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 resursive 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-Roeper (2014), Roeper (2011)

Direct recursion: *The broom is next to the oven (and) next to the dustbin (and) next to the table.*
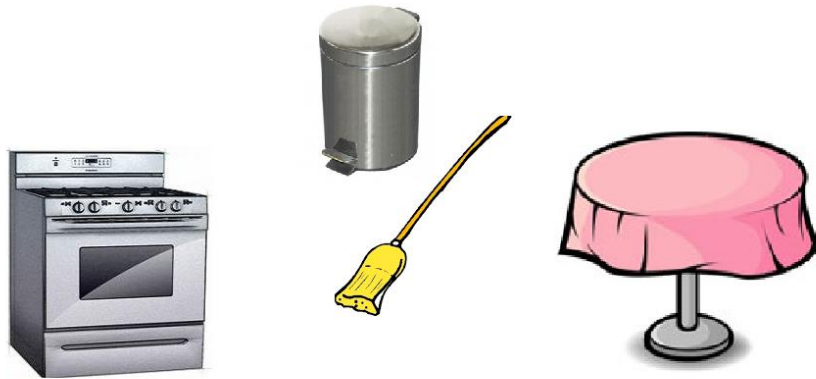
Direct recursion = conjunction.
At first English and Japanese children acquire the directly recursive, later the indirectly recursive interpretation.

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 indrect recursion, there is an intervening (covert) functional element between the recursing 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 krokodil [PP [AdjP [PP *a zsiráf* előtt] **-i**] *oroszlán*] *előtt*] áll.
the crocodile   the giraffe before-ADJ lion before stands
'The crocodile stands before the lion before the giraffe.'

(b)   embedded PP in a *lévő* participle phrase

A krokodil [PP [PartP [PP *a zsiráf előtt*] ***lévő***] *oroszlán*] *előtt*] *áll*.
the crocodile   the giraffe before being lion before stands
'The crocodile stands before the lion (being) before the giraffe'
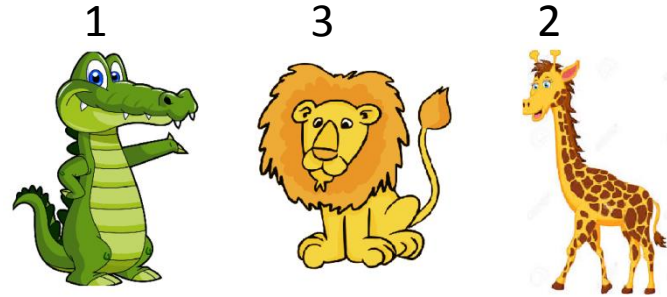
Hungarian recursive PPs

Two kinds of tested structures:

1   3   2

(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

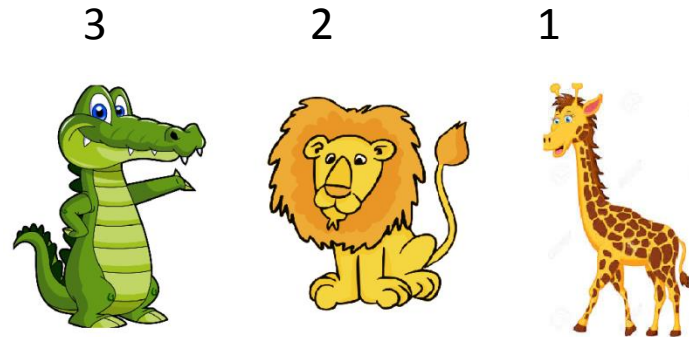'The crocodile stands before the lion before the giraffe.'

3   2   1

(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**

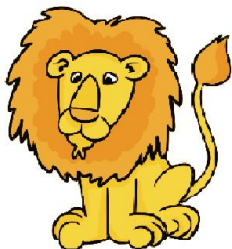|	Experiment 1	Experiment 2
Preschoolers:	N = 19, mean age = 6;7	N =17, mean age = 6;6
2nd graders:	N = 22, mean age = 8;5	N=23, mean age = 8;5
Adults:	N = 20, mean age = 48	N=27, mean age = 44

- **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:

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.'

