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Morphosyntactactic profiles of Spanish-speaking children with Down Syndrome in a sentence repetition task

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Introduction
Language development in people with Down syndrome (DS)

- Characteristic feature of people with DS: language problems

- AIM OF OUR RESEARCH GROUP: study of language development in people with DS:
  - Early lexical development
  - Morphosyntactic development
  - Relation between lexical and morphosyntactic developments
Early lexical development

- Trends of development: comprehension, oral-gestural production.

- Mechanisms in word acquisition (in progress):
  - Joint Attention
  - Socio-pragmatic cues (Baldwin)
Early lexical development → trends of development:

- Productive vocabulary (oral modality): DS = TD
- Productive vocabulary (gestural modality): DS > TD
- Comprehension: DS > TD
Vocabulary

strength in DS
Morphosyntax

- Morphosyntax → most affected areas
  - delay in the transition from 1 word to 2 words utterances
  - shorter and less complex utterances in comparison with TD children

- Acquisition of grammatical morphemes:
  - important difficulties with inflectional morphemes
  - and in comprehension and production
Studies on morphosyntactic development in DS show some problems

- Participants → age of children and adults
  - We need to know early stages.

- Number of participants → very small
  - Representative samples?
    - Great variability in early stages of language development.

- Most of the research → English speakers
  - Data from other languages is needed.
Aims of our research group

- Study of morphosyntactic development from its beginning (20 months of MA) to 6 years of MA.

- Early morphosyntactic development → 20 to 30 meses of MA (already published)
  - 92 children with DS and 92 con TD individually matched on MA and gender
  - 80 children with con DS y 80 con TD matched on lexical development
  - Measure → CDI-Down

  - poorer morphosyntactic performance except in words combination

  - they are able to combine them but in much simple constructions!!
Morphosyntax

Difficult area in DS
Our research aims

AT THIS MOMENT

- Study of morphosyntax from 30 months to 6 years of MA

Measures

- Narration of story → narrations promote complex structures production
- Sentence repetition test → adapted from Devescovi & Caselli (2007)
- MacArthur-Bates adapted to language developmental profile of children with DS (CDI-Down).
PRESENT COMUNICACION

- Data from sentence repetition test

- Measurers
  - Total number of complete sentences produced and MLU-words
  - Omissions (total and by words categories)
  - Errors: agreement
NOTE:

- Part of these data were presented at VII Congreso Internacional de Adquisición del Lenguaje (Bilbao, 2013).

- At the present communication we include analysis of:
  - words types omissions
  - agreement errors
Method
<table>
<thead>
<tr>
<th>MA</th>
<th>Condition</th>
<th>Girls</th>
<th>Boys</th>
<th>Total</th>
<th>MA</th>
<th>CA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mean (range)</td>
<td>Mean (range)</td>
</tr>
<tr>
<td>Grup 1</td>
<td>DS</td>
<td>11</td>
<td>6</td>
<td>17</td>
<td>36,12 (31-40)</td>
<td>108,23 (43-197)</td>
</tr>
<tr>
<td>(31-40 m)</td>
<td>TD</td>
<td>11</td>
<td>6</td>
<td>17</td>
<td>36,18 (31-40)</td>
<td>42,88 (39-47)</td>
</tr>
<tr>
<td>Grup 2</td>
<td>DS</td>
<td>8</td>
<td>9</td>
<td>17</td>
<td>53,00 (41-60)</td>
<td>125,76 (77-174)</td>
</tr>
<tr>
<td>(41-60 m)</td>
<td>TD</td>
<td>8</td>
<td>9</td>
<td>17</td>
<td>53,06 (41-60)</td>
<td>52,65 (36-60)</td>
</tr>
<tr>
<td>Grup 3</td>
<td>DS</td>
<td>8</td>
<td>9</td>
<td>17</td>
<td>67,29 (61-72)</td>
<td>148,94 (110-226)</td>
</tr>
<tr>
<td>(61-72 m)</td>
<td>TD</td>
<td>8</td>
<td>9</td>
<td>17</td>
<td>67,18 (61-72)</td>
<td>61,88 (52-79)</td>
</tr>
<tr>
<td>Total</td>
<td>DS</td>
<td>27</td>
<td>24</td>
<td>51</td>
<td>52,14 (31-72)</td>
<td>127,65 (43-226)</td>
</tr>
<tr>
<td></td>
<td>TD</td>
<td>27</td>
<td>24</td>
<td>51</td>
<td>52,14 (31-72)</td>
<td>52,47 (39-79)</td>
</tr>
</tbody>
</table>

- All children were matched on MA and gender
- Age limits are arbitraries, but they show important changes:
  - 31-40 months: basic domain of syntax
  - 41-60 months: more mature domain
  - 61-72 months: more complex structures
**Procedure**

