Which aspects of familiarity are associated with the volumes of the perirhinal and entorhinal cortices?

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Introduction

Neuropathology of Alzheimer's Disease appears ealy in the perirhinal and entorhinal cortices[1].

Understanding the role of these regions in cognition is key for developing early diagnostic tools.

They are assumed to be linked with familiarity, but it remains unclear to what aspects of familiarity, especially in aging population with neurodegenerative pathology.

Using 3 tasks and MRI data in heterogenous aging population composed of healthy volunteers, MCI and SCD patients, we investigate:
- *lifetime* familiarity: gradual accumulation of familiarity with object concepts over the course of one's life[2,3]
- *episodic* familiarity: sense of recognizing based on a specific prior encounter[2,3]
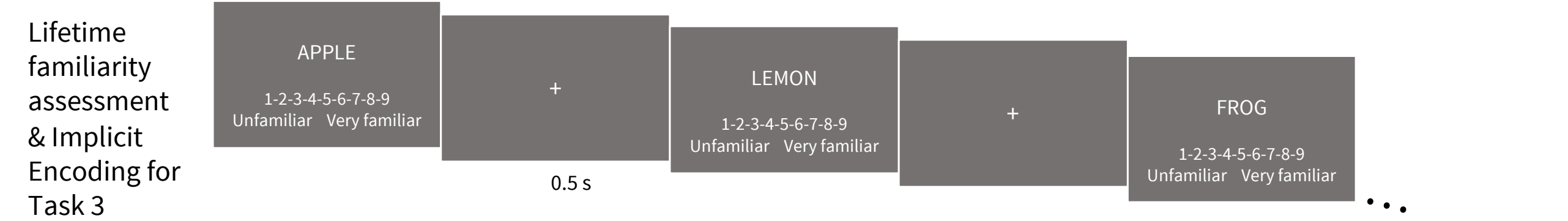- their additive effects and the impact of conceptual overlap discrimination

Methods

58 participants aged > 55 years old (37 healthy volunteers, 7 with Subjective Cognitive Decline, 14 with Mild Cognitive Impairment)
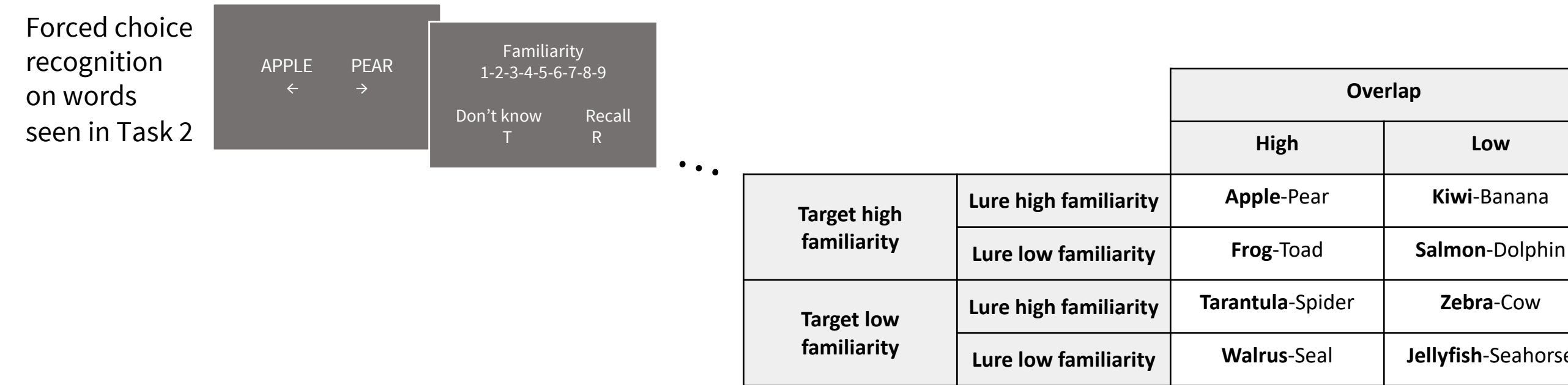
Task 1 - *Assessment of episodic familiarity*

