

AMLaP2022

Is mathematical priming really structural?

The case of French relative clauses

Céline Pozniak¹, Mireille Copin², Giuseppina Turco³ & Barbara Hemforth³

¹SFL, University of Paris 8, ²LNPL, University of Toulouse, ³LLF, University of Paris Cité

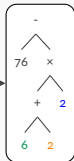
Mathematical priming on attachment ambiguities

Scheepers et al. (2011)

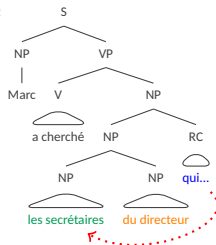
AMuP₂₀₁₁

1

$$76 - (6 + 2) \times 2$$



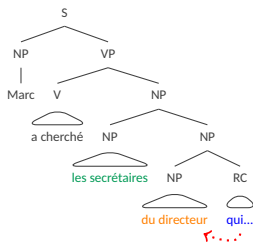
High Attachment



$$76 - 6 + 2 \times 2$$



Low Attachment



Mathematical priming on attachment ambiguities

Hedier (2020), Hedier et al. (2020)



2

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2. $(76 - 6) + (2 \times 2)$
3. $76 - 6 + 4$
4. $76 - 2 = 74$

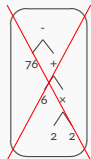
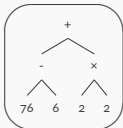
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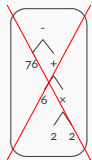
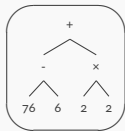
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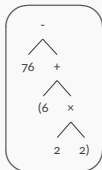


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- ▶ Correct structure representation should be $76 - (6 + 2 \times 2)$



1. $76 - (6 + 2 \times 2)$
2. $76 - (6 + 4)$
3. $76 - 10 = 66$

Continuation experiment in French

Design, materials, procedure & predictions



Continuation experiment in French

Design, materials, procedure & predictions



Design & materials

Item	NP number	Prime	Sentence
1	Plural- Singular	High : $76 - (6 + 2) \times 2$ Low : $76 - (6 + 2 \times 2)$	Marc a cherché les secrétaires du directeur qui... <i>Mark has looked for the personal assistants of the general manager that...</i>
2	Singular- Plural	High : $8 - (6 - 2) / 2$ Low : $8 - (6 - 2 / 2)$	Philippe a épousé l'éditrice des journalistes qui... <i>Philip married the editor of the journalists that...</i>

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Procedure

- ▶ Participants (N=80) reminded of the arithmetic operator-precedence rules.
- ▶ They did the calculations, then read and continued sentences.

Continuation experiment in French

Design, materials, procedure & predictions



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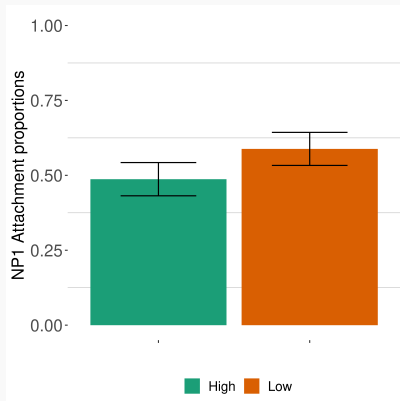
- ▶ Participants (N=80) reminded of the arithmetic operator-precedence rules.
- ▶ They did the calculations, then read and continued sentences.

Predictions

- ▶ If shared structural representations between mathematics and language exist that trigger priming (Scheepers et al., 2011), :
 - ▶ high attachment calculations should prime RC high attachment
 - ▶ low attachment calculations should prime RC low attachment

Continuation experiment in French

Results (N=618 observations)

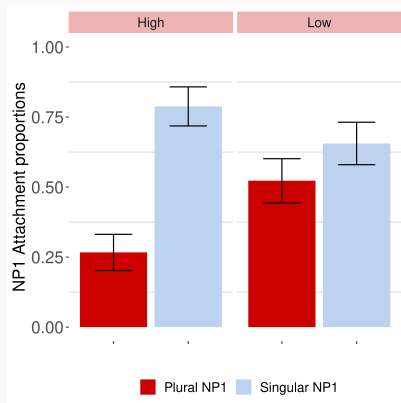


More high attachment continuations after a low attachment prime :

$$\hat{\beta} = -0.53, 95\% \text{ CrI} = [-1.47, 0.36], P(\beta) < 0 = 0.88$$

Continuation experiment in French

Results (N=618 observations)



More high attachment continuations with a singular NP1 in the high prime condition : $\hat{\beta} = 2.69$, 95% CrI=[0.30,5.19], $P(\beta) > 0 = 0.99$

Discussion

How can we explain these results ?