- Individual tests in quiet contexts in schools
- Random sentences except the first 3 ones (shorter ones)

**Instruments**

- Sentences repetition test (Devescovi & Caselli, 2007).
- 27 sentences with different lengths and morphosyntactic complexity
- All sentences were simple with 3-7 words
- Some examples:
<table>
<thead>
<tr>
<th>TYPE OF SENTENCES</th>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple sentences with copula</td>
<td>El coche es rojo</td>
</tr>
<tr>
<td></td>
<td>the car is red</td>
</tr>
<tr>
<td>Simple sentences with one argument (singular)</td>
<td>El niño corre</td>
</tr>
<tr>
<td></td>
<td>the child (masculine) runs</td>
</tr>
<tr>
<td>Simple sentences with one argument (plural)</td>
<td>Las niñas corren</td>
</tr>
<tr>
<td></td>
<td>the children (feminine) run</td>
</tr>
<tr>
<td>Sentences with one argument  and one modifier</td>
<td>El perro corre deprisa</td>
</tr>
<tr>
<td></td>
<td>the dog runs fast</td>
</tr>
<tr>
<td>Simple sentences with two arguments and a simple preposition</td>
<td>El perro está en el jardín</td>
</tr>
<tr>
<td></td>
<td>the dog is in the garden</td>
</tr>
<tr>
<td>Simple sentences with three arguments and a simple preposition</td>
<td>Lucas da la mano a María</td>
</tr>
<tr>
<td></td>
<td>Lucas gives his hand to María</td>
</tr>
<tr>
<td>Simple sentences with three arguments and a simple preposition</td>
<td>Lucas lee el libro al niño</td>
</tr>
<tr>
<td></td>
<td>Lucas reads the book to the child (masculine)</td>
</tr>
</tbody>
</table>
Results 1:

- Number of total sentences produced
  - MLU-words
- Number of omissions
Children with DS produce lower number of complex sentences.

No interaction $\rightarrow$ DS < TD in each age group.
Children with DS produce shorter sentences.

Interaction:
- TD → no age differences
- DS → Group 1 < Group 2 < Group 3 → They show progress
Children with DS present higher number of omissions

Interaction →
- TD → no differences by age
- DS → Group 1 > Group 2 > Group 3 → there is developmental progress!!
Results 2:

Number of omissions as a function of classes of words
RESULTS

For Group, Age level, and Interaction → results are quite similar to those founded in omissions analysis:

• Children with DS omit larger number of elements

• Interaction:
  - TD → no differences by age
  - DS → Group 1 = Group 2 > Group 3

We will center on word classes and their interactions
Classes of words (statistically significant)

Modifiers < Nouns < Verbs < Dets = Preps
Group x Classes of words (statistically significant)

- **DS →** Modifiers < Nouns < Verbs < Dets = Preps
- **TD →** no differences between classes
Group x Age level x Classes of words (no significant)

- **DS** → Progressive decrease in all classes of words except Modifiers
  - More omitted classes of words: Dets + Preps
- **TD** → Few omissions in general, except in group 31-40.
Greater resemblance in omitted classes in group 1:
1. Dets and Preps
2. Nouns and Verbs

DS omite more verbs!!

Changing scale
Results 3:

Number of omissions as a function of classes of words ONLY IN CHILDREN WITH DS
Previous analysis do not allow to know the developmental profile in each age level of children with DS, considering statistically significative differences.

\[ \text{ANOVA 3 (MA Levels) x 5 (Classes of Words) (= repeated measures)} \]

Again, we will center on classes of words and their interactions.
Classes of words (significant, partial eta squared = 0.593)

DS: Modifiers < Nouns < Verbs < Dets = Preps

(TD = Modifiers = Nouns = Verbs < Dets = Preps)
MA levels x Classes of words (statistically significant, partial $\eta^2 = 0.124$)

(Figure = previous figure, but with principal effect analysis)

- **31-40**: Modifiers < Nouns = Verbs < Dets + Preps
- **41-60**: Modifiers = Nouns = Verbs < Dets + Preps (but Nouns < Verbs)
- **61-72**: Modifiers = Nouns = Verbs < Dets = Preps
Results 4:
Analysis of agreement errors
<table>
<thead>
<tr>
<th>MA Groups</th>
<th>DS</th>
<th>Type of errors</th>
<th>TD</th>
<th>Type of errors</th>
</tr>
</thead>
</table>
| Group 1   | 11 | 7 = number S/P (S-sing / V-plural or viceversa)  
2 = number (Det-Noun)  
1 = gender (Det-Noun)  
1 = verb person (3ª → 2ª) | 3  | 3 = number S/P (S-sing / V-plural or viceversa) |
| (31-40 m) |    | Greater number of errors for higher MLU |    |                                            |
| Group 2   | 11 | 9 = number S/P (S-sing / V-plural or viceversa)  
1 = number (Det-Noun)  
1 = gender (Det-Noun) | 0  | --                                         |
| (41-60 m) |    |                                            |    |                                            |
| Group 3   | 21 | 17 = number S/P (S-sing / V-plural or viceversa)  
3 = number (Det-Noun)  
1 = gender (Det-Noun) | 0  | --                                         |
| (61-72 m) |    |                                            |    |                                            |
| Total     | 43 |                                                                                  | 3  |                                            |
Results 5:

