

# Resisting Attraction: The Role of Executive Control in Monolingual, Bilingual, and Bi-Dialectal Children

ULB

Alma Veenstra<sup>1,2</sup>, Kyriakos Antoniou<sup>1,2</sup>, Napoleon Katsos<sup>1</sup>, Mikhail Kissine<sup>2</sup>

<sup>1</sup> University of Cambridge (UK), <sup>2</sup> Université Libre de Bruxelles (BE)

## Introduction

Attraction in subject-verb agreement production:

- Number of head noun drives number of verb  
“The **key**<sub>(SG)</sub> to the cabinets **is**<sub>(SG)</sub> missing”
- Number of local noun drives number of verb  
“The key to the **cabinets**<sub>(PL)</sub> **are**<sub>(PL)</sub> missing”

Verb is ‘attracted’ to local noun instead of head noun [1]

Linguistic factors are well-studied [2]  
Cognitive factors are lesser-studied [3]

Why do healthy native speakers make attraction errors?  
Does executive control play a role?

## Method

Participants (10-12 years old):

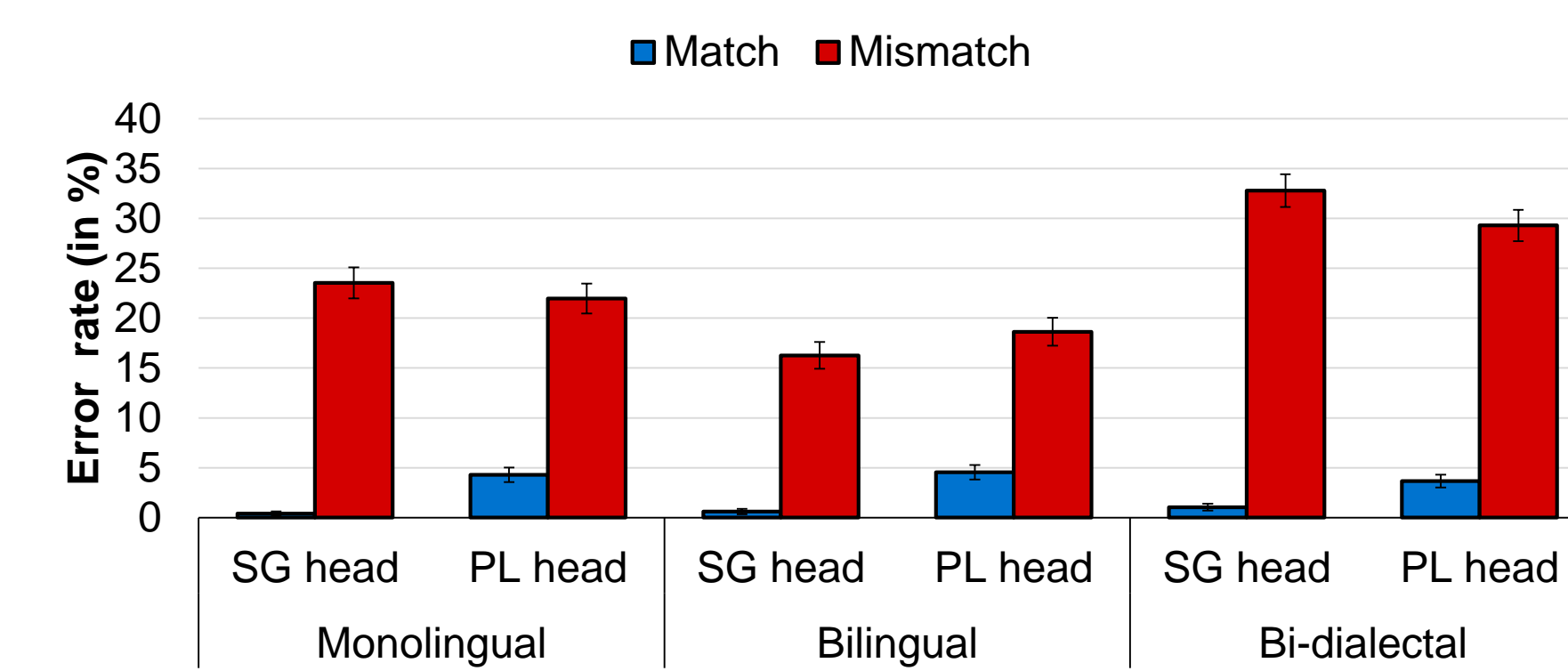
- 46 monolingual Dutch speakers
- 48 bilingual French-Dutch speakers
- 51 bi-dialectal West-Flemish-Dutch speakers