Implicit encoding

Forced choice recognition
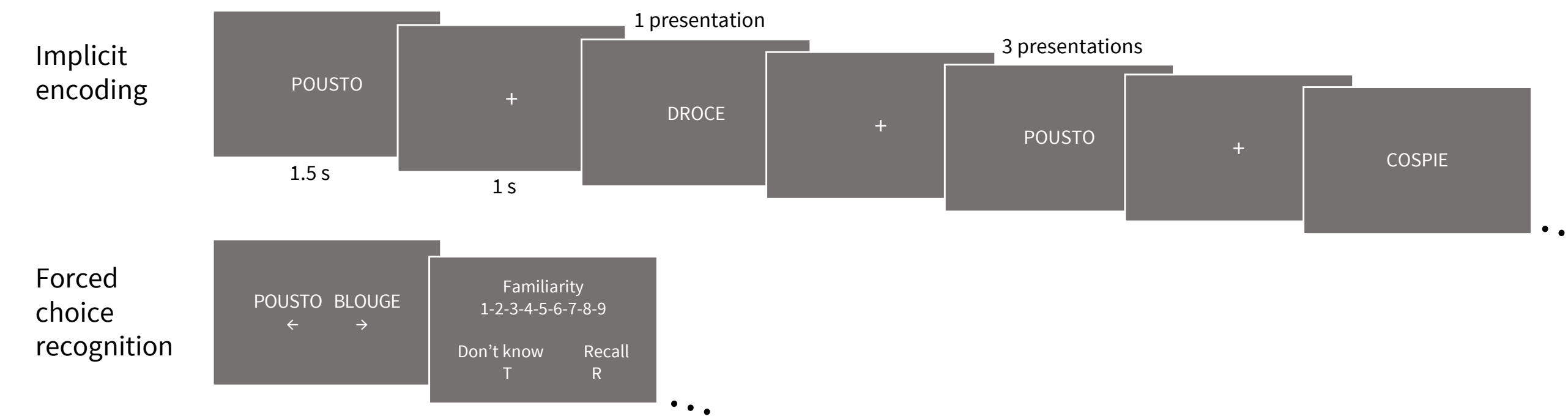
Task 2 - *Assessment of lifetime familiarity*

Lifetime familiarity assessment & Implicit Encoding for Task 3

Task 3 - *Assessment of their additive effects and the impact of conceptual overlap*

Forced choice recognition on words seen in Task 2

		Overlap	
		High	Low
Target high familiarity	Lure high familiarity	Apple-Pear	Kiwi-Banana
	Lure low familiarity	Frog-Toad	Salmon-Dolphin
Target low familiarity	Lure high familiarity	Tarantula-Spider	Zebra-Cow
	Lure low familiarity	Walrus-Seal	Jellyfish-Seahorse

