

Recursive Structures in Language Acquisition

Recent findings, open questions, and implications for linguistic theory

Emma J. Merritt



Presentation Overview

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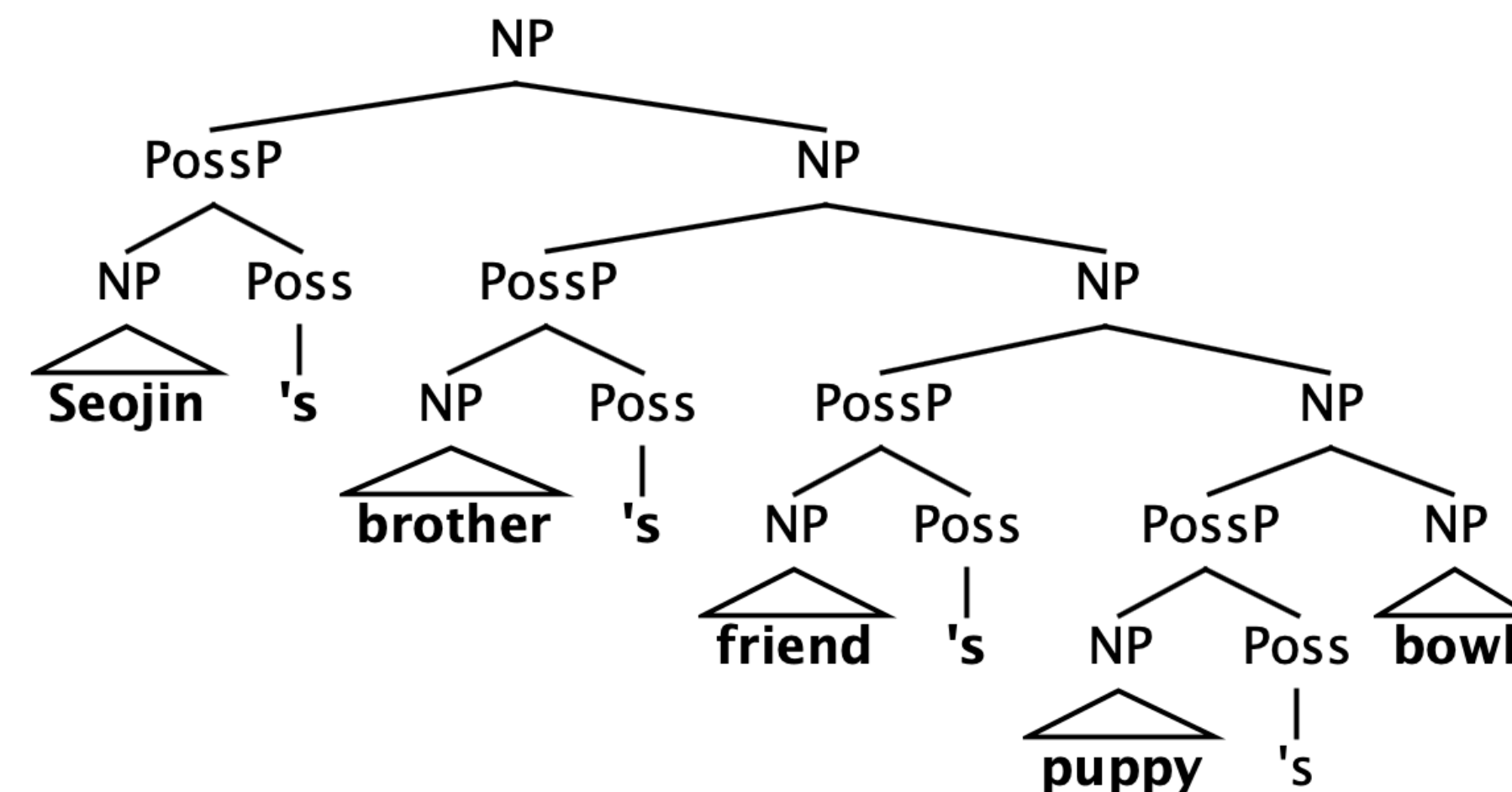
What is Recursion?