Tasks:

- Agreement production task (see below [6])
- Verbal WM task (Digit span task [7])
- Non-verbal WM task (Corsi blocks task [8])
- Attentional Networks task (Fish task [9])
- Switching task (Color Shape task [10])

## Results

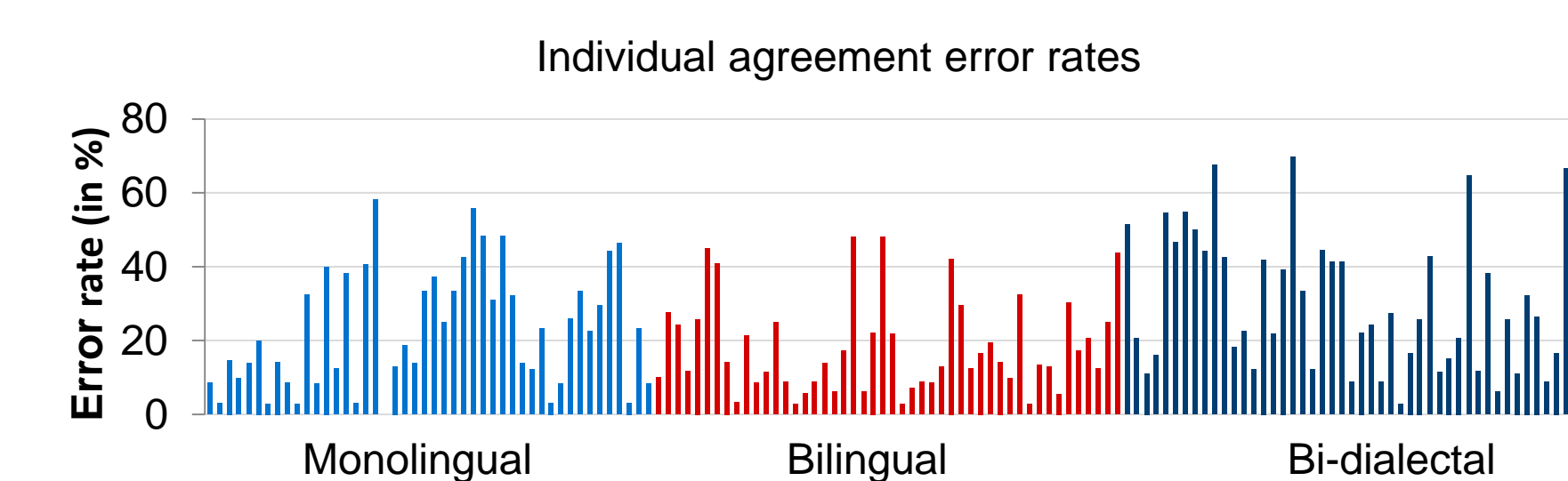


Attraction effect mirrors previously found adult patterns: [6]

- Main effect of Number Mismatch ( $p < .001$ )
- Number asymmetry not significant

When controlled for socio-economic status (SES):

- No group differences in agreement errors
- No group differences in executive control measures
- Large variation *within* language groups

