

INFLUENCE OF BILINGUAL EXPERIENCE ON BRAIN STRUCTURE AND CONNECTIVITY IN OLDER ADULTS

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Introduction

Bilingualism produces brain changes that are modulated by language use and proficiency and could act as a cognitive reserve factor (Gallo et al., 2022).

The aim of this study is to determine whether bilingualism modulates the organization of brain networks in healthy older adults. To do so, we analyzed data from the ALFA+ study sample (N=290) (Molinuevo et al., 2016) based on bilingualism profiles using two strategies:

- Comparison of bilinguals with early acquisition of Catalan and Spanish with those with late acquisition and high or low proficiency of Catalan (second language).
- Continuous predictors of years of exposure to Catalan and level of proficiency in Catalan.

We based our predictions of brain network changes on the BAPSS model (Grundy et al., 2017).

FUNCTIONAL CHANGES IN AGING AND BILINGUALISM

Posterior-Anterior Shift in Aging (PASA; Davis et al., 2008; Grant et al., 2014).

Compensatory over-recruitment of anterior regions

Time (Aging)

Bilingual Anterior-to-Posterior Subcortical Shift model (BAPSS; Grundy et al., 2017).

Lifelong bilingualism postpones PASA shift automating posterior and subcortical routing mechanisms.

Time (increased L2 experience)