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

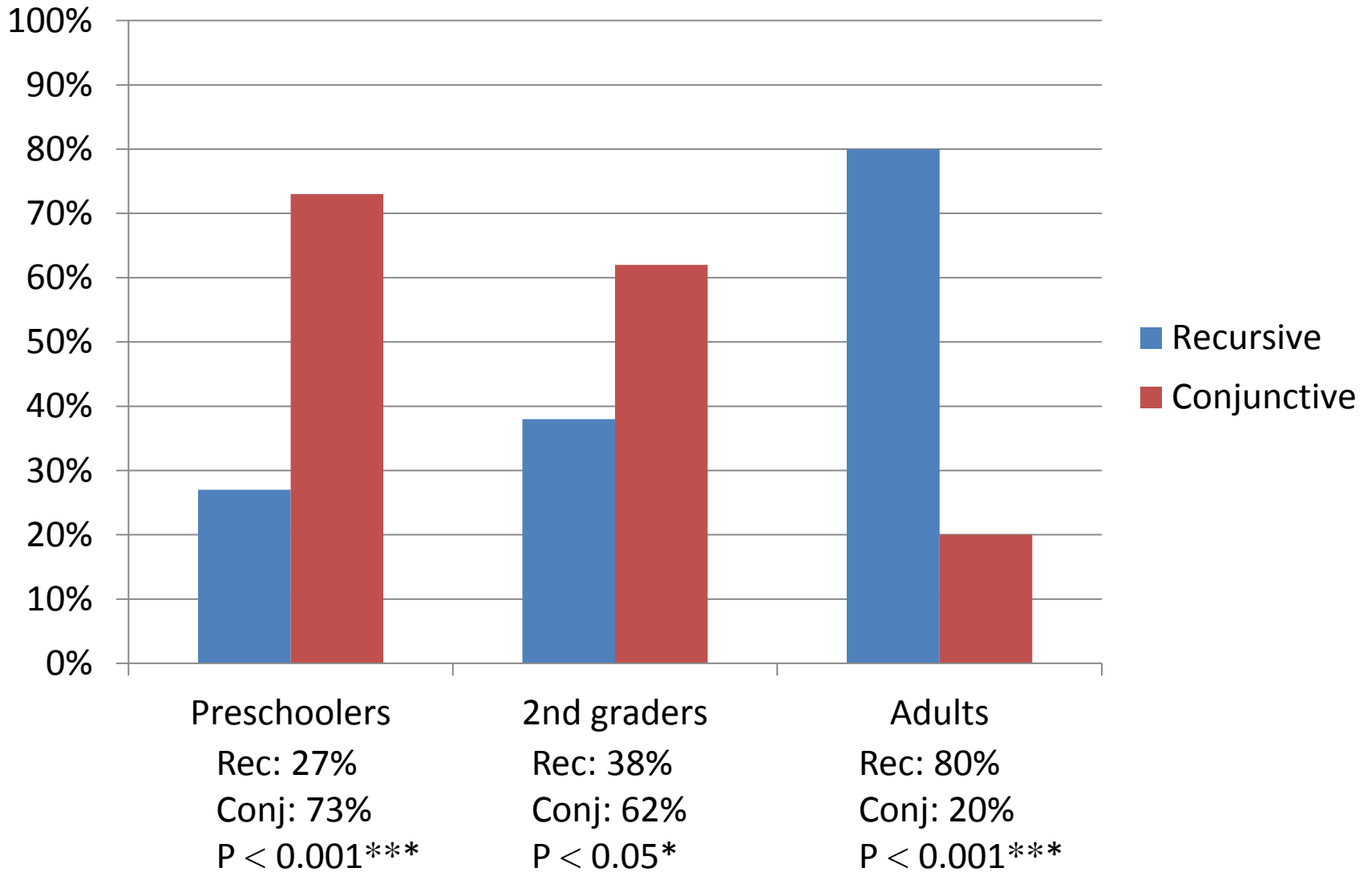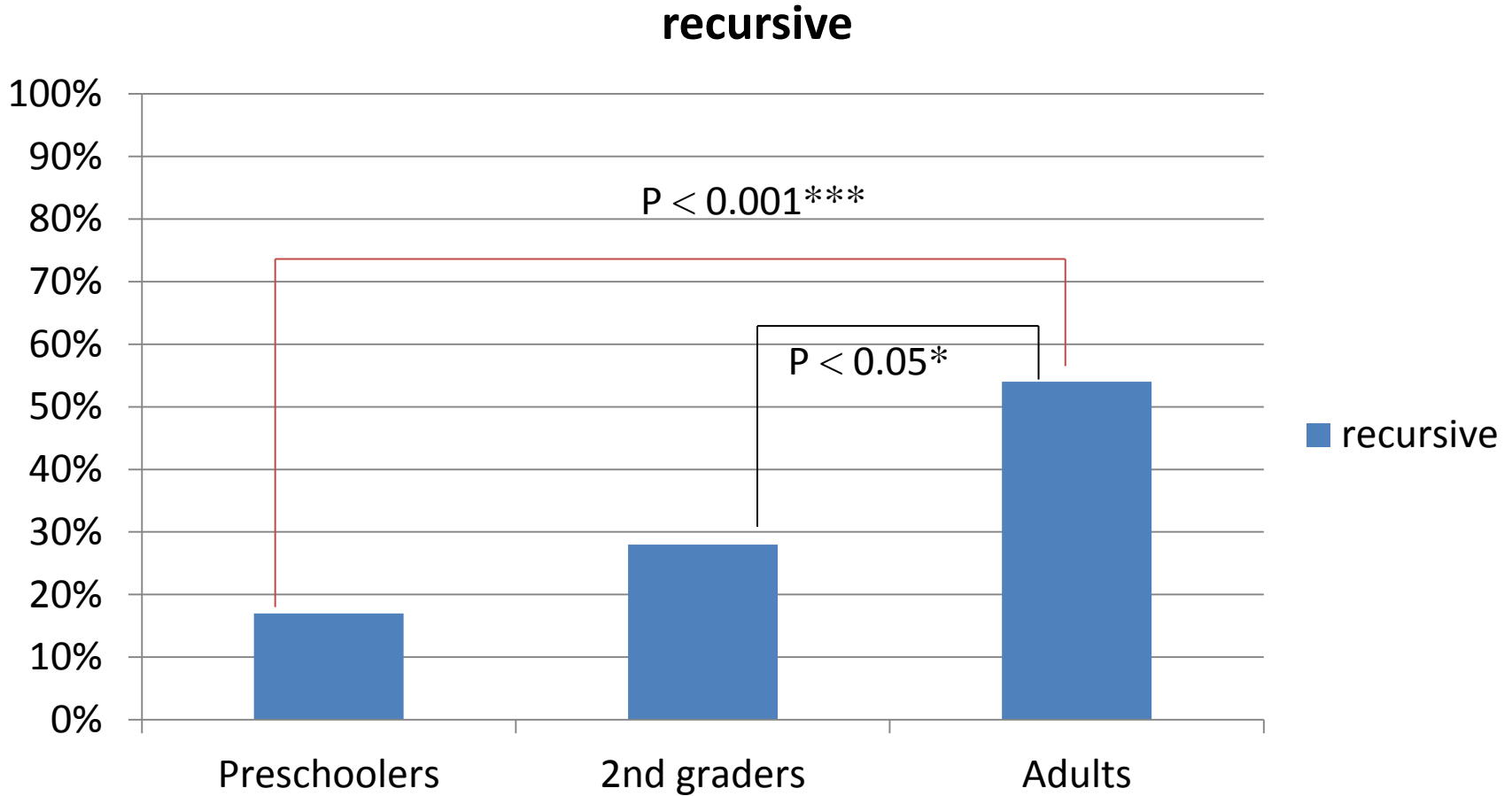*'The lion is sitting under the monkey before the giraffe.'*

