

# Age-related decline of semantic inhibition despite the preservation of semantic memory

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## Introduction

Across the life span, successful language production requires both the retrieval of relevant semantic information from memory and the simultaneous inhibition of semantically related but irrelevant information.

With age

- semantic memory remains preserved [1,2]
- inhibition of irrelevant information declines: inhibition deficit theory [3,4]
- word-finding difficulties increase: prolonged naming latencies, more picture-naming errors, larger semantic interference effects [5,6,7]

### Research question

How do older adults remain able to successfully retrieve relevant semantic information from memory despite the increasing distraction from irrelevant semantic information?

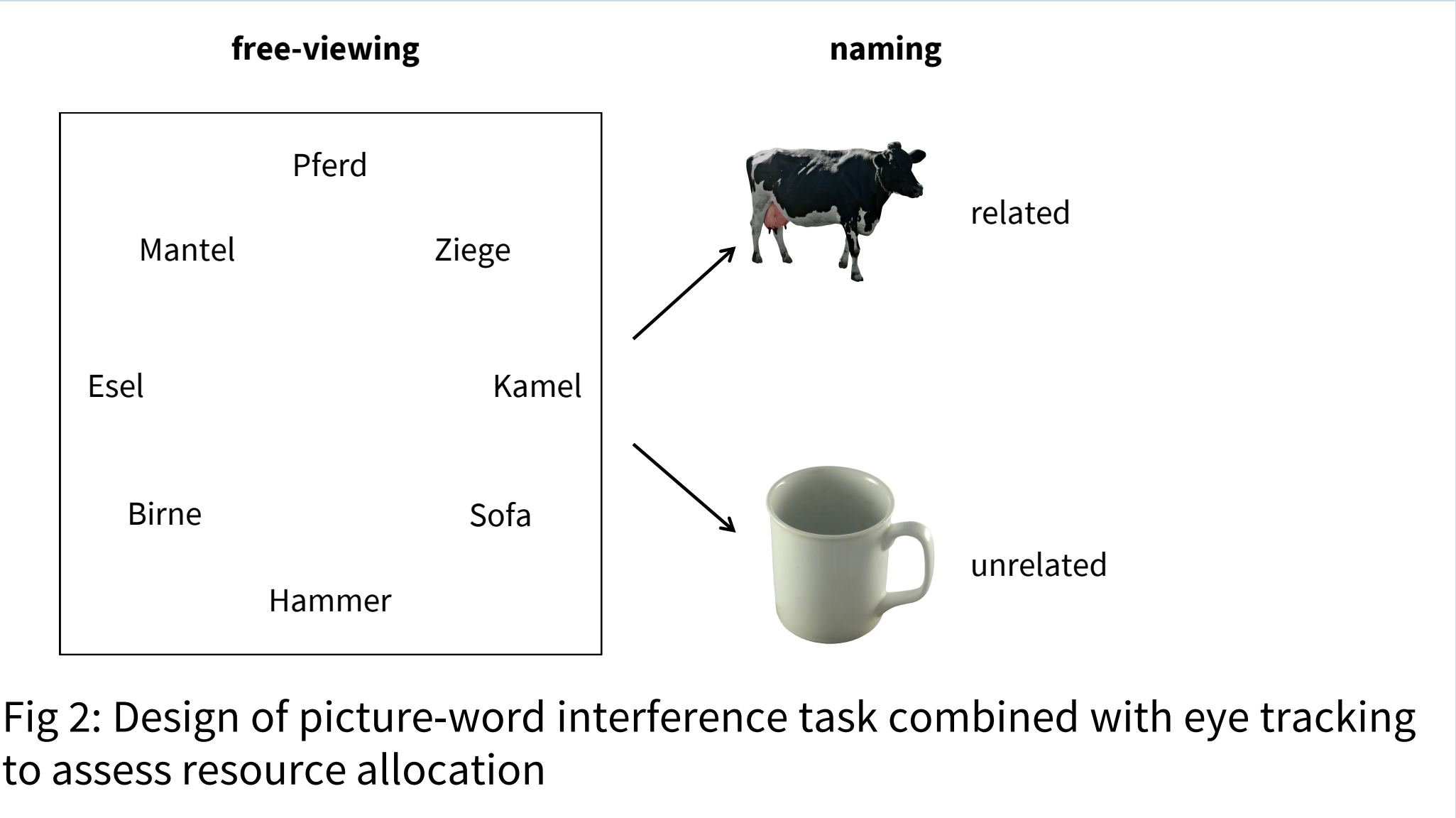
## Methods

### Participants

24 young adults (mean age: 26 years; age range: 21–32 years)  
24 older adults (mean age: 65 years; age range: 60–69 years)

### Semantic inhibition

- picture-word interference task
- fixation durations (i.e., resource allocation) to member (relevant) and non-member (irrelevant) semantic categories