Is the sentence repetition test a valid and reliable measure?
Devescovi & Caselli (2007) found a high relationship statistically significant in children with TD (aged 2-4 years) between performance in sentences repetition test and spontaneous language examples.

Is it possible to generalize these results to people with DS?

Here are 3 extreme cases:

- Child 1: MLU = 1, omissions = 105.
- Child 2: MLU = 1.89, omissions = 82.
- Child 3: MLU = 4.89, omissions = 5.

Orthographical transcription of 50 utterances-each child (if possible).

An utterance was defined as a sequence of words preceded or followed by silence (pause) or by a conversational turn.
<table>
<thead>
<tr>
<th></th>
<th>Child 1</th>
<th>Child 2</th>
<th>Child 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MLU</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RT</td>
<td>1</td>
<td>1,89</td>
<td>4,89</td>
</tr>
<tr>
<td>SL</td>
<td>1</td>
<td>1,72</td>
<td>3,94</td>
</tr>
<tr>
<td><strong>Omissions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RT</td>
<td>105</td>
<td>82</td>
<td>5</td>
</tr>
<tr>
<td>SL</td>
<td>A lot</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td><strong>Omissions / total words</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RT</td>
<td>78,95 %</td>
<td>61,65 %</td>
<td>3,76 %</td>
</tr>
<tr>
<td>SL</td>
<td>High</td>
<td>11,63 %</td>
<td>4,57 %</td>
</tr>
</tbody>
</table>

- Classes of words omitted in SL → grammatical words (pronouns, determinants, auxiliaries, etc.).
<table>
<thead>
<tr>
<th>Child 1</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Ahí → there</td>
<td></td>
</tr>
<tr>
<td>- Papá → Daddy</td>
<td></td>
</tr>
<tr>
<td>- tos → cough</td>
<td></td>
</tr>
<tr>
<td>- este → this</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Child 2</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Después (a) dormir → after this, (we are going to) sleep</td>
<td></td>
</tr>
<tr>
<td>- el nene se cae → the child falls</td>
<td></td>
</tr>
<tr>
<td>- no, ahí → No, there</td>
<td></td>
</tr>
<tr>
<td>- (el) café → (the) coffee</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Child 3</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>- La niña ha ido (a) pasear (con) la rana y el perro</td>
<td></td>
</tr>
<tr>
<td>- que su padre (lo) quería destapar</td>
<td></td>
</tr>
<tr>
<td>- y se lo ha hecho daño</td>
<td></td>
</tr>
<tr>
<td>- un niño que estaba a (=en el) colegio</td>
<td></td>
</tr>
</tbody>
</table>
Discussion / conclusions
Children with DS:
- Poorer performance in all measures
- Developmental progress in all ages!!

Children with TD → no age differences

Explanation of results of children with TD:
- Extremely easy task → ceiling effect.
- Devescovi y Caselli (2007) noted that test is not sensitive from 3-4 years.
- Children with DS → due to their problems with morphosyntaxis → test is sensitive to their progress:

Test seems useful for children and adolescents with DS
Adolescents with DS do not reach test ceiling → it is possible that some progress continue in later ages

Progress beyond adolescence WOULD NOT confirm critical period hypothesis

Support to Chapman et al. data (1998) with children, adolescents, and adults

Important individual differences in children with DS

Look for explanations of these differences → theory and practice
Greater omissions of **Determiners** and **Prepositions** → similar to data of language development in people with DS.

- Tendency to omit more verbs than nouns

  Support to Galeote et al. (2007) data about a greater production of nouns in children with DS from 8 to 30 months of MA

- Less omission of **Modifiers** → this class of word appeared at the end of sentences → better remembering.

- There are also important individual differences in children and adolescents with DS.
Limitations

- $n = \text{significative, but there are still many children not evaluated}$ (110)
- Just sentences repetition test $\rightarrow$ other type of tests are needed
  results of the other measures (narratives + CDI)
- Remain to be analyzed many qualitative and quantitative aspects:
  - Stuttering and speech problems $\rightarrow$ load in memory (more time for production)
  - Unintelligibility
  - They refuse to repeat ($\Rightarrow$ they are aware of the difficulty)
  - Great gesture support
  - Some disruptive behaviors: precipitation, lack of attention, negation, etc.
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