3

2

1

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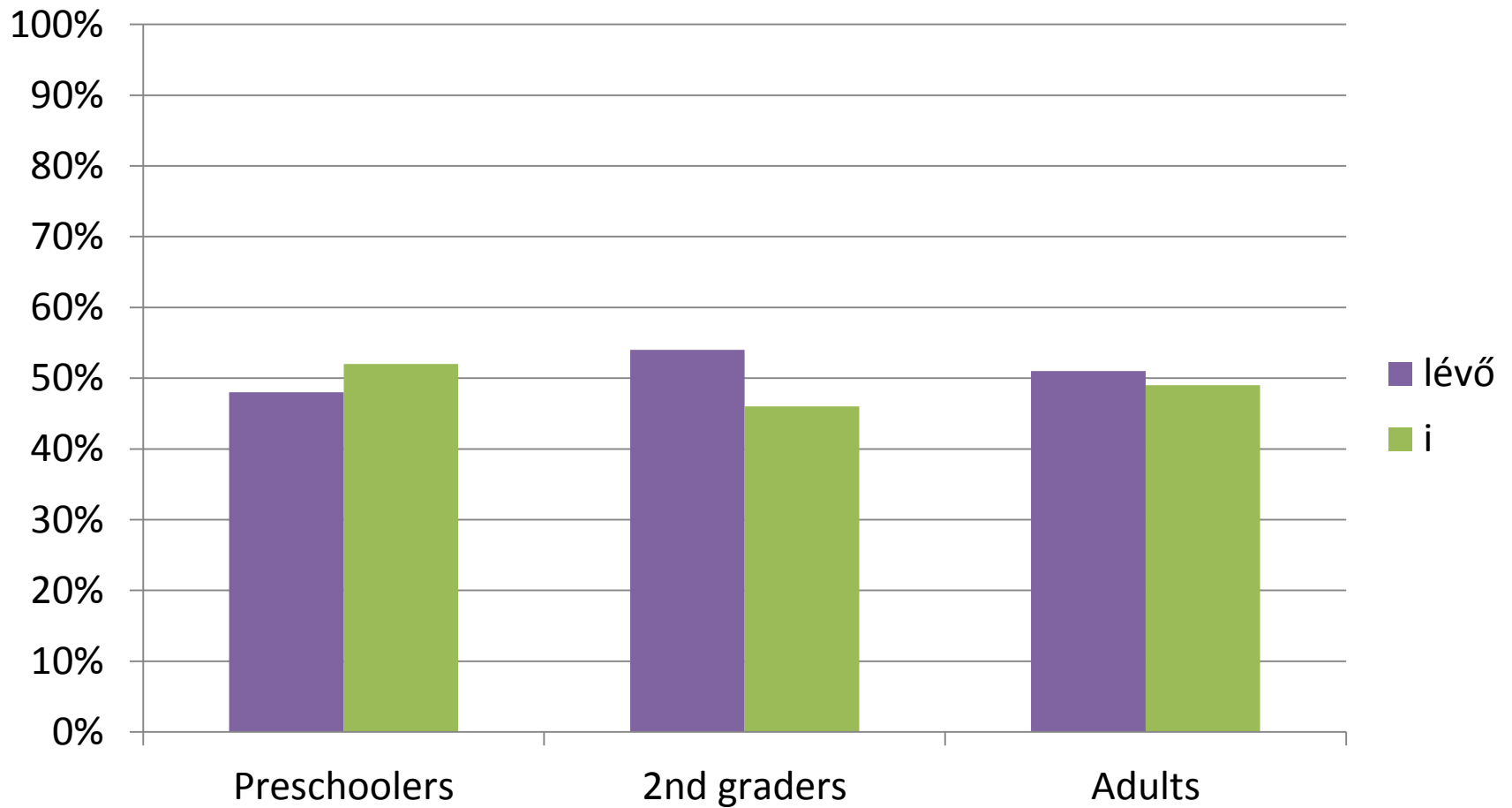
1st Experiment - results

Legend: ■ Recursive ■ Conjunctive

	Preschoolers	2nd graders	Adults
	Rec: 27%	Rec: 38%	Rec: 80%
	Conj: 73%	Conj: 62%	Conj: 20%
	$P < 0.001$***	$P < 0.05$*	$P < 0.001$***

