Early prosodic development in Catalan

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ICREA–Universitat Pompeu Fabra

1st DEPE Workshop
Lisbon, October 25, 2010
• The acquisition of prosody starts very early in a person's lifetime.

– While still in the womb, babies develop a memory for the mother's voice (DeCasper & Fifer 1980), and become sensitive to the intonational patterns of their native language (Mehler et al. 1987; Camras et al. 1992, 1998).
– Babies also appear to be sensitive to visual input from another human: e.g. newborn babies imitate facial gestures from an adult (Meltzoff & Moore 1983).
– Children learn to exploit prosodic features for various linguistic and social purposes.

Yet, our knowledge of this development in young children is still very limited.
The majority of the studies of the acquisition of prosody have investigated early prosodic patterns irrespective of the potential differences in linguistic meaning.

In this project, we aim at studying early acquisition of prosody in relation to meaning:

**PRODUCTION STUDY.** How do babbling children exploit prosodic features for various linguistic purposes?

**PERCEPTION STUDY.** Are one-year old babies aware of the main intonational contrasts of the target language?
The Development of Prosodic Patterns in Catalan-babbling infants

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1st DEPE Workshop
Lisboa, October 25
1. Introduction

Contradictory evidence for the presence or absence of language-specific influences in children’s prosody:

<table>
<thead>
<tr>
<th>No Language-specific Influences</th>
<th>Language-specific Influences</th>
</tr>
</thead>
<tbody>
<tr>
<td>DePaolis, Vihman, Kunnari (2008)</td>
<td></td>
</tr>
<tr>
<td>Hallé et al (1991)</td>
<td></td>
</tr>
<tr>
<td>Snow (2006)</td>
<td></td>
</tr>
</tbody>
</table>

Studies not dealing with the semantic and pragmatic aspects of prosody

1. Introduction
2. Goals
3. Method
4. Results
5. Discussion
Development of cognitive and social abilities as a necessary condition for language acquisition (Trevarthen, Piaget)

Some studies focused on the acquisition of intonation patterns in relation to the expression of intentionality:

- Marcos (1987): at 1;2-1;10, distinct prosodic patterns for repeated requests, for initial requests, for giving and showing, and for labeling.
- D’Odorico & Franco (1991): at 0;4-0;11, ‘selective production hypothesis’
- Papaeliou, Mindakis & Cavouras (2002): at 0;7-0;11, distinct prosodic patterns between communicative vocalizations and when expressing emotions.
- López-Ornat & Karousou (2005): at 0;8, children produce vocalizations with pragmatic functions such as protoconversations or protodeclaratives
- Papaeliou & Trevarthen (2006): at 0;7-0;11, distinct prosodic patterns between communicative and investigative vocalizations.

The development of intonation patterns is directly linked to the emergence of communicative intention.

How do children use prosodic patterns to express their communicative abilities in the pre-linguistic stage?
2. Goals

- Do Catalan-babbling children display different prosodic patterns to distinguish between communicative and non-communicative vocalizations?
  - To confirm Papaeliou & Trevarthen’s (2006) results

- Do Catalan-babbling children use prosodic cues selectively to express distinct pragmatic functions?
3. Method: participants

Recorded from 0;6 to 1;0 and still in process.
3. Method: data collection

- Recorded weekly for 30 minutes per session, at their homes and while playing normally with their parents.

- In order to monitor vocabulary acquisition, the same set of toys was given to the child in all sessions.

- Recordings from 0;6 to 1;0; analysis of the target vocalizations produced at 0;7, 0;9, and 0;11.
3. Method: data analysis

Total number of vocalizations: **2,467**
Vocalizations excluded: **245**
Vocalizations analyzed: **2,222**

Exclusion criteria:
- Strong background noise
- Cries or laughs
- Overlapping of adult with child

<table>
<thead>
<tr>
<th></th>
<th>0;7</th>
<th>0;9</th>
<th>0;11</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Àngela</td>
<td>147</td>
<td>168</td>
<td>265</td>
<td>580</td>
</tr>
<tr>
<td>Biel</td>
<td>227</td>
<td>191</td>
<td>385</td>
<td>803</td>
</tr>
<tr>
<td>Martí</td>
<td>138</td>
<td>252</td>
<td>449</td>
<td>839</td>
</tr>
<tr>
<td>TOTAL</td>
<td>512</td>
<td>611</td>
<td>1099</td>
<td>2,222</td>
</tr>
</tbody>
</table>
3. Method: pragmatic analysis

Classification according to non-vocal or gestural cues, based on Sarriá (1991)
3. Method: pragmatic analysis