Definitions

- An operation that takes its own output as the input (Corballis, 2014:5)
- “the ability to iterate syntactic constituents inside constituents” (Pérez-Leroux et al., 2012)
- A defining property of UG (Hauser, Chomsky, & Fitch, 2002; Limbach & Adone, 2010)

NP → N (PossP)

PossP → NP 's

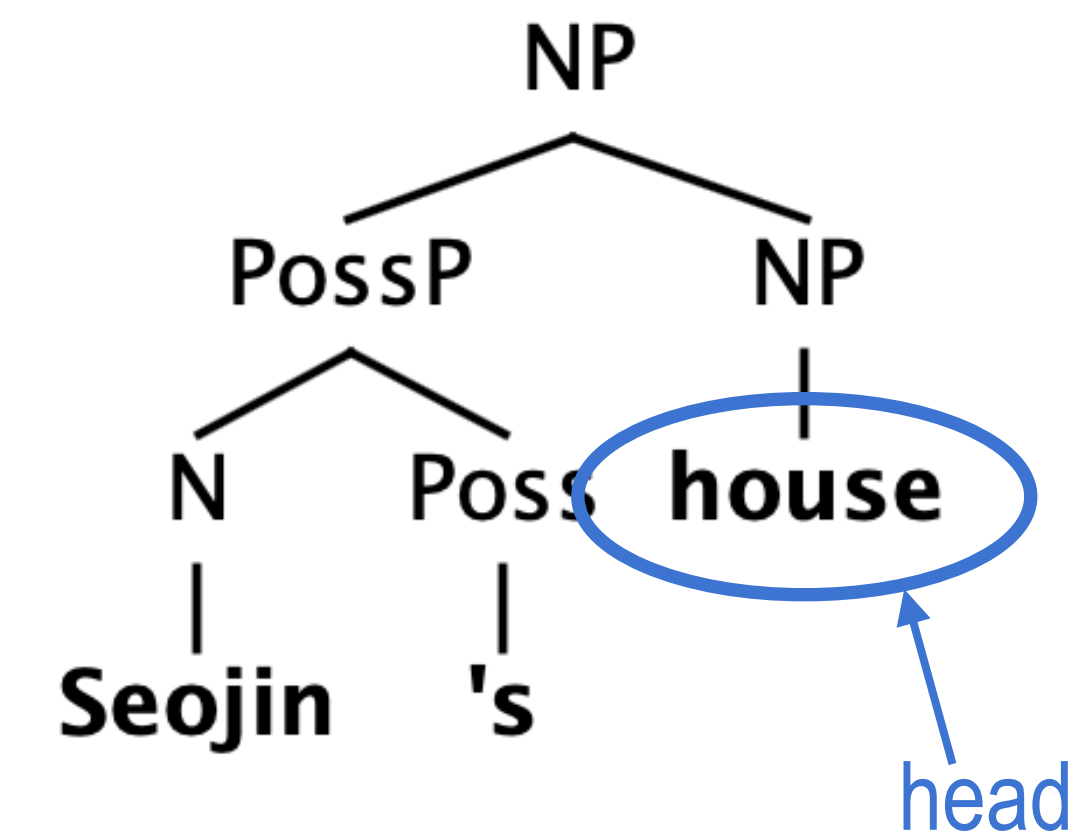


Corballis, M. C. (2014). *The Recursive Mind: The Origins of Human Language, Thought, and Civilization*. <https://doi.org/10.1515/9781400851492>

Recursion & Merge

What is the relationship?