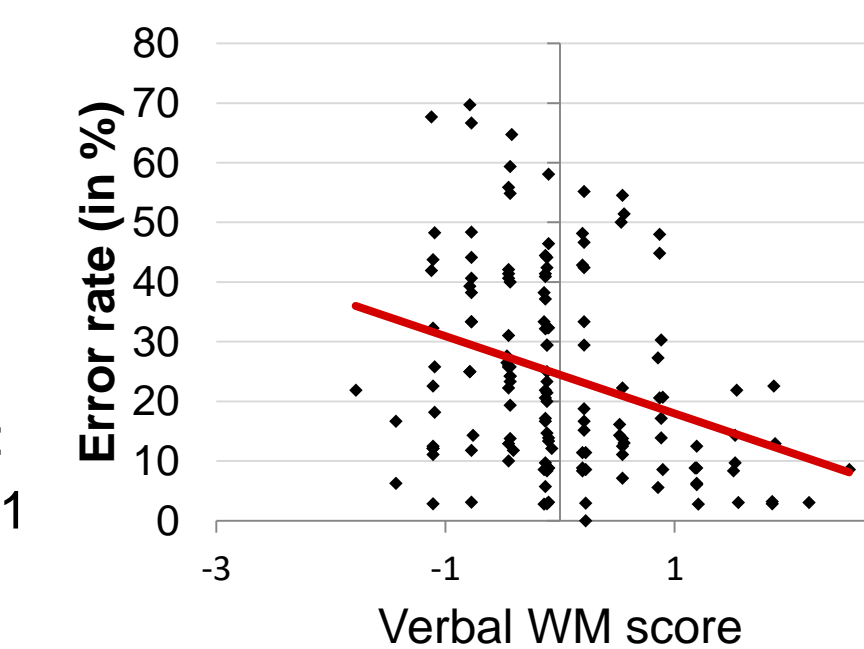


Across language groups, agreement is influenced by:

- Verbal working memory
- Inhibitory control

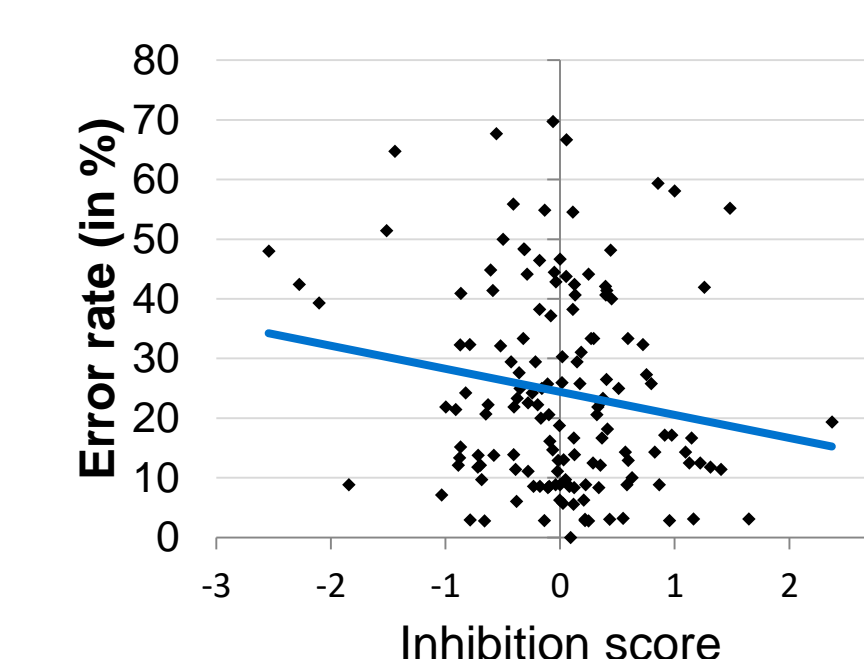
Correlations (controlling for age and SES):

- Agreement x verbal WM:  $r = -.232, p < .01$
- Agreement x Inhibition:  $r = -.211, p < .05$



LMER (controlling for head noun number, age, SES, language group, non-verbal WM, and language proficiency):

- Main effect of verbal WM:  
 $\beta = -0.35, SE = 0.10, z = -3.32, p < .001$
- Main effect of inhibitory control:  
 $\beta = -0.27, SE = 0.11, z = -2.54, p < .05$