<table>
<thead>
<tr>
<th>Pragmatic function</th>
<th>Meaning</th>
<th>Visual cues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protest</td>
<td>The child expresses disagreement or disapproval because of a situation the child does not like.</td>
<td>Facial gestures showing opposition, or quick and sudden hand movements.</td>
</tr>
<tr>
<td>Request</td>
<td>The child would like to have an object but (s)he is not able to reach it.</td>
<td>The eye-glance is directed to a particular object or by pointing at the object. If the child is not able to get it, (s)he protests.</td>
</tr>
<tr>
<td>Response</td>
<td>Right after the mother says something to the child, the child answers.</td>
<td>The child looks at the mother while she is speaking or the child looks at her while answering.</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>The child is happy because of something that happened to him or around him/her</td>
<td>Facial gestures like smiling or by body gestures expressing pleasure and gratification.</td>
</tr>
<tr>
<td>Statement</td>
<td>The child is looking at an object and vocalizes while the mother is around. It can be differentiated from the ‘response’ because in this case it is the child that initializes the communicative interaction.</td>
<td>The child is pointing at an object or looking at it while vocalizing. The child is not aiming at possessing the object.</td>
</tr>
<tr>
<td>Surprise</td>
<td>The child vocalizes something because a sudden unexpected event has occurred.</td>
<td>The child opens his/her mouth and eyes when looking at the unexpected event.</td>
</tr>
<tr>
<td>Vocative</td>
<td>The child is clearly calling somebody that left the room or is willing to catch the attention of his/her mother.</td>
<td>The eye-glance is directed to the person that left the room.</td>
</tr>
</tbody>
</table>
3. Method: gestural analysis

<table>
<thead>
<tr>
<th>Manual labeling of:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaze direction</td>
</tr>
<tr>
<td>Manual gestures</td>
</tr>
<tr>
<td>Facial gestures</td>
</tr>
</tbody>
</table>

Based on Allwood et al (2007)

<table>
<thead>
<tr>
<th>Gaze direction</th>
<th>Manual gestures</th>
<th>Facial gestures</th>
</tr>
</thead>
<tbody>
<tr>
<td>absent gaze</td>
<td>clapping hands</td>
<td>furrowing brows</td>
</tr>
<tr>
<td>gaze to camera</td>
<td>extending arms</td>
<td>opening eyes</td>
</tr>
<tr>
<td>gaze to object</td>
<td>embracing parent</td>
<td>closing eyes</td>
</tr>
<tr>
<td>gaze to parent</td>
<td>manipulating object</td>
<td>opening mouth</td>
</tr>
<tr>
<td></td>
<td>moving arms</td>
<td>closing mouth</td>
</tr>
<tr>
<td></td>
<td>pointing object</td>
<td>pouting</td>
</tr>
<tr>
<td></td>
<td>moving hands</td>
<td>shaking arms</td>
</tr>
<tr>
<td></td>
<td>shaking arms</td>
<td>no specific manual gesture</td>
</tr>
<tr>
<td></td>
<td>no specific facial gesture</td>
<td>no specific facial gesture</td>
</tr>
</tbody>
</table>
3. Method: gestural analysis

**Correlation gestures - communicativeness**

1. Introduction
2. Goals
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5. Discussion
3. Method: gestural analysis

Correlation gestures – intentionality.

- Furrowing brows → protests
- Smiling → satisfaction
- Pointing an object → statement.

Graph showing correlation between gestures and intentionality:
- Embracing parent
- Extending arms
- Moving arms
- Pointing object
- Shaking arms
- Gaze to object
- Gaze to parent
- Furrowing brows
- Smiling

Legend:
- Response
- Protest
- Request
- Satisfaction
- Statement
- Non-communicative
3. Method: acoustic analysis

Manual labeling of:

- **pitch range**: distance from the highest point in the f(0) line to the lowest point in the f(0) line
- **duration**: distance from the last point in the f(0) line to the first point in the f(0) line

1. Introduction
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4. Results

- Prosodic cues and communicative status of vocalizations
  - Pitch range (in st)
  - Duration (in ms)

- Prosodic cues and specific pragmatic intentions
  - Pitch range (in st)
  - Duration (in ms)
4. Results:

communicativeness and prosodic cues

<table>
<thead>
<tr>
<th></th>
<th>¿Àngela¿</th>
<th>¿Biel¿</th>
<th>¿Martí¿</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.7:</td>
<td>75</td>
<td>41</td>
<td>130</td>
</tr>
<tr>
<td>0.9:</td>
<td>143</td>
<td>182</td>
<td>267</td>
</tr>
<tr>
<td>0.11:</td>
<td>294</td>
<td>311</td>
<td>754</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>¿ communicates¿</th>
<th>0.7:</th>
<th>0.9:</th>
<th>0.11:</th>
</tr>
</thead>
<tbody>
<tr>
<td>¿communicative¿</td>
<td>80</td>
<td>78</td>
<td>205</td>
</tr>
<tr>
<td>¿investigative¿</td>
<td>128</td>
<td>71</td>
<td>254</td>
</tr>
<tr>
<td>¿not clear¿</td>
<td>86</td>
<td>182</td>
<td>295</td>
</tr>
</tbody>
</table>

