDI forms in various regions of Portugal
  - Proso-Quests also collected for every child participating in BabyLab’s experiments in the last two years
Method

- Exclusion criteria:
  - Insufficient data about the child (e.g. date of birth)
  - Several answers strikethrough/erased
  - Multiple answers
  - Same response across blocks (A, B, all) (often coinciding with the age of child at the time of response)
  - Bilinguals/multilinguals coded separately; excluded at this point

- Questionnaires collected

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Total</td>
<td>440</td>
</tr>
<tr>
<td>Excluded</td>
<td>21</td>
</tr>
<tr>
<td>Partially excl</td>
<td>36</td>
</tr>
<tr>
<td>Bilinguals/Multilinguals</td>
<td>50</td>
</tr>
<tr>
<td>Included</td>
<td>333</td>
</tr>
</tbody>
</table>
Results and Discussion

The child understands/produces Call, Stat, Com, Quest, Req

- **Utterance types**
  
  **Comprehension**
  - All types understood between 9mo~13mo
  - Call > Stat, Com, Quest, Req
  
  **Production**
  - All types produced between 14-18
  - Call > Stat, Req > Com, Quest

Comprehension precedes production: the latest category in comprehension precedes the earliest category that is produced
\[ F(1, 234) = 637.62, \ p < .001, \ \eta^2 = .73 \]

Significant interaction between comprehension/production and type
\[ F(4, 936) = 14.6, \ p < .001, \ \eta^2 = .06 \]
Results and Discussion – Utterance types

- Distribution of responses

- Very close relation between the results from comprehension and production

- L productions (F&V2008) ~ Proso-Quest results (Prod)
  - All these sentence types documented in L productions at 13mo;
  - L within 25th-50th

<table>
<thead>
<tr>
<th></th>
<th>Stat</th>
<th>Req</th>
<th>Com</th>
<th>Quest</th>
<th>Call</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>12mo</td>
<td>12mo</td>
<td>13mo</td>
<td>13mo</td>
<td>13mo</td>
</tr>
<tr>
<td>Proso-Quest</td>
<td>10-25th</td>
<td>10th-25th</td>
<td>10th-25th</td>
<td>10th-25th</td>
<td>50th</td>
</tr>
</tbody>
</table>

~ L: Stat, Req (Com) > Call, Quest ~ Proso-Quest: Call > Stat, Req > Com, Quest
Results and Discussion

The child understands better/produces mainly isolated words, words in final position, integrated words

Words in context

Comprehension

- Prominent positions facilitate word comprehension
- Preference for isolated words (10mo) > final position favores comprehension (12mo) > words inside sentences understood at ~13mo

Production

- Prosodic integration occurs late
- Isolated Wds (14-15mo) > Wrd sounds like sentence (16-17mo) >Words integrated in the sentence (18-19mo)

Comprehension precedes production: latest category in comprehension precedes earliest category that is produced (F(1,228) = 567.64, p < .001, \eta^2 = .071)

Significant interaction between comprehension/production and type (F(2,456) = 3.09, p < .05, \eta^2 = .01)
Results and Discussion – Words in context

- Distribution of responses

- Very close relation between the results for comprehension and production

- L productions (F&V2008) ~ Proso-Quest results (Prod)

<table>
<thead>
<tr>
<th>L within 80th-85th</th>
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<table>
<thead>
<tr>
<th></th>
<th>[Word]</th>
<th>[Word Word]</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>21mo</td>
<td>22mo</td>
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<tr>
<td>Proso-Quest</td>
<td>~80th</td>
<td>~85th</td>
</tr>
</tbody>
</table>
Results and Discussion
– Focus

Focus

Comprehension:
Focus reported to be understood at 13

Production:
Focus reported to be produced at 18

Comprehension precedes production
\( (F(1,294) = 497.17, p < .001, \eta^2 = .63) \)
Results and Discussion
– Focus

- Distribution of responses

✓ Very close relation between the results for comprehension and production

✓ L productions (F&V2008) ~ Proso-Quest results (Prod)

<table>
<thead>
<tr>
<th></th>
<th>Production of focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>17mo</td>
</tr>
<tr>
<td>Proso-Quest</td>
<td>10th-25th</td>
</tr>
</tbody>
</table>
Results and Discussion
– Reliability of Proso-Quest

- Reliability measured using Cronbach’s coefficient alpha

  a measure of internal consistency, that is, how closely related a set of items are as a group (above .8 is generally considered acceptable, e.g. Fenson et al., 2000)

  The coefficient was .92. → therefore reliable measure of comprehension/production

- Partially excluded responses: seems fairly evenly spread across Q1 and Q2 – no reason to believe some questions more difficulty than others
Results and Discussion
– Age of the child at the moment of parents’ report and response distribution (comprehension)

Groups 16-18 (N=20), 18-20 (N=38) 28-30 (N=46) and 30+ (N=80) compared to 23-25 (N=63)

Utterance types – no differences
Words in context – no differences
Focus – no differences
Overall – no differences
Results and Discussion
– Age of the child at the moment of parents’ report and response distribution (production)