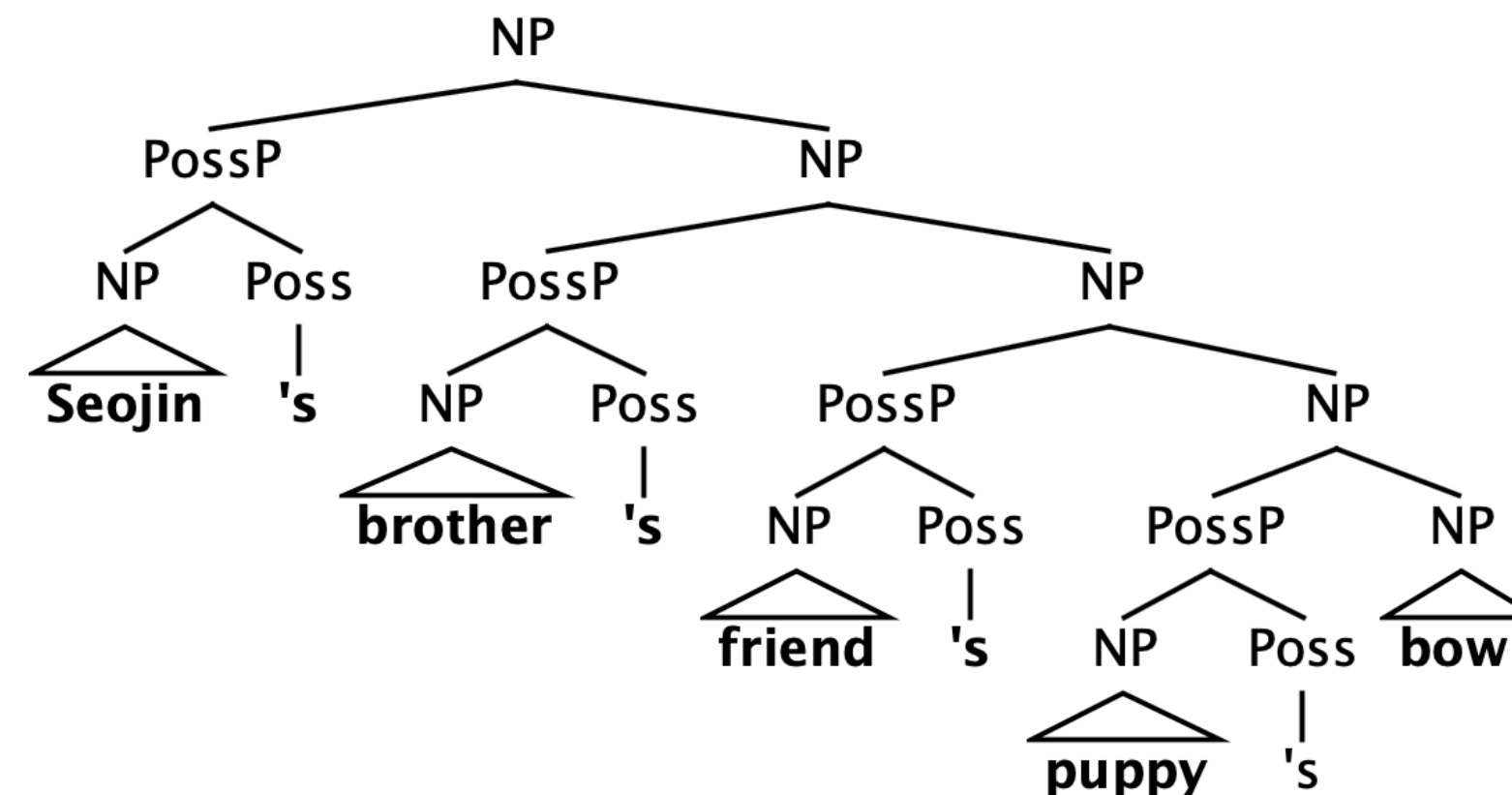
- Merge = an operation that combines two objects into a single syntactic constituent
 1. Concatenate
 2. Label
- “a completely universal form of recursion” (Hauser et al., 2002; Roeper, 2011; Crain et al., 2019)
 - Onset of multi-word utterances = onset of recursion?



- Symmetric Merge/coordination/conjunction
 - Relies on a single computational rule e.g. $NP \rightarrow N (NP)$
 - “The acquisition default” (Roeper, 2011)
 - Unordered
 - Shallow structure
- Indirect Recursion (IR) = Asymmetric Merge
 - Iterative embedding (Limbach & Adone, 2010; Roeper, 2011)
 - Hierarchical, ordered
 - Deep structure

e.g. **Seojin, Chris, and Wolfgang**
=
Chris, Wolfgang, and Seojin

e.g. **Seojin's brother's friend**
≠
Seojin's friend's brother



Why Recursion?

What makes it worth investigating?