## Discussion & Conclusion

**No differences** between monolinguals, bilinguals, and bi-dialectals (when controlled for SES) in:

- Agreement production
- Executive control

Analysis of individual patterns of language use/switching in preparation

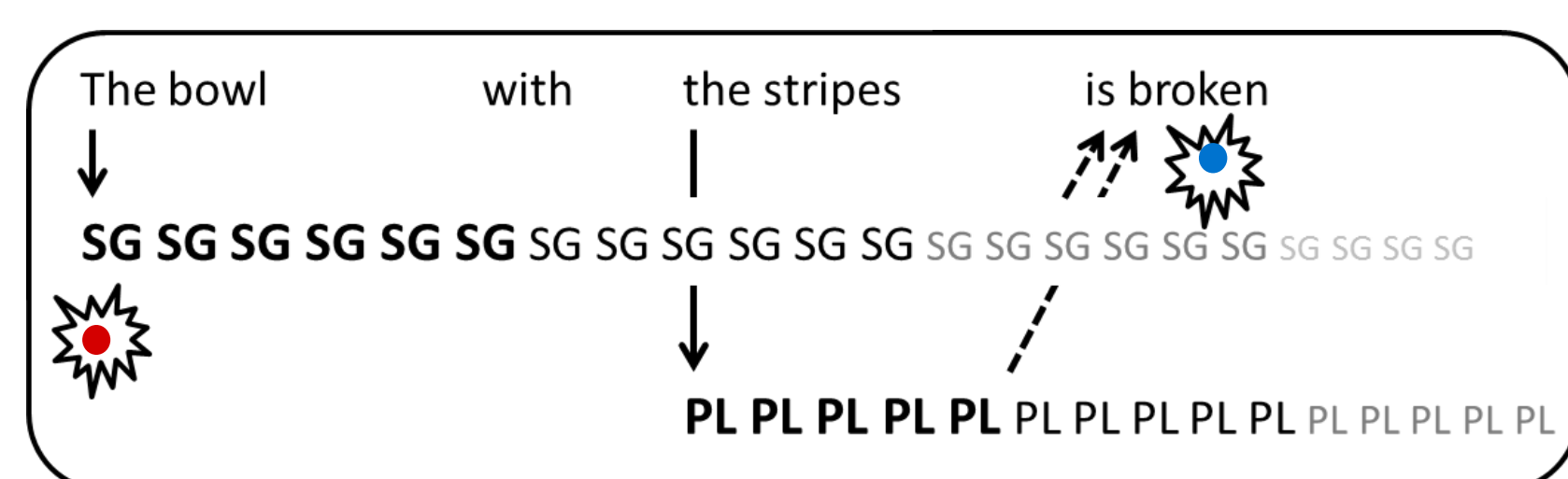
Effects *across* language groups:

- Children with a better verbal working memory make fewer agreement errors
- Children with a better inhibitory control make fewer agreement errors

**Agreement follows grammar rules, but attraction can be resisted with domain general executive control**

## Hypothesis

- Working memory (WM) is needed to keep head noun number activated
- Inhibitory control is needed to resist attraction from local noun number



SG = activation of the singular head noun  
PL = activation of the plural local noun  
★ = possible origin of agreement errors