1st Experiment – results recursive answers

recursive

P < 0.001***

P < 0.05*

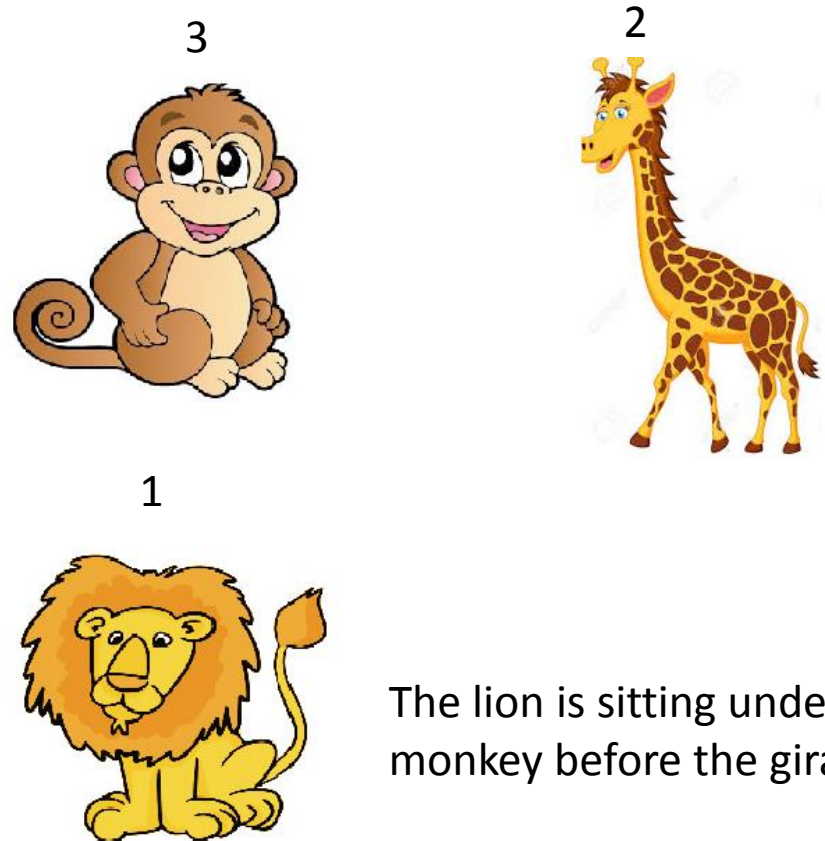# 1st Experiment – results
-i and lévő

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

3

2

1

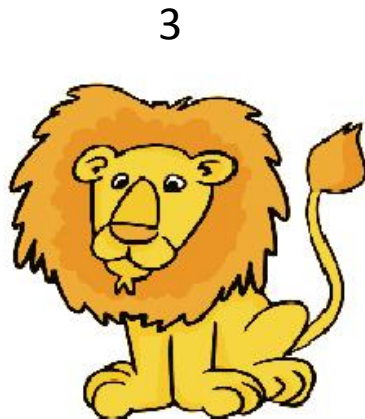The lion is sitting under the monkey before the giraffe

2nd Experiment (test B)

PP – subject – V order:

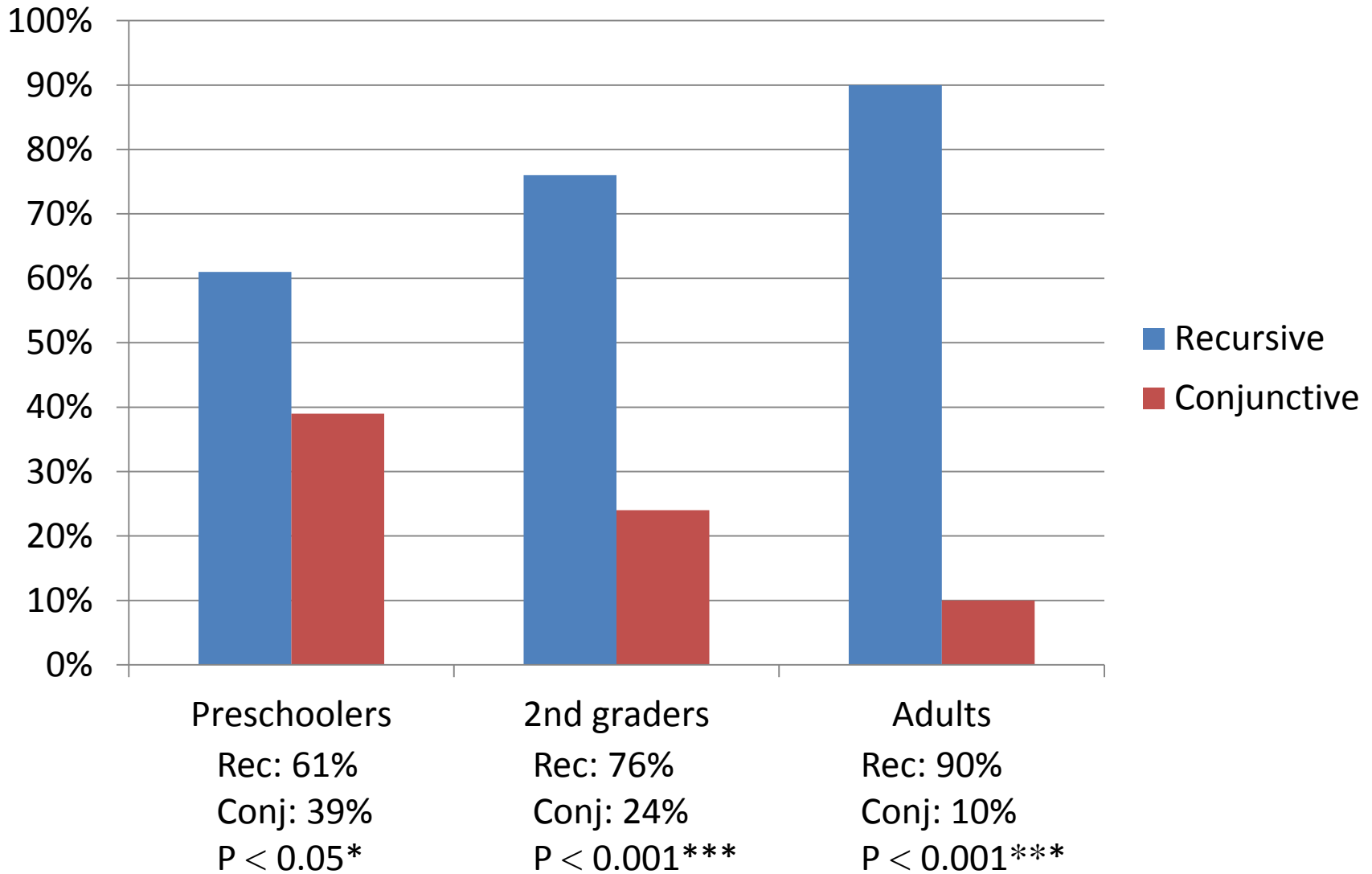A   zsiráf előtt-i/lévő majom alatt oroszlán üldögél.