- Domain-general
- Structurally complex
- Theory-neutral
- Innately human(?)

```
def factorial(n):  
    if n == 1:  
        return n  
    else:  
        return n * factorial(n-1)
```

$$5! = 5 * 4 * 3 * 2 * 1$$



Source: depositphotos.com



Source: "Fractal Broccoli" wikipedia.org

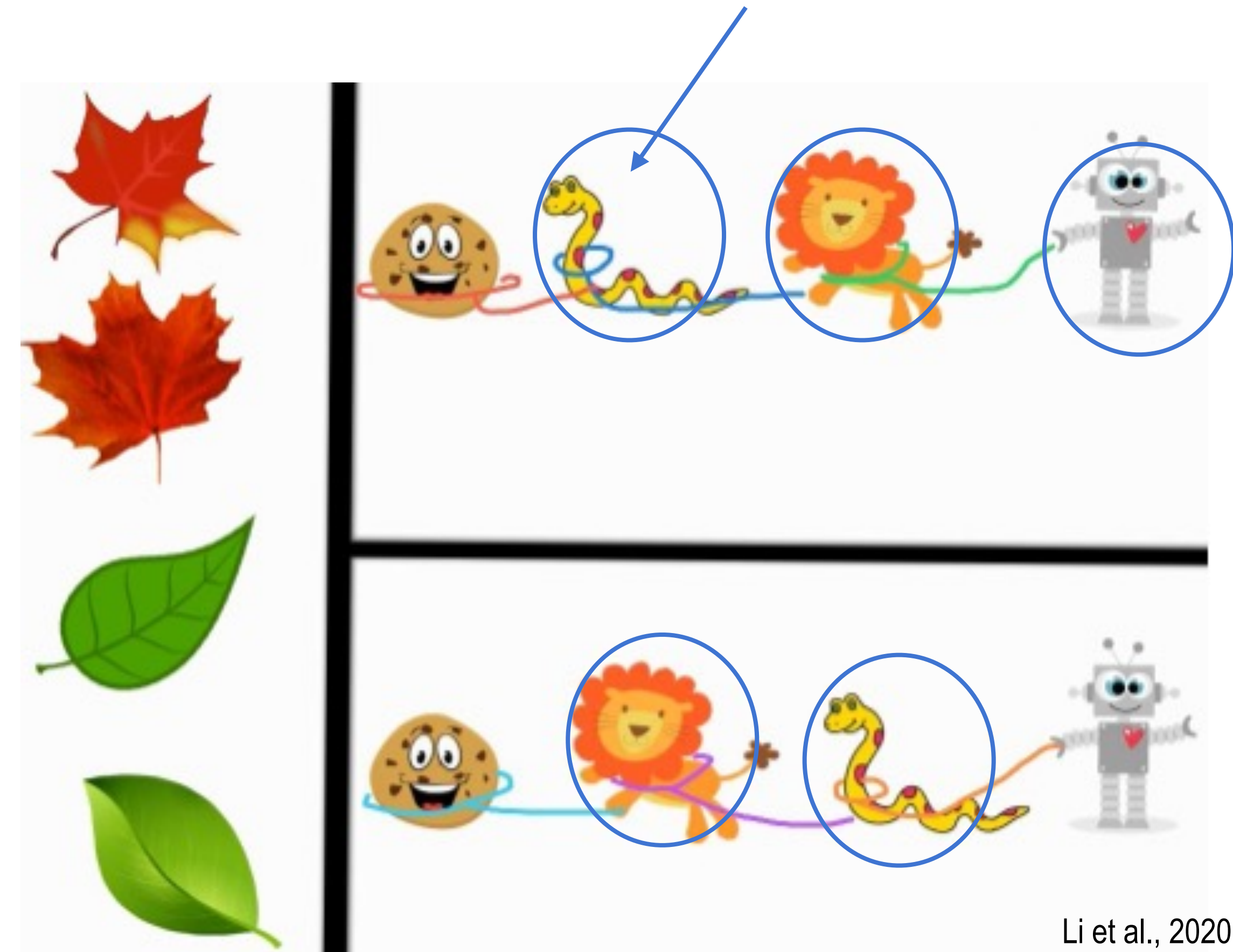


Past Findings

Children's comprehension of recursion

- Stepwise progress: additional embedding levels → additional challenge
- Age of acquisition varies between languages & studies
 - <5;0 – Tamil (Lakshmanan, 2020)
 - 4;0 – Mandarin (Shi et al., 2019)
 - 7;0 – Wapichana/English (Leandro & Amaral, 2014)
- Certain types of errors tend to reoccur:
 - Conjunction (robot, lion, and snake)
 - Reduction (robot's lion)
 - Reversal or reordering (robot's snake)

“Give a leaf to the robot's lion's snake!”