Structural MRI images (T1 and T2-weighted)
→ segmentation of MTL using ASHS (+ manual for alErC and pmErC).
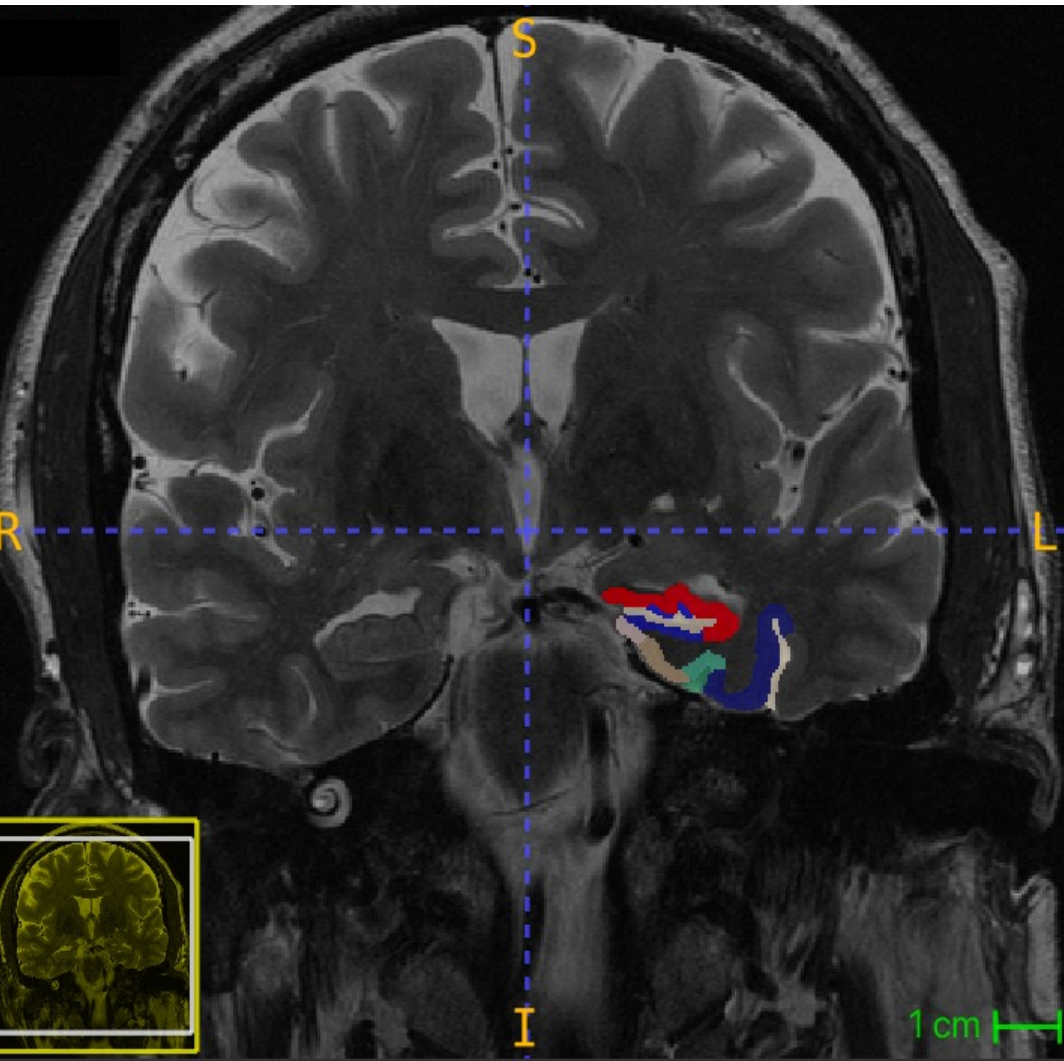
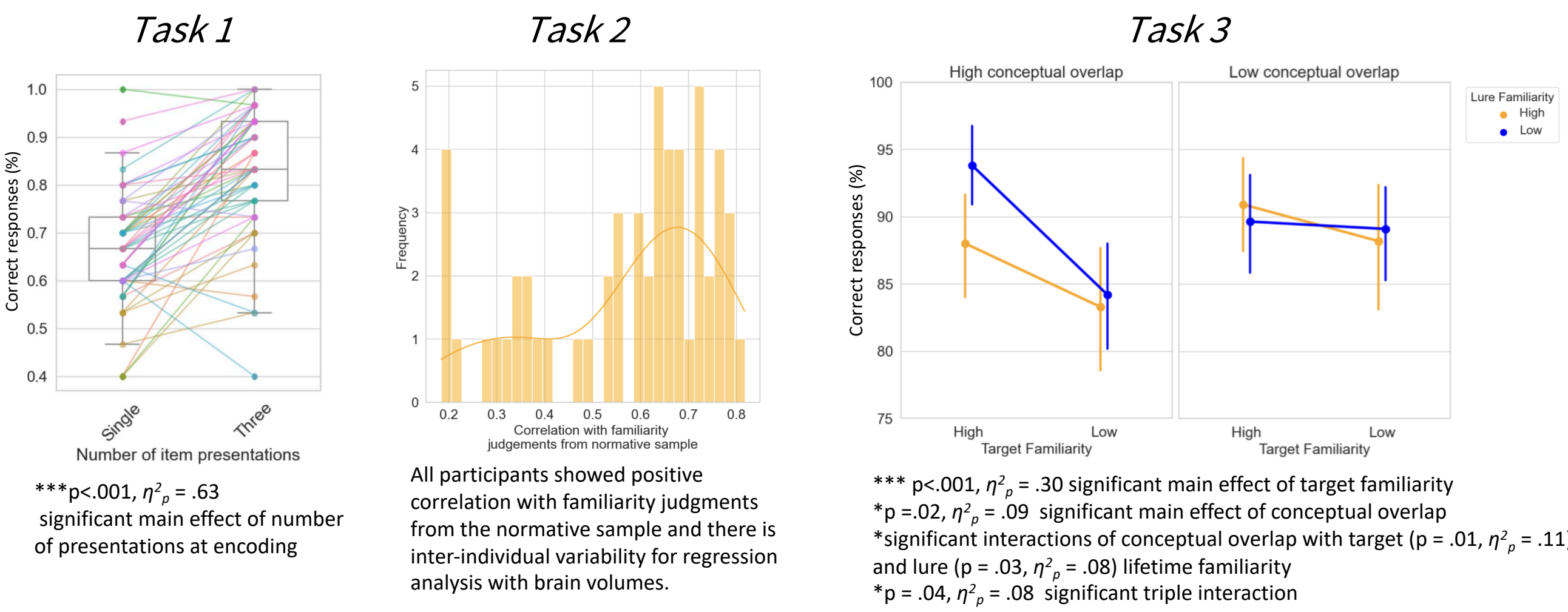pmErC alErC BA35 BA36
Transentorhinal cortex

Analyses

Task 1: ANCOVA with RM (2 numbers of presentation at encoding) on % correct responses.