The **giraffe** before   **monkey** under **lion**   sits

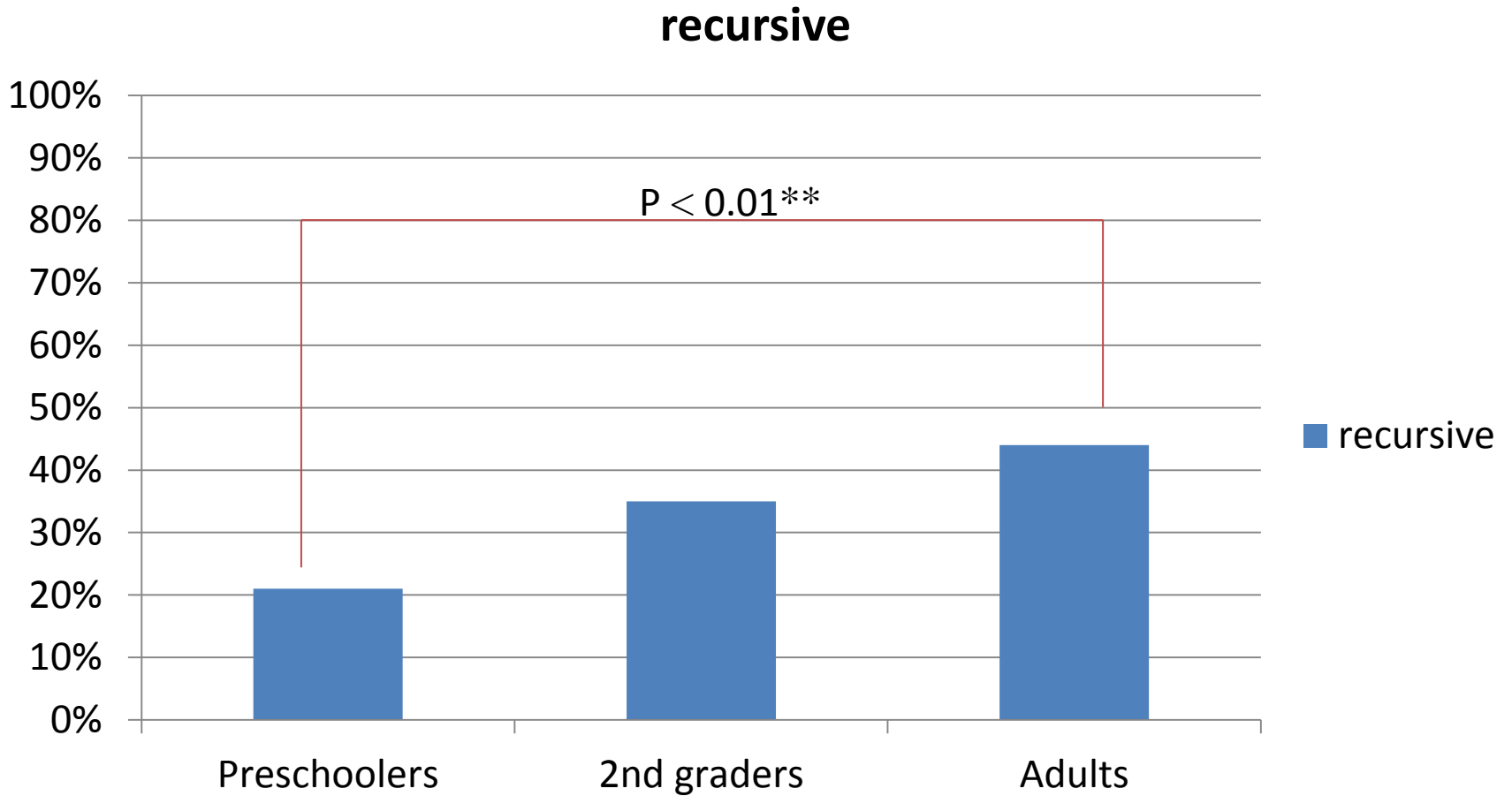'*There is a lion under the monkey before the giraffe.*'