Calculations did not prime the expected structure of RC attachment and we found a strong interaction with number marking.

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Why?



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Why?

Construal Theory (Frazier and Clifton, 1997)

- ▶ Relative clauses are associated to a thematic domain
- ▶ The antecedent is chosen based on a variety of factors
- ▶ Our “high attachment” calculations could prime a thematic domain above the complex NP and the “low attachment” calculations could prime a thematic domain defined by NP1

Discussion

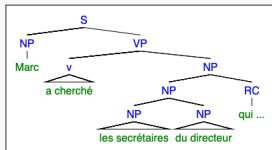
Thematic Domain vs. Structural priming



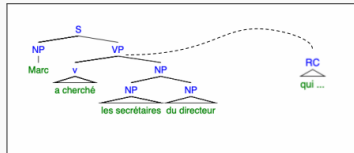
Calculation

$$76 - (6+2) \times 2$$

Structural Priming



Thematic Domain Priming



Discussion

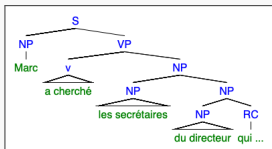
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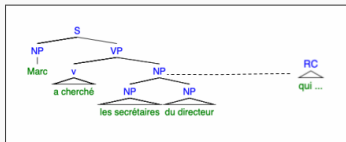
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Structural Priming



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Discussion

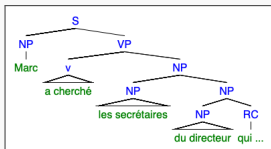
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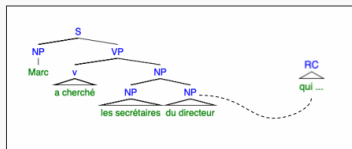
Calculation

$$76 - 6 + (2 \times 2)$$

Structural Priming



Thematic Domain Priming



Take home message





- ▶ Our results suggest that structural priming may not be at stake for relative clause attachment.



- ▶ Our results suggest that structural priming may not be at stake for relative clause attachment.
- ▶ Is it about thematic domains, as suggested by Construal Theory?
 - ▶ Experiments underway with the adequate calculations (low : $76-6+(2\times 2)$, high : $76-(6+2\times 2)$)

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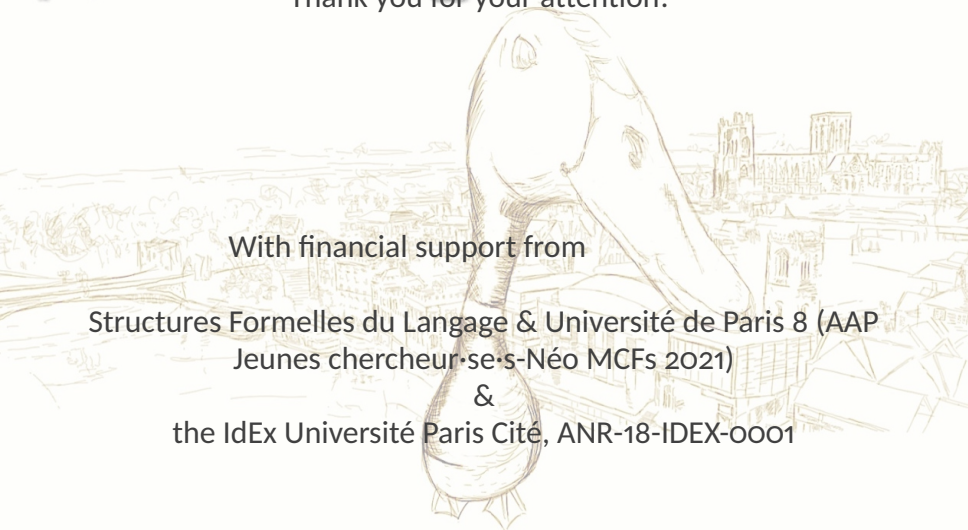
Thank you for your attention!

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Jeunes chercheur·se·s-Néo MCFs 2021)

&

the IdEx Université Paris Cité, ANR-18-IDEX-0001





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- Christoph Scheepers, Patrick Sturt, Catherine J Martin, Andriy Myachykov, Kay Teevan, and Izabela Viskupova. Structural priming across cognitive domains: From simple arithmetic to relative-clause attachment. *Psychological Science*, 22(10):1319–1326, 2011.