Methods

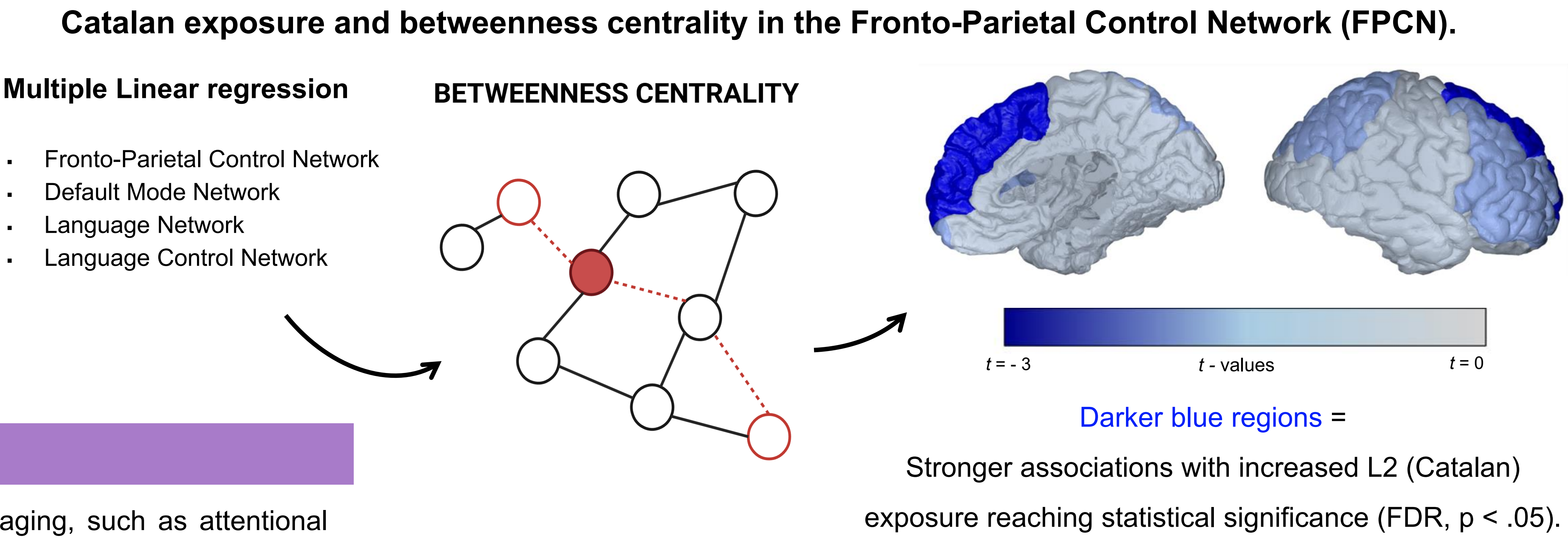
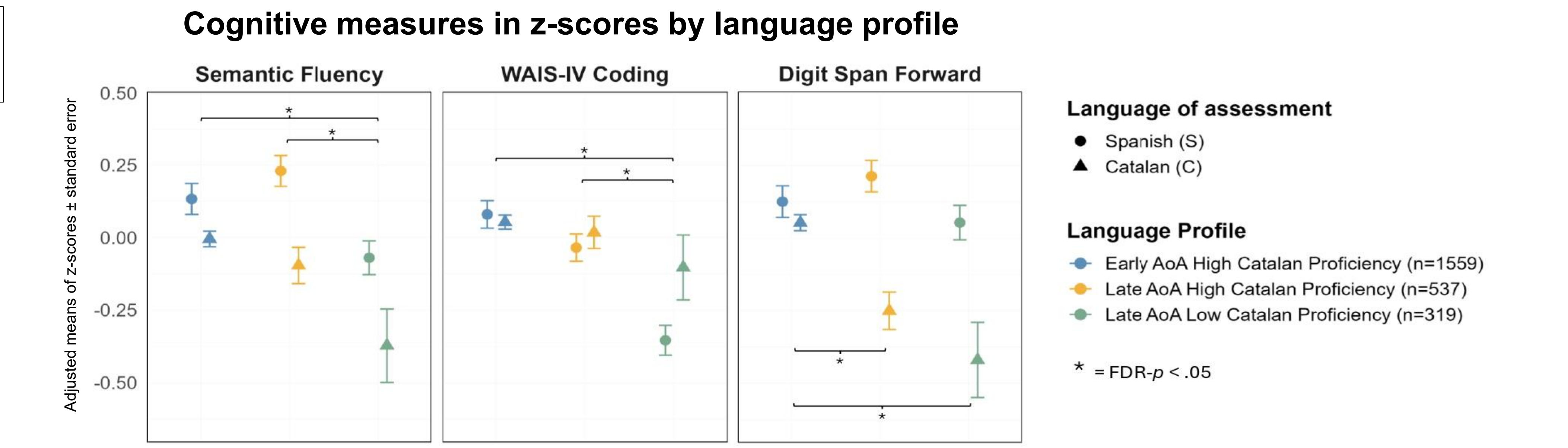
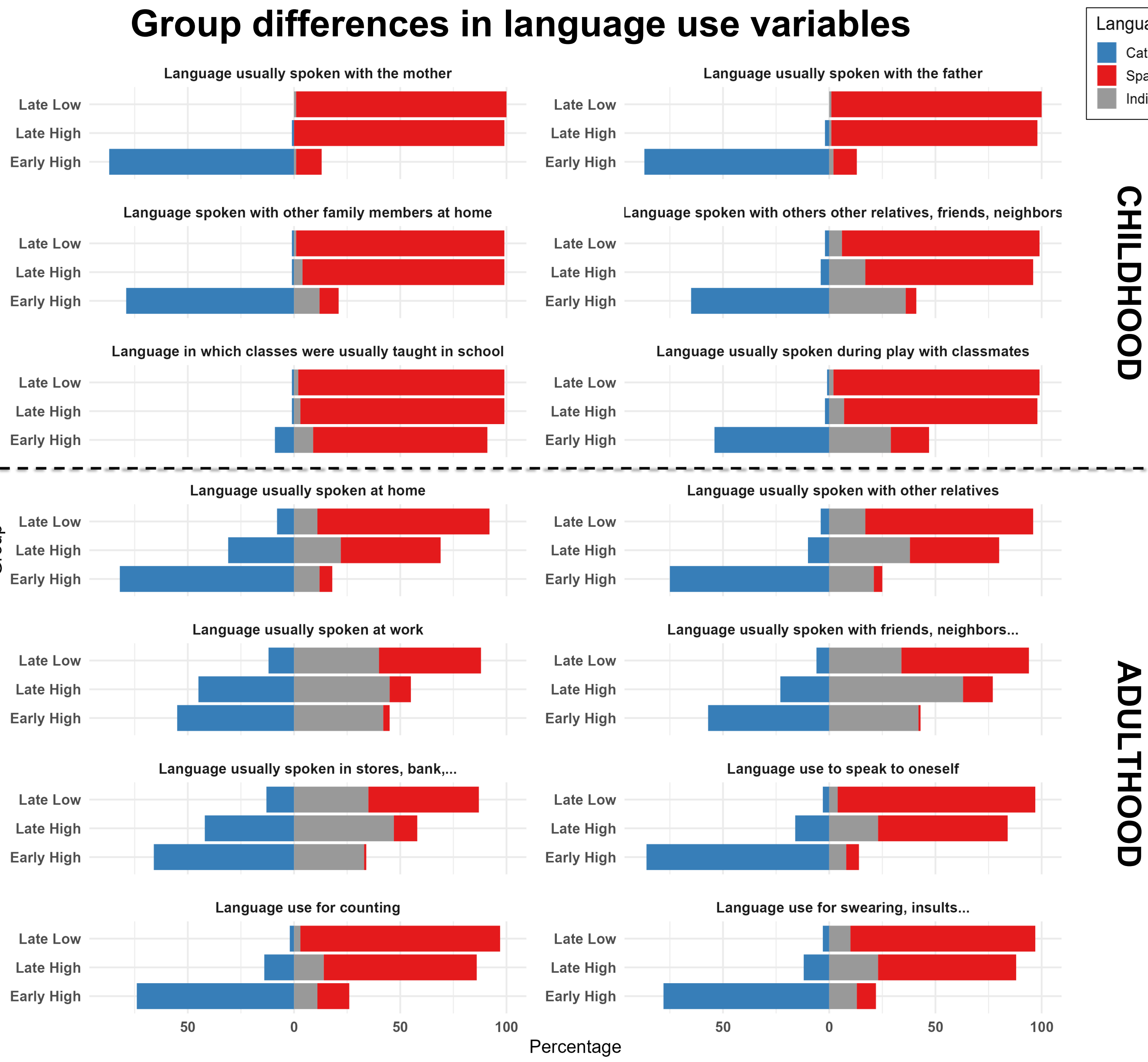
Groups based on age of acquisition and proficiency of Catalan.	Early AoA and high proficiency <i>n</i> = 1559	Late AoA and high proficiency <i>n</i> = 537	Late AoA and low proficiency <i>n</i> = 319
Sex (M/F)	586/973	189/348	130/189
Age	56.29 ± 6.78	53.9 ± 6.28	55.92 ± 6.08
Years of formal education	13.64 ± 3.43	14 ± 3.31	11.69 ± 3.5
Cognitive Reserve Questionnaire	10.47 ± 2.72	10.34 ± 2.52	8.82 ± 2.89
Catalan Language Measures			
Age of acquisition	1.1 ± 0.56	18.62 ± 8.35	24.44 ± 12.19
Comprehension (1-5)	4.97 ± 0.16	4.95 ± 0.23	4.56 ± 0.72
Reading (1-5)	4.96 ± 0.21	4.89 ± 0.45	4.24 ± 0.98
Speaking (1-5)	4.95 ± 0.22	4.77 ± 0.45	3.16 ± 0.96
Writing (1-5)	4.78 ± 0.5	4.66 ± 0.56	2.14 ± 0.91

Casas-Roma (2022)

Single-layer networks

Multilayer network

Results



Conclusions

The protective effects of bilingualism preserve cognitive domains highly sensitive to aging, such as attentional control and processing speed. Our findings suggest that prolonged dual-language management is associated with reduced betweenness centrality within the Fronto-Parietal Control Network. This functional reorganization reflects a transition from effortful, top-down cortical monitoring to a more automated and efficient executive control system.

References

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