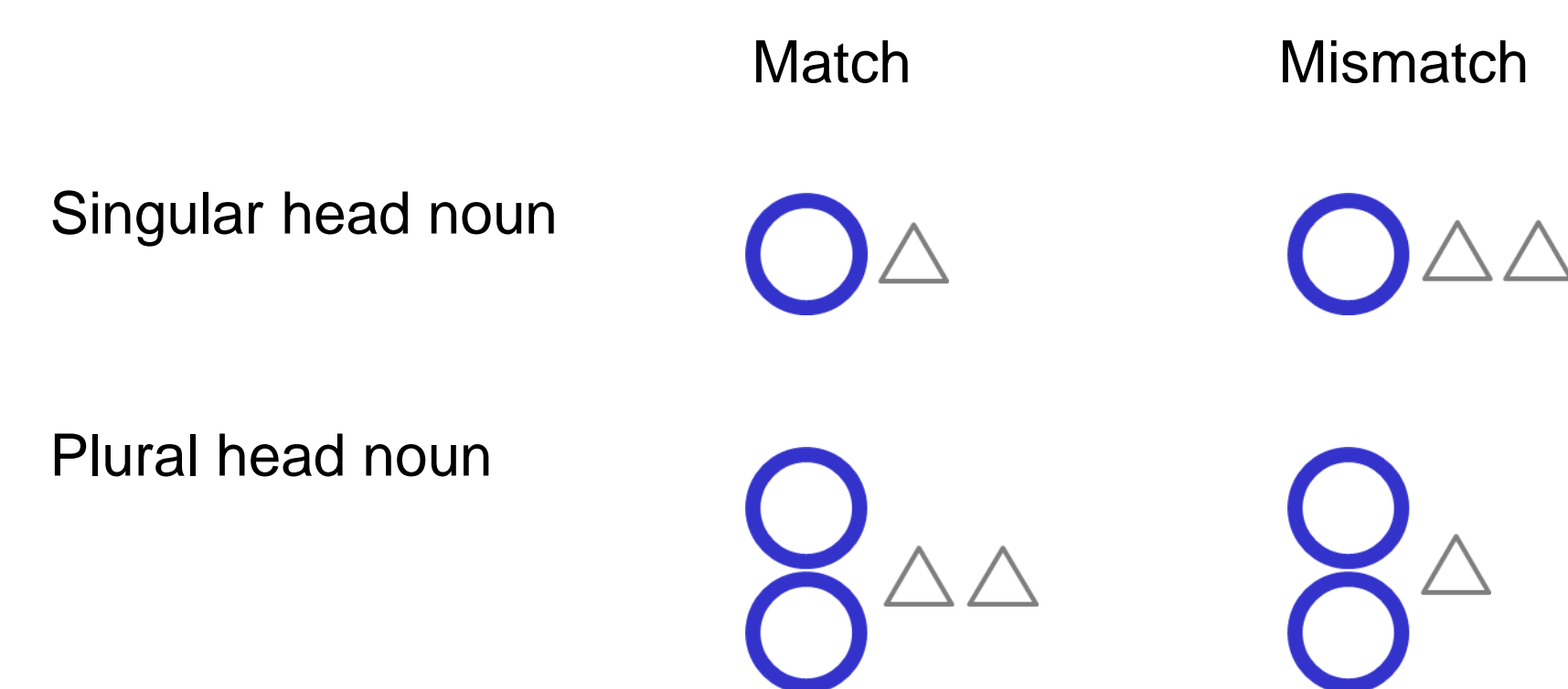
- Working memory
- Inhibitory control

Studies have shown that bilinguals have better executive control than monolinguals [4,5]

Do bilinguals therefore make fewer attraction errors than monolinguals? What about bi-dialectals?

## Agreement Production Task

- Elicited production cued by simple pictures
- Entire sentence generated by participant
- 18 items (circle/star/triangle, blue/yellow/red)
- 102 trials (30 practice, 72 experimental)
- 2x2 design



“De cirkel(s) naast de driehoek(en) is/zijn blauw”  
“The circle(s) next-to the triangle(s) is/are blue”

## References

- [1] Bock & Miller (1991). Broken agreement. *Cognitive psychology*, 23(1), 45-93.
- [2] Bock & Middleton (2011). Reaching agreement. *Natural Language & Linguistic Theory*, 29(4), 1033-1069.
- [3] Hartsuiker & Barkhuysen (2006). Language production and working memory: The case of subject-verb agreement. *Language and Cognitive Processes*, 21(1-3), 181-204.
- [4] Adesope, et al. (2010). A systematic review and meta-analysis of the cognitive correlates of bilingualism. *Review of Educational Research*, 80(2), 207-245.
- [5] Barac, et al. (2014). The cognitive development of young dual language learners: A critical review. *Early Childhood Research Quarterly*, 29(4), 699-714.
- [6] Veenstra, et al. (2014). Keeping it simple: studying grammatical encoding with lexically reduced item sets. *Frontiers in psychology*, 5.
- [7] Semel et al. (2008). *CELF® 4 NL: clinical evaluation of language fundamentals: Nederlandse versie*. Pearson.
- [8] Mueller & Piper (2014). The Psychology Experiment Building Language (PEBL) and PEBL Test Battery. *Journal of Neuroscience Methods*, 222, 250-259.
- [9] Rueda, et al. (2004). Development of attentional networks in childhood. *Neuropsychologia*, 42(8), 1029-1040.
- [10] Ellefson, et al. (2006). Asymmetrical switch costs in children. *Cognitive Development*, 21(2), 108-130.

## More info:

Email: amv36@cam.ac.uk

Website: bibi.ac.ulb.be

Funding: Wiener-Anspach Foundation