Li et al., 2020

Past Findings

Children's comprehension of recursion

Adjectives: conjunction, order reversals (Bleotu & Roeper, in press)

The little little big flowers

Prepositional phrases: conjunction (Nelson, 2016)

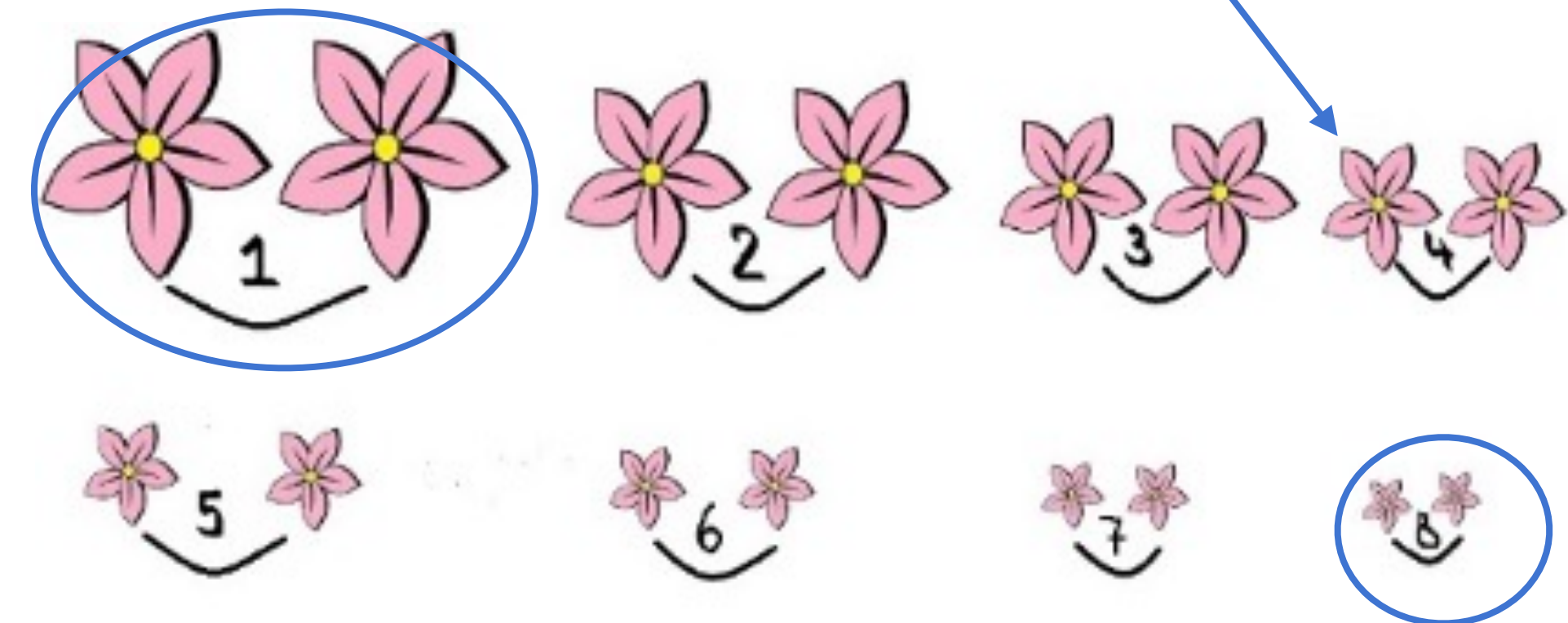
A lion next to a zebra under a crocodile

Relative clauses: reduction (Hollebrandse et al., 2007), conjunction (Amaral & Leandro, 2018)