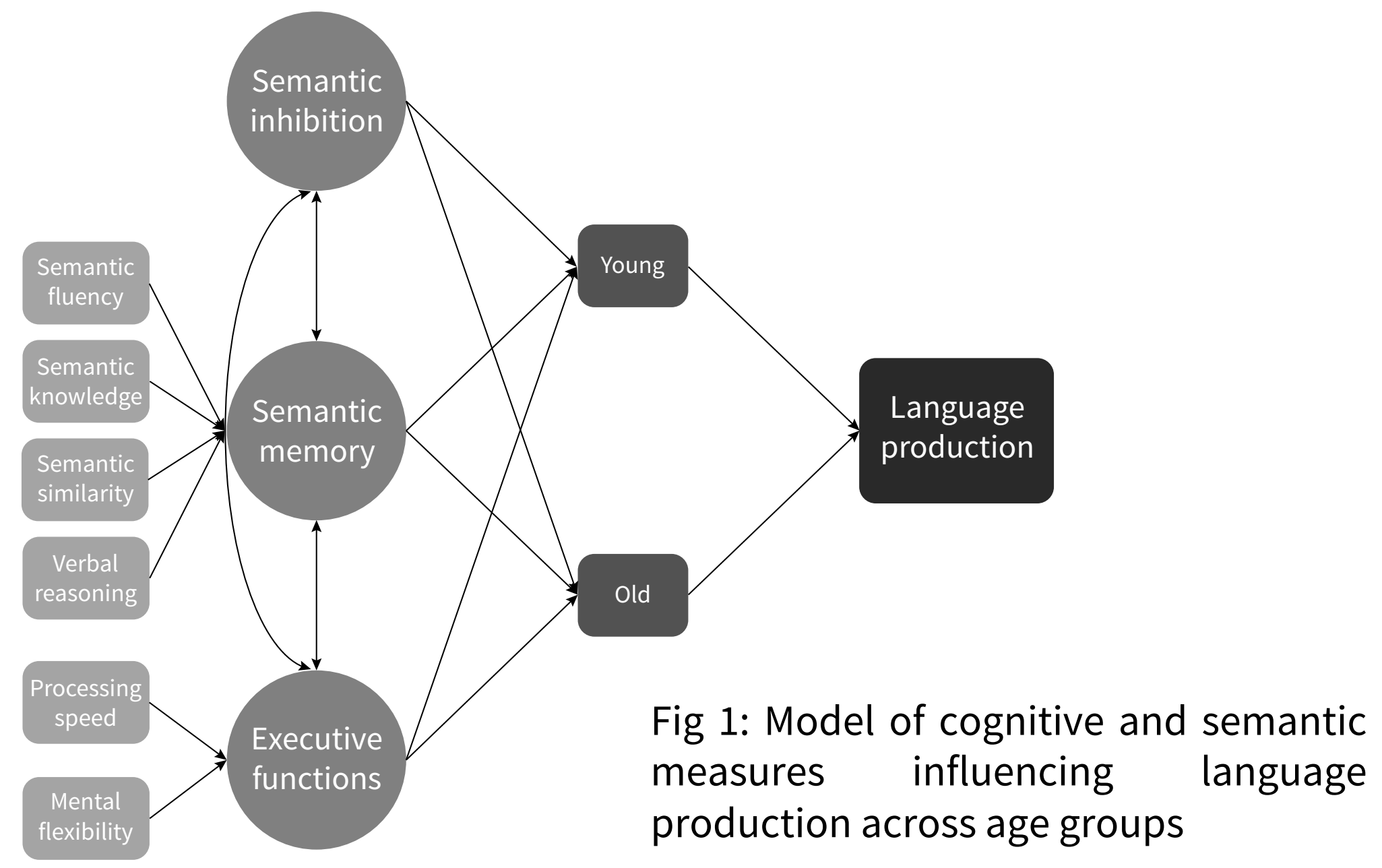


### Semantic memory

- semantic fluency: non-standardized verbal fluency test of 30 semantic categories
- semantic similarities: Wilde Intelligenz Test subtest synonyms
- semantic analogies: Wilde Intelligenz Test subtest analogies
- semantic knowledge: Wortschatztest

### Executive functions

- processing speed: Trail Making Test A
- mental flexibility: Trail Making Test B



