The role of the functional heads in Hungarian PP recursion

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Questions to be answered

1. Do Hungarian children interpret recursive structures as direct recursion (conjunction) at first?
2. Does a more salient functional head help Hungarian children interpret recursive PPs?
3. Do the different word orders of recursive PPs affect the interpretation of them?
What is recursion?

• HCF (2002): Recursion is the core property of human speech, that differentiates human communication from the communicational methods of animals.

• Chomsky: recursion is the procedure of *merge*.
  
  Two kinds of input:

  1. a new element
  2. an element which was created by *merge* before.

• A narrower notion of recursion: merge when the output category is the same as one of the input elements.
Direct vs. Indirect recursion

Hollebrandse-Roep (2014), Roep (2011)

**Direct recursion:** *The broom is next to the oven* (and) *next to the dustbin* (and) *next to the table.*

Direct recursion = conjunction.
At first English and Japanese children acquire the directly recursive, later the indirectly recursive interpretation.

**Indirect recursion:** *The broom is next to the oven next to the dustbin next to the table.*
The role of the functional heads in indirect recursion

• DiSciullo (2015) in the case of indirect recursion, there is an intervening (covert) functional element between the recurring phrases.

• E.g.:
  • The broom is 0 next to the oven 0 next to the dustbin 0 next to the table.

• A seprű az asztal mellett lévő szemetes the broom the table next to being dustbin mellett lévő tűzhely mellett van. next to being oven next to is
Hungarian recursive PPs

Two kinds of functional heads (-i and lévő).

(a) embedded PP adjectivalized by -i

\[ A \text{ krokodil} [_{\text{AdjP}}[_{\text{PP}} a \text{ zsiráf előtt}] -i] \text{ oroszlán} ] \text{ előtt}] \text{ áll.} \]
the crocodile the giraffe before-ADJ lion before stands
’The crocodile stands before the lion (before) before the giraffe.’

(b) embedded PP in a lévő participle phrase

\[ A \text{ krokodil} [_{\text{PartP}}[_{\text{PP}} a \text{ zsiráf előtt}] \text{ lévő}] \text{ oroszlán} ] \text{ előtt}] \text{ áll.} \]
the crocodile the giraffe before being lion before stands
’The crocodile stands before the lion (being) before the giraffe’
Hungarian recursive PPs

Two kinds of tested structures:

(a) subject – PP – V order:

A krokodil a zsiráf előtt -i/lévő oroszlán előtt áll.
the crocodile the giraffe before-ADJ/being lion before stands
’The crocodile stands before the lion before the giraffe.’

(b) PP – subject – V order:

A zsiráf előtt -i/lévő oroszlán előtt krokodil áll.
the giraffe before-ADJ/being lion before crocodile stands.
’Before the lion before the giraffe a crocodile stands.’
Experiments

• Participants

<table>
<thead>
<tr>
<th></th>
<th>Experiment 1</th>
<th>Experiment 2</th>
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</thead>
<tbody>
<tr>
<td>Preschoolers:</td>
<td>N = 19, mean age = 6;7</td>
<td>N = 17, mean age = 6;6</td>
</tr>
<tr>
<td>2nd graders:</td>
<td>N = 22, mean age = 8;5</td>
<td>N = 23, mean age = 8;5</td>
</tr>
<tr>
<td>Adults:</td>
<td>N = 20, mean age = 48</td>
<td>N = 27, mean age = 44</td>
</tr>
</tbody>
</table>

• Methods

• A and B tests – different sentence types
• Forced choice test
• 4 PPs: under ‘alatt’, above ‘fölött’, before ‘előtt’, behind ‘mögött’
• Same participants were in the two experiments
• One of the pictures: recursive, the other one: conjunctive
• Randomized order according to -i and lévő and conjunctive-recursive order
• Fillers: pictures about animals, they had to pick one of them as well.
Example:
The lion the giraffe before monkey under sits
‘The lion is sitting under the monkey before the giraffe.’