2

1

3

The expected
visual distance
of the elements
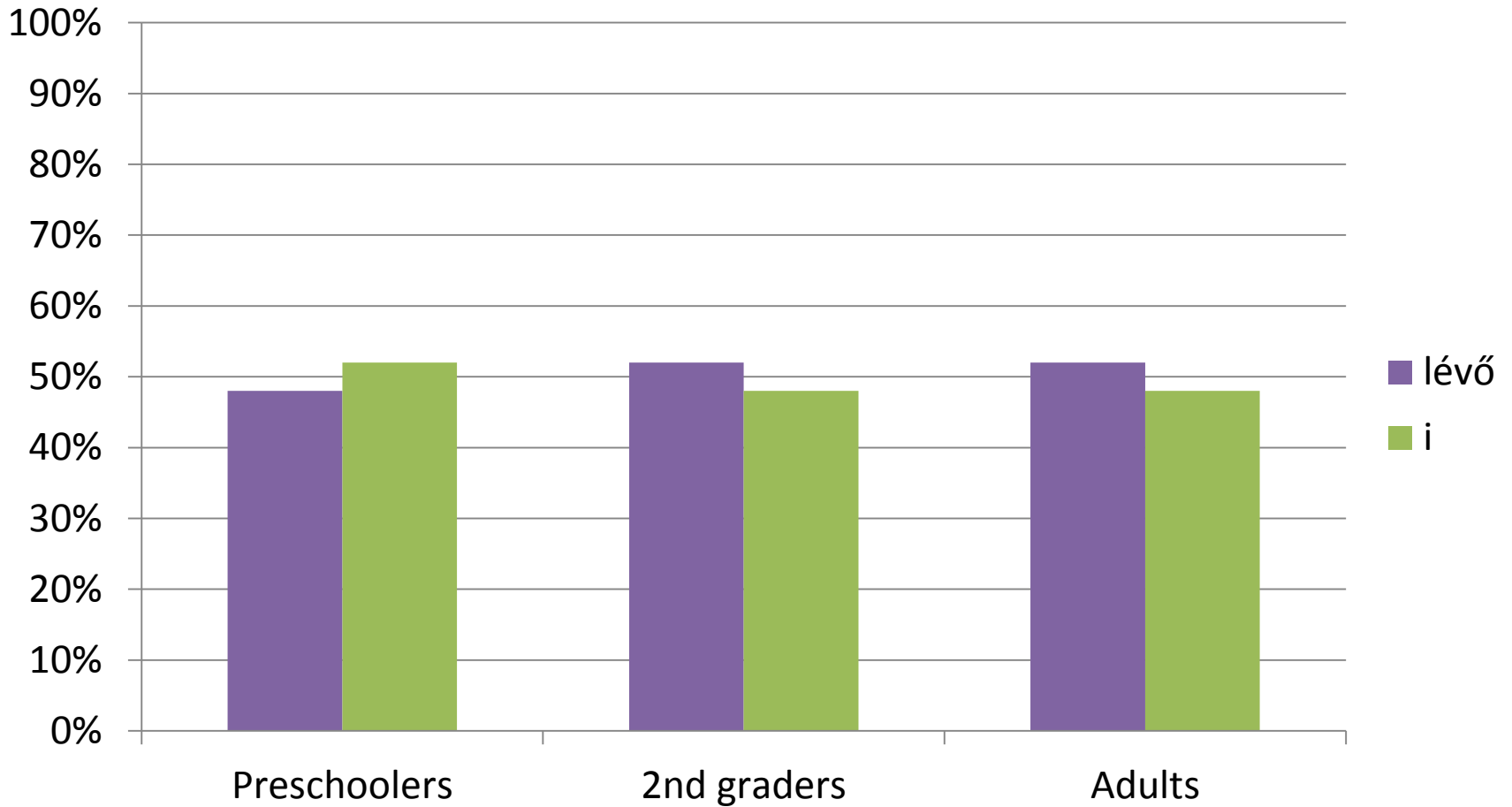**corresponds** to
the word order.

2nd Experiment - results

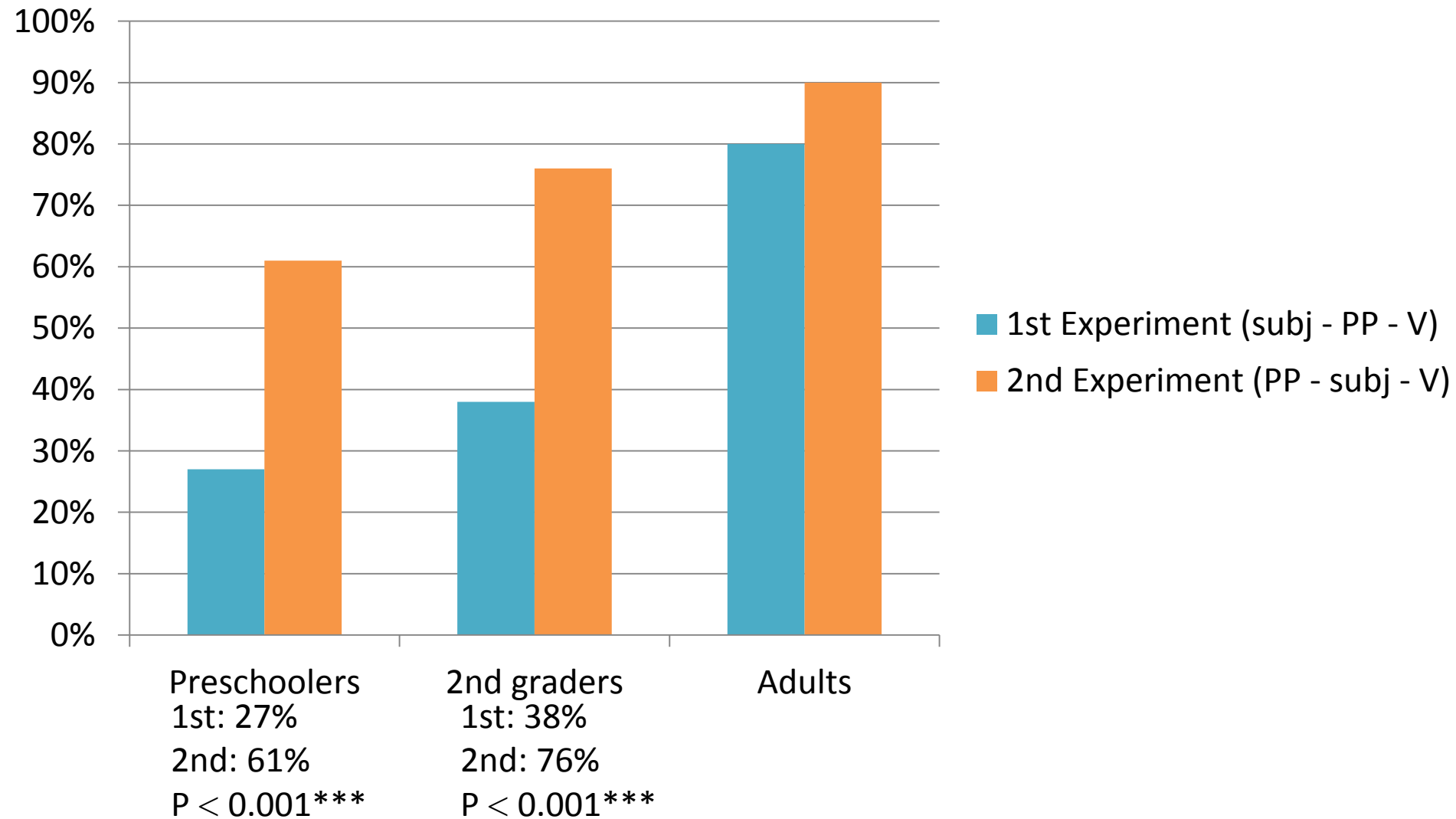# 2nd Experiment - results recursive answers