### Analysis

- Generalized Linear Mixed Models for RTs
- Random effects for Subject and Item

## Results

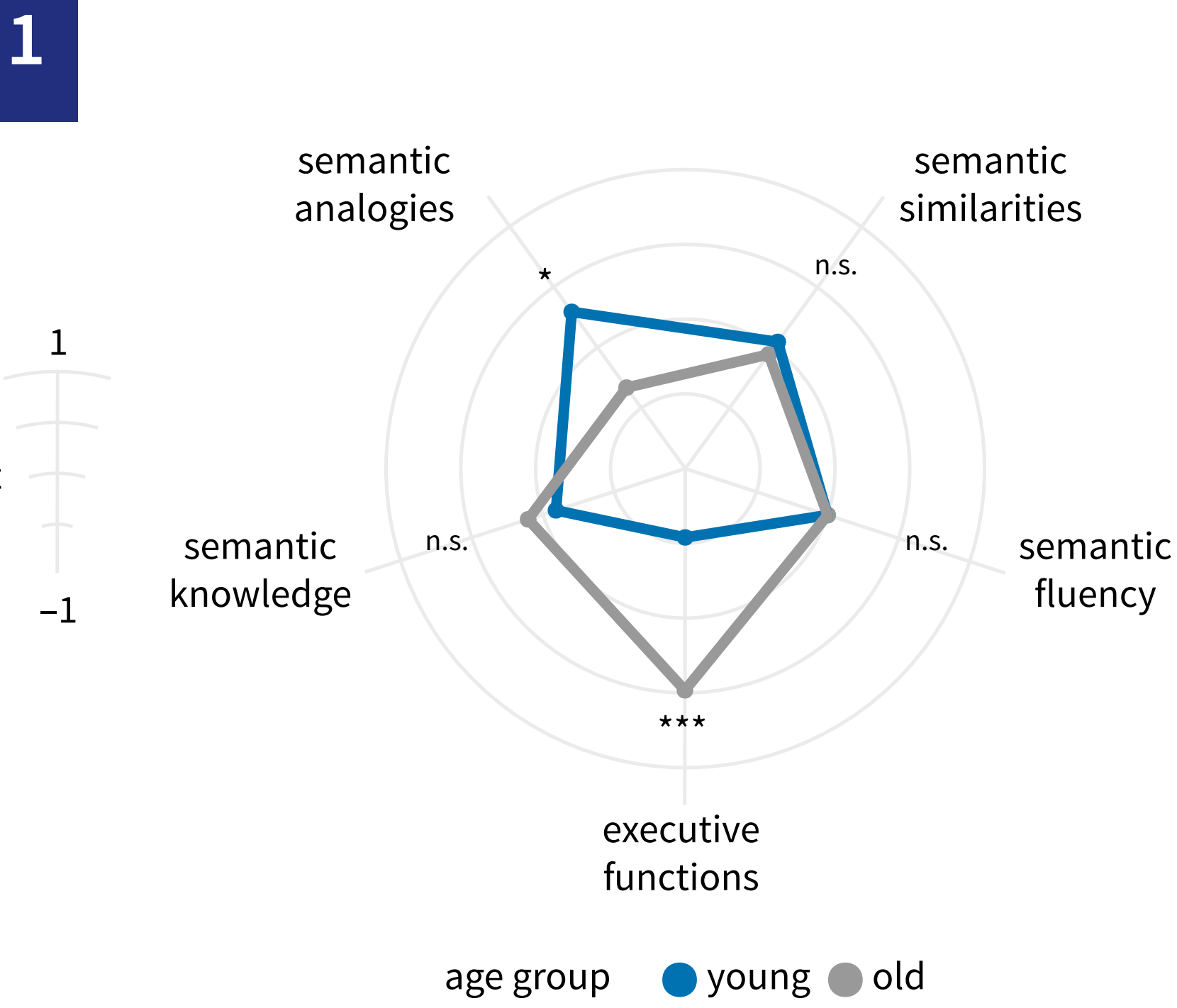


Fig 3: Age differences in semantic memory and executive function, n.s. = non-significant, \*\*\* p < .001, \* p < .05