Groups 16-18 (N=20), 18-20 (N=38) 28-30 (N=46) and 30+ (N=80) compared to 23-25 (N=63)

Utterance types
- Significant difference between 23-25 and 28-30 (t(4) = 2.83, p < .05)
- Almost significant difference between 23-25 and 16-18 (t(4) = 2.7, p = .054)
- Almost significant difference between 23-25 and 30+ (t(4) = 2.68, p = .055)

Words in context
- Almost significant difference between 23-25 and 16-18 (t(4) = 2.6, p = .06)

Focus - no differences

Overall - Significant difference between 23-25 and 28-30 (t(4) = 3.21, p < .05)
Comparing age groups

- For **comprehension**, no difference between responses for the different age groups.

- For **production**, utterances types judged different to the ideal, group 16-18 (earlier), group 28-30 (later) and group 30+ (later). For words and contexts, group 16-18 judged earlier than ideal. Overall, group 28-30 judged later than ideal.
Results and Discussion

- Age of the child at the moment of parents’ report and parents’ level of education in excluded reports

- Mean excluded questionnaires filled out when child was 27 months 9 days old (vs mean values for the forms included 26 months 16 days) – no significant difference (F1(305)<1)
  → Age of the child at the moment of parents’ report does not seem to explain excluded reports

- Parents’ level of education in excluded questionnaires
  45% highly qualified, 39% medium qualified, 5% low qualified and workers, 11% unemployed

No indication that a high level of education is required in order for parents to be able to fill out Proso-Quest
Results and Discussion
– Results by region

Lisboa (N=80), Norte (N=165), Centro (N=68), Algarve (N=20)

Utterance types – no differences

Words in context - Significant difference between Lisboa and Norte (t(4) = 3.7, p < .05) and Norte and Algarve (t(4) = 4.4, p < .05). Almost significant difference between Norte and Centro (t(4) = 2.66, p = .056)

Focus – Significant difference between Lisboa and Norte (t(4) = 3.86, p < .05), Lisboa and Centro (t(3.44, p < .05), Norte and Centro (t(4) = 2.87, p < .05) and Norte and Algarve (t(4) = 3.63, p < .05).

Overall – almost significant difference between Norte and Algarve (t(4) = 2.66, p = .056)
Results and Discussion
– Results by region

Lisboa (N=80), Norte (N=165), Centro (N=68), Algarve (N=20)

Utterance types – significant difference between Lisboa and Centro (t(4) = 2.87, p < .05)

Words in context – significant difference between Lisboa and Norte (t(4) = 3.25, p < .05) and Lisboa and Centro (t(4) = 3.43, p < .05)

Focus – no differences

Overall – significant difference between Centro and Algarve (t(4) = 3.01, p < .05)
Comparing regions

- For **comprehension**, words are reported to be understood in context and focus is reported to be understood later in the Norte later than Lisboa, Centro and Algarve, and focus, but not words in context, is reported to be understood later in Centro than Lisboa.

- For **production**, in utterances, Centro emerges later than Lisboa, while in words in context, Lisboa emerges earlier than Norte and Centro.
Results and Discussion
– Relation between Proso-Quest results based on parental reports and developmental patterns actually observed in children productions

- The evolution of children’s first productions from this perspective was only investigated for L, so far;

- The results indicate that L behaves like the most precocious children in parental’s report w.r. to production of a variety of sentence types and focus, but like the children with later development w.r. the prosodic integration of sequences of words

- These results should be related to other measures of language development for L

- The evolution of the same prosodic parameters in other children’s speech must be analysed
Results and Discussion
– Proso-Quest results and other developmental measures

- How do the results of Proso-Quest (prosodic development questionnaire) relate to the results of CDI (lexical development questionnaire)?
  >> next talk

- How do the results of Proso-Quest relate to other areas of language development
  >> future work
Concluding remarks

- First results of the application of Proso-Quest are certainly promising.

- According to parental reports, comprehension precedes production in all prosodic skills under evaluation. (a delay of ~5 months in average in all parameters)

- Chronology of sentence type emergency in comprehension and production: very similar.
  
  Compreh.: Call > Stat, Req, Com, Ques
  Product.: Call > Stat, Com > Req, Quest
Concluding remarks

- In average, all types of sentences are reported to be understood and produced within a 4 months window, respectively (9-13 and 14-18, respectively).
- Prosodic breaks are reported to facilitate word comprehension early on (10-12mo).
- Prosodic breaks between words also reported in first stages of word production: words firstly produced in isolation; combinations of words first sound as if each word is a sentence; prosodic integration only occurs later (18-19mo in average).
- Focus is understood by 13 mo and produced by 18mo in average.
Concluding remarks

Future work
- Collect more data > a reference for prosodic development skills in Portuguese population
- Relate measures from Proso-Quest to developmental measures in other areas of language acquisition
- Compare the results from the parental reports with what is actually observed in comprehension and production studies of child language.
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