recursive

2nd Experiment – results
-i and lévő

1st and 2nd Experiment

1st and 2nd Experiment – results recursive answers

Legend:
- 1st Experiment (subj - PP - V)
- 2nd Experiment (PP - subj - V)

Preschoolers
1st: 27%
2nd: 61%
P < 0.001***

2nd graders
1st: 38%
2nd: 76%
P < 0.001***

Adults

Discussion

1st and 2nd Experiment:

-i and *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.

Acquisition path

- 1st Experiment (subj - PP - V)
- 2nd Experiment (PP - subj - V)
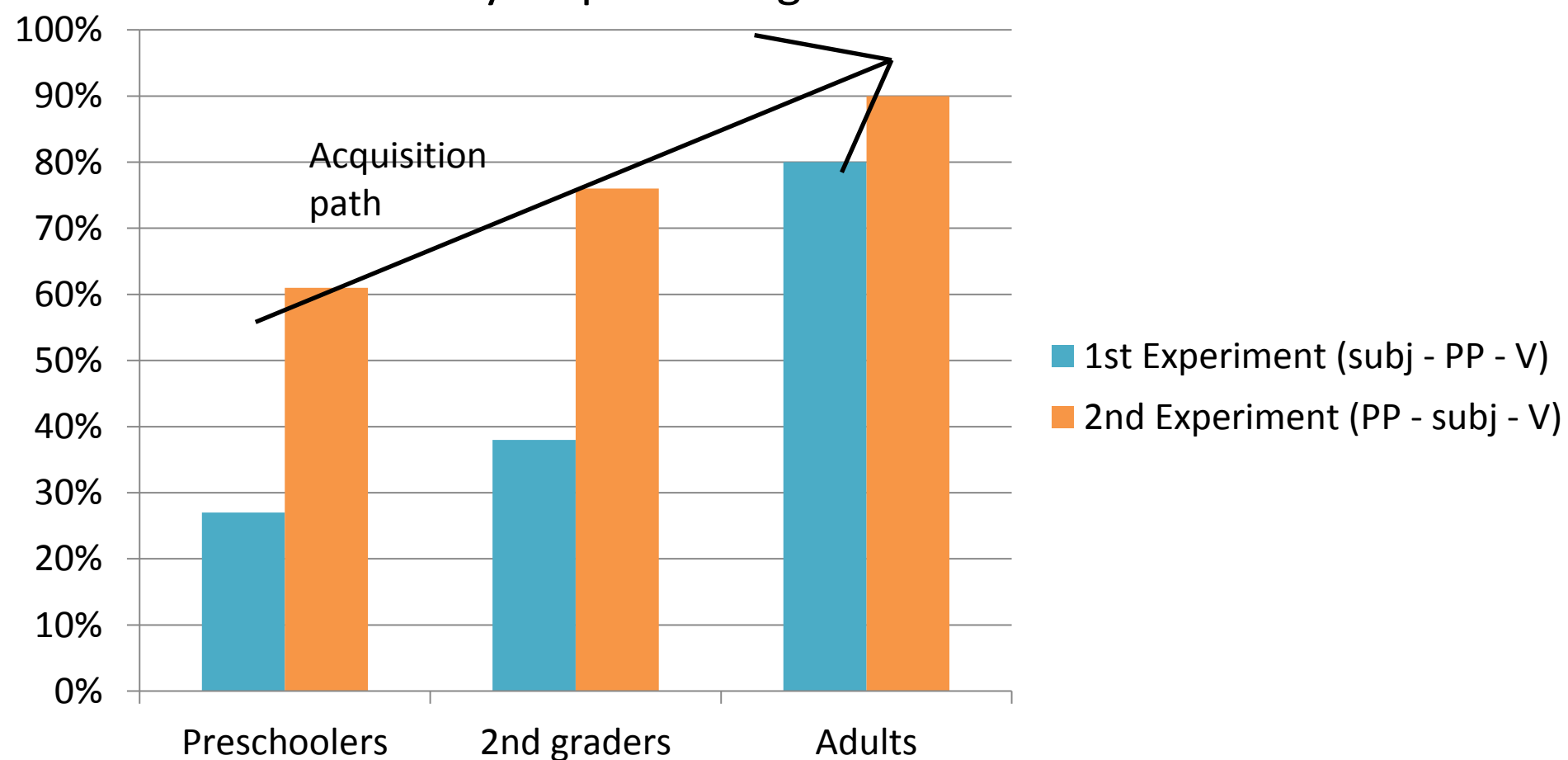
Conclusion 2