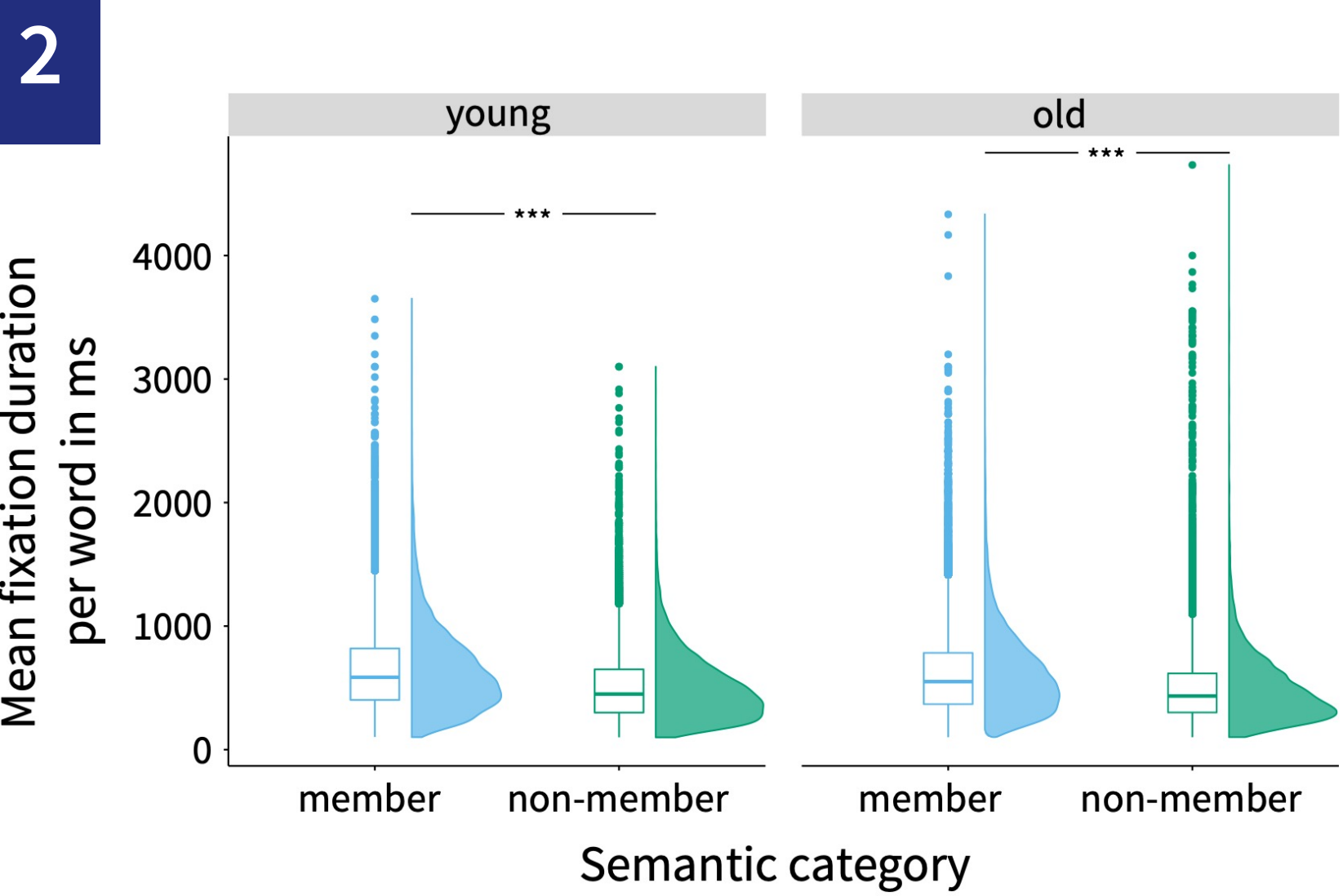


Fig 4: Longer fixation durations to category members than non-members in both age groups, \*\*\* p < .001