She thinks that he thinks that she is bringing him chocolate chip cookies

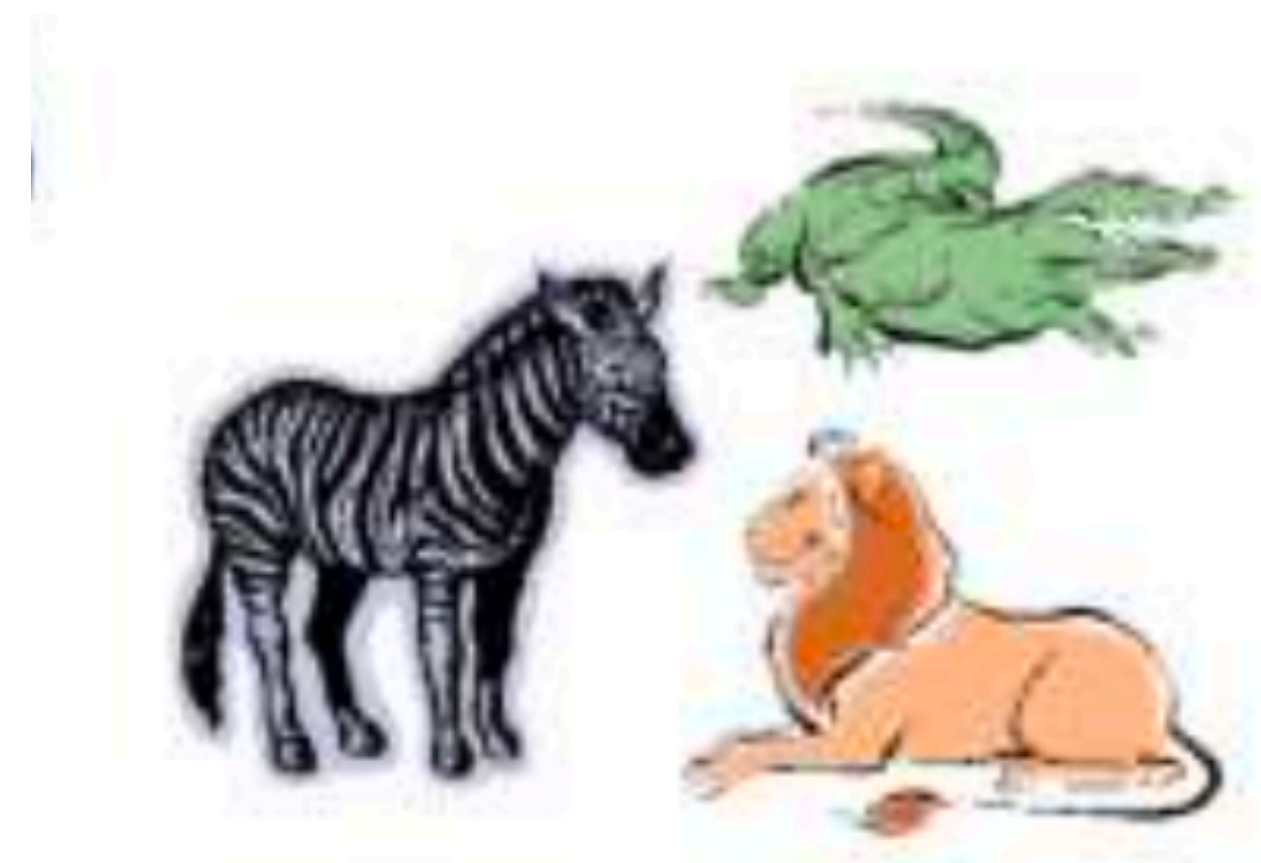
The guy that is seeing the girl that is wearing the hat

“Show me the little little big flowers”



Bleotu & Roeper, in press

“Show me a lion next to a zebra under a crocodile”