TOTAL: 147 168 265 227 191 385 138 252 449 2,222
4. Results:

**pitch range and communicativeness**

- **ANOVA**: significant effects of the communicative status on pitch range ($F(1, 2.225)=33.893, p<.05$): significant effects at 0;7 ($F(1, 2.433)=23.496, p<.05$), marginally significant at 0;9 ($F(1, 3.792)=5.793, p=.077$) and not significant 0;11 ($F(1, 2.265)=4.394, p=.156$)

- **Post-hoc**: significant differences in some children between 0;7 and 0;11 (Martí, $p>.05$; Àngela, $p=.060$)
4. Results:

duration and communicativeness

- **ANOVA**: marginal effect of the communicative status on duration (F(1, 2.050)=10.194, p=.083)

- **Post-hoc**: significant differences between 0;7 and 0;11 (p<.01), and between 0;9 and 0;11 (p<.001), but not between 0;7 and 0;9 (p=.096).
Prosodic cues and communicative status of vocalizations

- **Pitch range**: communicative vocalizations have wider pitch range than investigative ones. The difference is more significant at 0;7.

- **Duration**: it is when children are 0;9 that communicative vocalizations display longer duration than investigative vocalizations.
4. Results:

pragmatic functions and prosodic cues

<table>
<thead>
<tr>
<th>Communicative vocalizations</th>
<th>Ángela</th>
<th>Biel</th>
<th>Martí</th>
</tr>
</thead>
<tbody>
<tr>
<td>protest</td>
<td>21</td>
<td>27</td>
<td>11</td>
</tr>
<tr>
<td>request</td>
<td>2</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>satisfaction</td>
<td>4</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>response</td>
<td>-</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>statement</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>surprise</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>vocative</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>fuzzy intention</td>
<td>53</td>
<td>71</td>
<td>53</td>
</tr>
<tr>
<td>TOTAL</td>
<td>80</td>
<td>128</td>
<td>86</td>
</tr>
</tbody>
</table>
4. Results:

pitch range and pragmatic functions

**ANOVA**: marginal effect of the specific pragmatic intentions on pitch range (F(8, 17.451)=2.388, p=.061)

**Post-hoc**: significant differences between pragmatic intentions
4. Results: 

duration and pragmatic functions

**ANOVA**: significant effect of the specific pragmatic intentions on duration $(F(4, 6.819)=32.436, p>.001)$

**Post-hoc**: significant differences between pragmatic intentions:

- protest
- request
- satisfaction
- response
- statement
4. Results

Prosodic cues and specific pragmatic intentions

- **Pitch range**: protests and requests have wider pitch range than responses and statements.

- **Duration**: protests are the longest vocalizations, followed by requests, in the middle there are satisfactions, and the shortest are responses and statements.
5. Discussion and conclusions

Do Catalan-babbling infants display specific prosodic cues to be communicative?

Do Catalan-babbling infants distinguish specific pragmatic functions by means of prosodic cues?

1st. Duration: communicative vocalizations are shorter than non-communicative vocalizations. The difference is only significant at 0;9.

2nd. Pitch range: communicative vocalizations have wider pitch range than investigative vocalizations. This tendency is observed at all ages but it is stronger when children are 0;7.
| 1. Introduction |  
| 2. Goals |  
| 3. Method |  
| 4. Results |  
| 5. Discussion |  

### Goals

- Do Catalan-babbling infants display specific prosodic cues to be communicative?
- Do Catalan-babbling infants distinguish specific pragmatic functions by means of prosodic cues?

1. When children **protest** or **request** they use expanded pitch range and longer duration.

2. When children express **satisfaction** they use wide pitch range but short duration.

3. When children produce **responses** or **statements** they use narrow pitch range and short duration.

5. Discussion and conclusions
5. Discussion and conclusions

1. Introduction

• Infants use consistent prosodic cues (pitch range and duration) to express communicativeness (D’Odorico & Franco, 1991; Papaeliou, Mindakis & Cavouras, 2002; Papaeliou & Trevathen, 2006)

2. Goals

• Before children produce their first words, they use systematic prosodic and gestural cues to express a set of pragmatic meanings:
  • Pitch range is used to distinguish the communicative status of a vocalization and to differentiate among pragmatic functions
  • Duration is also used but results are not so consistent.

3. Method

4. Results

5. Discussion

Prosodic patterns at the pre-linguistic stage have to be investigated in relation to the pragmatic meaning of the vocalization.
References