Task 2: Stepwise linear regression on the adequacy (i.e., correlation) between lifetime familiarity judgements and those from a normative sample.

Task 3: ANCOVA with RM 2x2x2 (high or low lifetime familiarity of lure, high or low lifetime familiarity of target, high or low conceptual overlap between lure and target) on % correct responses.

For all above, covariates are:
- Age
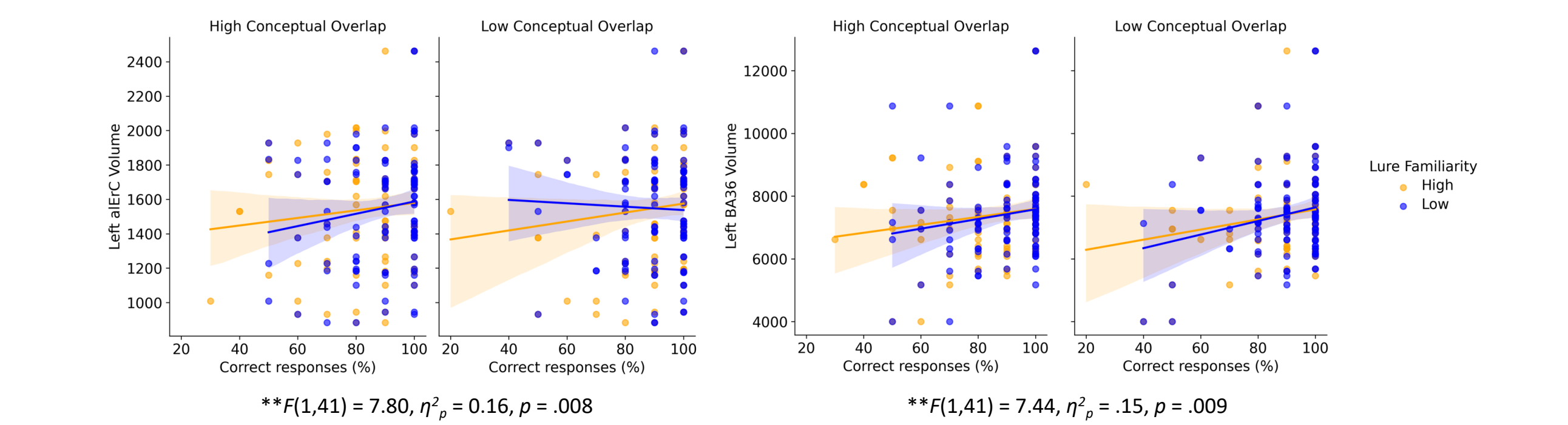- Volumes of left and right alErC, pmErC, BA35, BA36, CA1, CA3
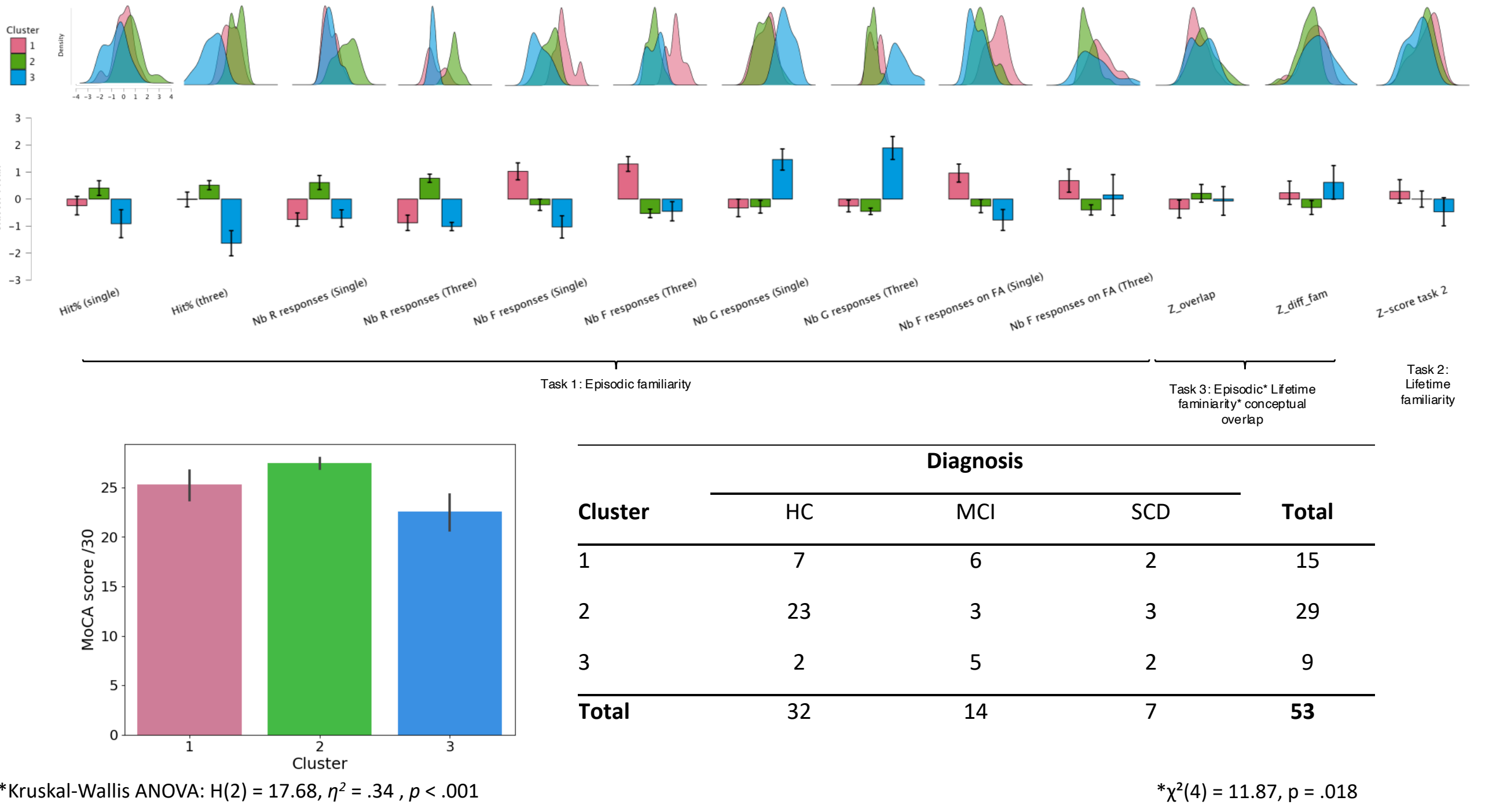
Results