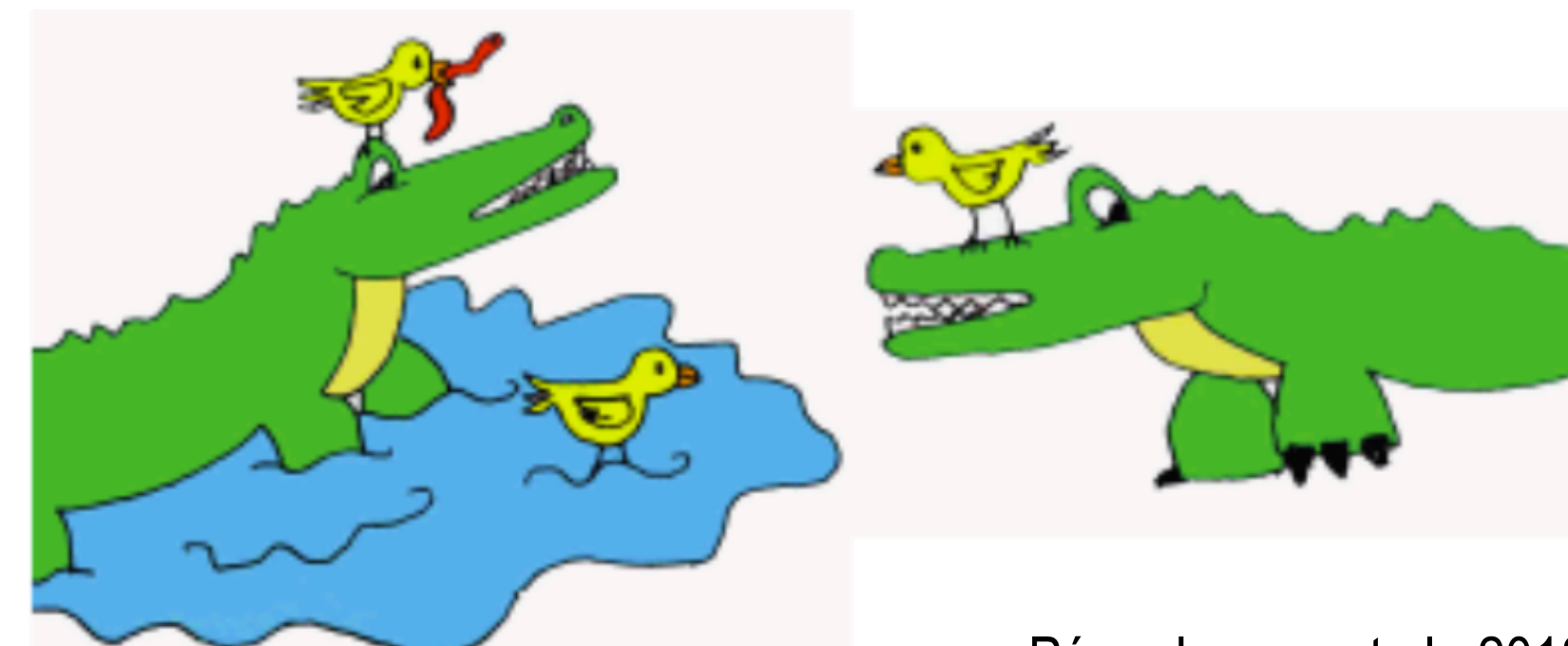
Past Findings

Children's production of recursion

Target: **The bird on the alligator in the water**

A number of syntactic and pragmatic avoidance strategies:

- Conjunction (Pérez-Leroux et al., 2012; Pérez-Leroux et al., 2018; Roberge et al., 2018) = *The bird on the alligator and in the water*
- Reduction (Pérez-Leroux et al., 2012; Pérez-Leroux et al., 2018; Roberge et al., 2018) = *The bird on the alligator*
- Spatial/locative (Pérez-Leroux et al., 2018; Roberge et al., 2018) = *The bird on the left*
- Reordering (→ conjunction) (Pérez-Leroux et al., 2018; Roberge et al., 2018) = *The bird that's in the water, on the alligator*



Pérez-Leroux et al., 2018

In their L1

- Dutch L1 speakers perform better on recursive PPs to PossPs (comprehension) (Merx, 2016)
 - Preferred a combination of PP and PossP in production *Dewey's uncle's dog's balloon*
→ “The balloon of the dog of Dewey's uncle”
- Spanish L1 significantly more recursive than English L1 (comprehension) (Nelson, 2016)

In their L2

- English learners struggle to produce and understand recursive nominals (Docteur, Jaffan, & Sanjeevan, 2017)
 - Preference for L1 congruent structures (e.g. left- or right-branching)
- Spanish L2, English L1 less recursive than native Spanish speakers (Nelson, 2016)
- English L2, Spanish L1 more recursive than native English speakers (Nelson, 2016)

Challenges for Acquisition

Why do language learners struggle with recursion?

- Depth of embedding?
- Constituent ordering?
- Interpretation at phase boundary? (Roeper, 2011)
- Frequency of input?
- Semantic considerations (Lakshmanan, 2020)
- Processing demands (Lakshmanan, 2020)