**Conjunctive:** The lion is sitting under the monkey (and) before the giraffe

**Recursive:** The lion is sitting under the monkey before the giraffe
1st Experiment (test A)
Subject – PP – V order:
Az oroszlán a zsiráf előtt-i/lévő majom alatt üldögél.
the lion the giraffe before monkey under sits
‘The lion is sitting under the monkey before the giraffe.’

The expected visual distance of the elements does not correspond to the word order.
1st Experiment - results

- **Preschoolers**
  - Recursive: 27%
  - Conjunctive: 73%
  - P < 0.001***

- **2nd graders**
  - Recursive: 38%
  - Conjunctive: 62%
  - P < 0.05*

- **Adults**
  - Recursive: 80%
  - Conjunctive: 20%
  - P < 0.001***
1st Experiment – results
recursive answers

Recursive

P < 0.001***

P < 0.05*

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Preschoolers 2nd graders Adults

recursive
1st Experiment – results
-i and lévő

<table>
<thead>
<tr>
<th></th>
<th>Preschoolers</th>
<th>2nd graders</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>lévő</td>
<td>50%</td>
<td>55%</td>
<td>45%</td>
</tr>
<tr>
<td>i</td>
<td>50%</td>
<td>45%</td>
<td>55%</td>
</tr>
</tbody>
</table>
Problem with the Subject – PP – V order

The Subject – PP – V order seemed to be difficult for children to interpret.

Because of the structure?
Or Because of recursion?

Solution: Experiment 2

The lion is sitting under the monkey before the giraffe
2nd Experiment (test B)
PP – subject – V order:
The **giraffe** before **monkey** under **lion** sits
‘There is a lion under the monkey before the giraffe.’

The expected visual distance of the elements **corresponds** to the word order.
2nd Experiment - results

Preschoolers
- Rec: 61%
- Conj: 39%
- $P < 0.05$*

2nd graders
- Rec: 76%
- Conj: 24%
- $P < 0.001$***

Adults
- Rec: 90%
- Conj: 10%
- $P < 0.001$***
2nd Experiment - results recursive answers

recursive

P < 0.01**
2nd Experiment – results -i and lévő

<table>
<thead>
<tr>
<th>Age Group</th>
<th>lévő</th>
<th>i</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preschoolers</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>2nd graders</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Adults</td>
<td>50%</td>
<td>50%</td>
</tr>
</tbody>
</table>
1st and 2nd Experiment
1st and 2nd Experiment – results recursive answers

<table>
<thead>
<tr>
<th>Group</th>
<th>1st Experiment (subj - PP - V)</th>
<th>2nd Experiment (PP - subj - V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preschoolers</td>
<td>1st: 27%</td>
<td>2nd: 61%</td>
</tr>
<tr>
<td></td>
<td>P &lt; 0.001***</td>
<td></td>
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</table>
Discussion

1st and 2nd Experiment:

-\( i \) and \( \text{lévő} \) no difference:
  because both of them are overt functional elements

The PP – Subject – V order was easier:
  a structure is easier to compute if the expected visual path correspond to the word order
Conclusion 1

1. Do Hungarian children interpret recursive structures as direct recursion (conjunction) at first?

Yes, they learn to interpret embedded structures recursively meanwhile they acquire Hungarian.
Conclusion 2

2. Does a more salient functional head help Hungarian children interpret recursive PPs?

No, lévő (a more salient functional element) helped children in neither of the experiments to interpret recursive PPs.

No significant difference
Conclusion 3

3. Do the different structures of embedded PPs affect the recursive interpretation of them?

Yes, when the word order corresponds to the expected visual distance of the elements (A) it is easier to interpret, compared to when it doesn’t (B).

A

2

1

3

A zsiráf előtti majom alatt ül

B

3

2

1

Az oroszlán a zsiráf előtti majom alatt ül.
References


Thank you for your attention!