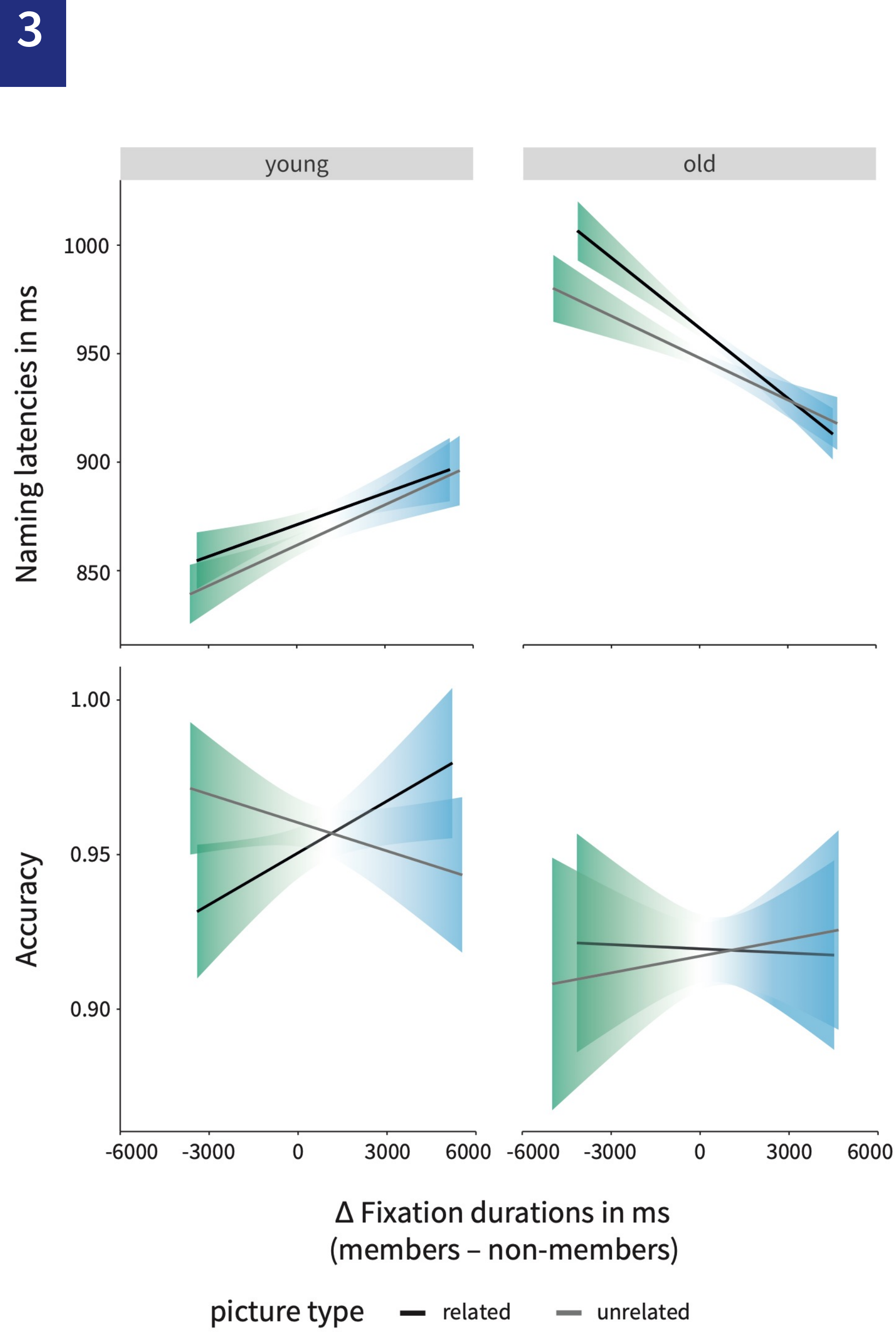


Fig 5: Reaction times but not accuracy dependent on resource allocation

	RTs				Accuracy			
	Df	BIC	X <sup>2</sup>	p	Df	BIC	X <sup>2</sup>	p
RT/Accuracy ~ group	5	134152.1			4	4251.961		
+ semantic inhibition	11	134168.0	39.54	<0.001	10	4296.949	10.86	0.093
+ fixation durations	17	134156.4	67.07	<0.001	16	4350.639	2.16	0.905
+ semantic memory	25	134219.7	10.65	0.222	24	4421.292	3.81	0.874
+ executive functions	39	134344.4	4.66	0.99	40	4555.626	14.59	0.555

Table 1: Comparisons of GLMMs with covariates added incrementally: main effect of picture-word interference and resource allocation (= fixation durations) for reaction times but not accuracy

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	RTs			Accuracy			
	Estimate	t	p	log Estimate	Odds Ratio	z	p
Intercept	957.06	239.36	<0.001	3.53	34.05	15.94	<0.001
Age group: old-young	72.20	14.47	<0.001	-0.75	0.47	-2.33	0.020
Picture type: related-unrelated	-10.75	2.84	0.005	-0.09	0.91	-0.89	0.372
Fixation durations (z-transformed)	-6.06	-1.95	0.051	0.04	1.04	0.80	0.425
Age group x picture type	-1.02	-0.26	0.792	0.08	1.08	0.37	0.710
Age group x fixation durations	4.59	1.39	0.163	-0.13	0.88	-1.25	0.212
Picture type x fixation durations	-4.40	-1.30	0.193	0.11	1.12	1.17	0.243
Age group x picture type x fixation durations	-7.22	-2.02	0.044	-0.27	0.76	-1.55	0.122

Table 2: GLMMs with age group, picture type and fixation durations predicting reaction times and accuracy

## Discussion

### Retrieval of semantic information from memory during picture naming across age groups

- is slower and less accurate in older than younger adults
- despite general preservation of semantic memory across age
- is significantly interfered by category members for both age groups

The retrieval speed is modulated by the ability to allocate resources to relevant, categorically related information:

- with longer fixation durations, retrieval is facilitated in older adults
- but hampered in younger adults

### Conclusion

Older adults need to overcome the inhibition deficit and maintain the level of resource allocation to relevant information in order to successfully retrieve relevant semantic information from memory.

## References

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