Seojin's brother's friend's puppy's bowl

phase phase phase

Recursion and Multilingualism

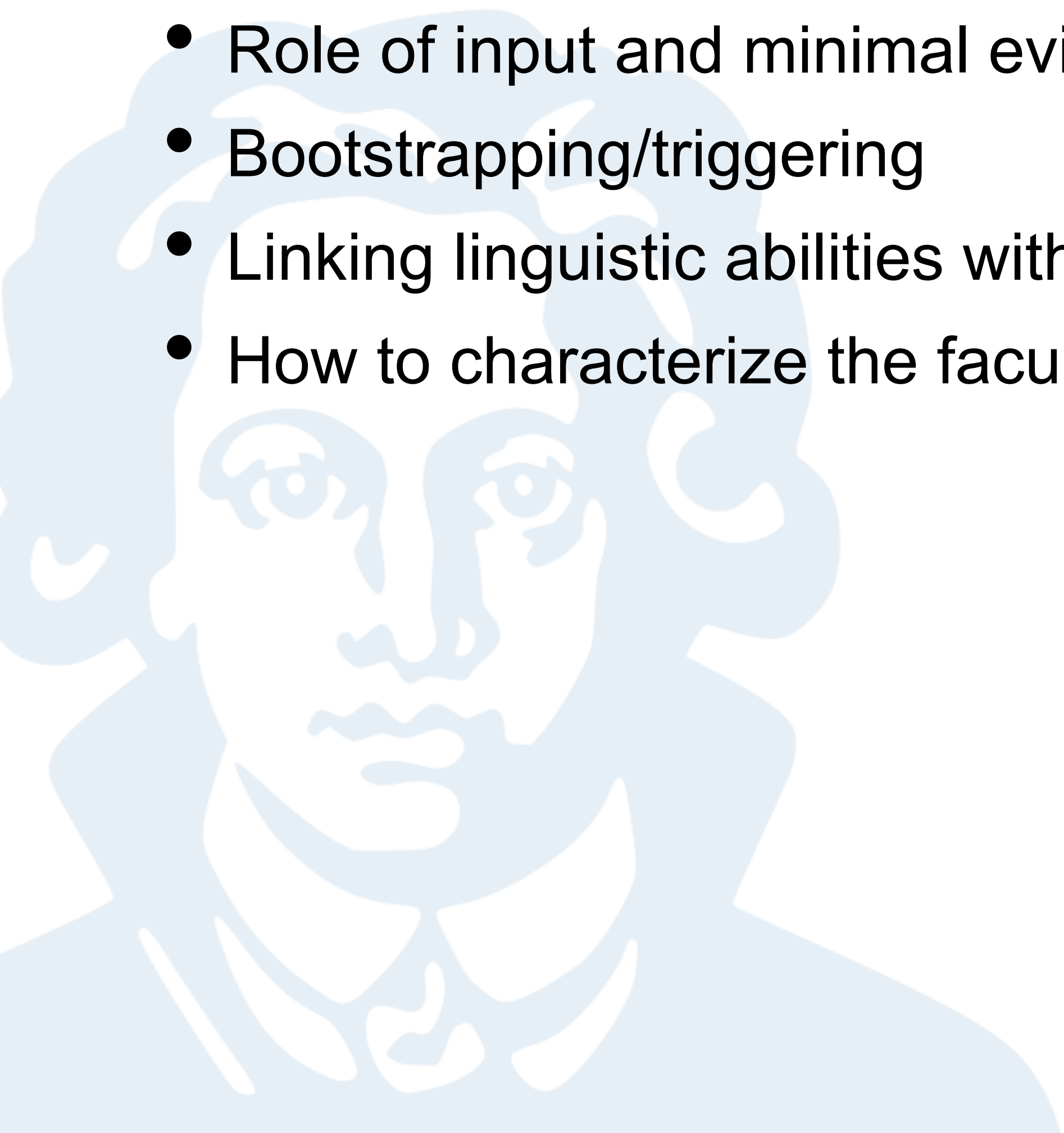
What is the relationship?

- Mandarin-speaking ~5 year olds > English-speaking ~5 year olds in comprehension (Limbach & Adone, 2010)
 - Different proportions of recursive PP interpretations by L1 English vs. L1 Spanish speakers (Nelson, 2016)
 - Bilingual children > monolingual children (Leandro & Amaral, 2014)
 - Bilingual children < monolingual children (Avram et al., 2021)
- ➔ **Does competence in multiple languages facilitate/hinder children's comprehension of NP recursion? If so, does this correlate with structural (dis)similarities (e.g. branching direction)?**

Theoretical Implications

How could these findings impact linguistic theory?

- Role of input and minimal evidence
- Bootstrapping/triggering
- Linking linguistic abilities with other cognitive domains
- How to characterize the faculty of language



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