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.
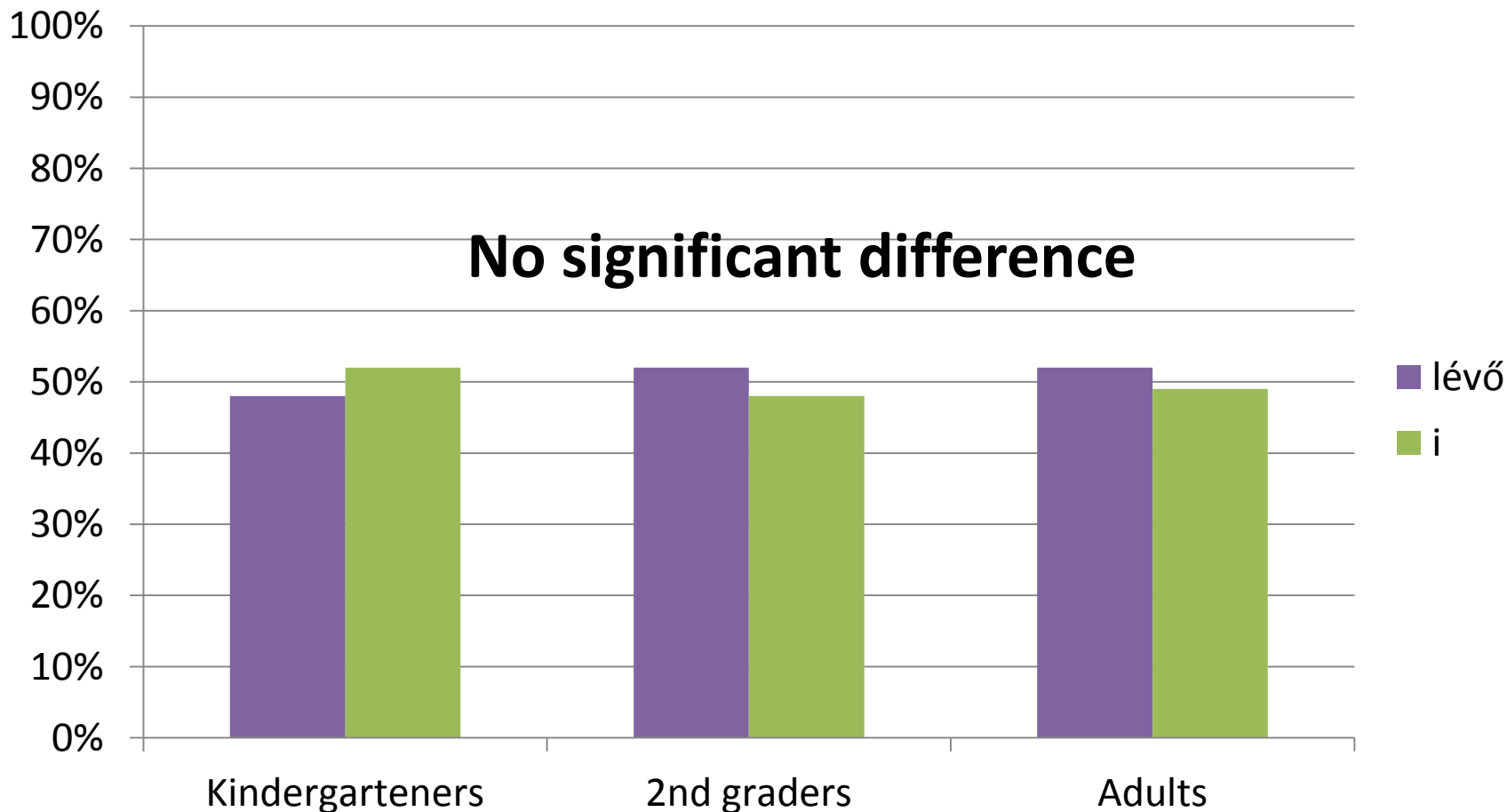
Conclusion 3

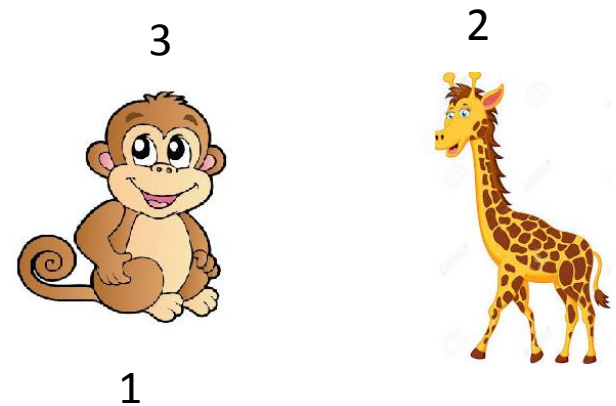**3. Do the different structures of embedded PPs affect the recursive interpretation of them?**

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

A

B

A zsiráf előtti majom alatt oroszlán ül

Az oroszlán a zsiráf előtti majom alatt ül.

References

- Di Sciullo, A. M. 2015. On the Domain Specificity of The Human Language Faculty and the Effects of Principles of Computational Efficiency: Contrasting Language And Mathematics.*RevistaLinguística*11/1: 28-53.

- Hauser, M.–Chomsky, N.–Fitch, T. 2002. The faculty of language: What is it, Who has it, and How did it evolve? *Science,* 298: 1569-1579.

- Hollebrandse, B.–Roeper, Tom 2014. Empirical Results and Formal Approaches to Recursion in Acquisition In:Tom Roeper– Margaret Spears(eds.) *Recursion: Complexity in Cognition*. Springer. Berlin. 179-220.

- Roeper, T. 2011. The Acquisition of Recursion: How Formalism Articulates the Child's Path, *Biolinguistics* 5/1–2: 57–86.

Thank you for your attention!