Familiarity performance

Task 1

***p<.001, η^2_p = .63 significant main effect of number of presentations at encoding

Task 2

All participants showed positive correlation with familiarity judgments from the normative sample and there is inter-individual variability for regression analysis with brain volumes.

Task 3

*** p<.001, η^2_p = .30 significant main effect of target familiarity
*p =.02, η^2_p = .09 significant main effect of conceptual overlap
*significant interactions of conceptual overlap with target (p = .01, η^2_p = .11) and lure (p = .03, η^2_p = .08) lifetime familiarity
*p = .04, η^2_p = .08 significant triple interaction

Link between familiarity performance

Task 1: ANCOVA with MTL brain volumes revealed no [...]
Task 2: Stepwise linear regression revealed no signif [...] MTL regions volumes
Task 3: ANVOCA releaved significant triple interactions on the performance between
- lifetime familiarity of the lure, the degree of conceptual overlap and the volume of **left BA36**
- lifetime familiarity of the lure, the degree of conceptual overlap and the volume of **left alErC**

**F(1,41) = 7.80, η^2_p = 0.16, p = .008

**F(1,41) = 7.44, η^2_p = .15, p = .009

K-mean clustering analysis across 3 tasks & Matching with diagnosis

*Kruskal-Wallis ANOVA: H(2) = 17.68, η^2 = .34 , p < .001

	Diagnosis			
Cluster	HC	MCI	SCD	Total
1	7	6	2	15
2	23	3	3	29
3	2	5	2	9
Total	**32**	**14**	**7**	**53**

*χ^2(4) = 11.87, p = .018

Discussion

- Results support the link between f[...] decision when discriminating highl[...]

- Clustering analysis suggests that a[...] familiarity may help early diagnosis[...]

- Limitation: Evaluation of [...] representational aspe[...] familiarity only, not e[...] to investigate the phenomenological dir[...] familiarity

Task 1   *Task 3*

F: familiarity; R: recollection; G: guess
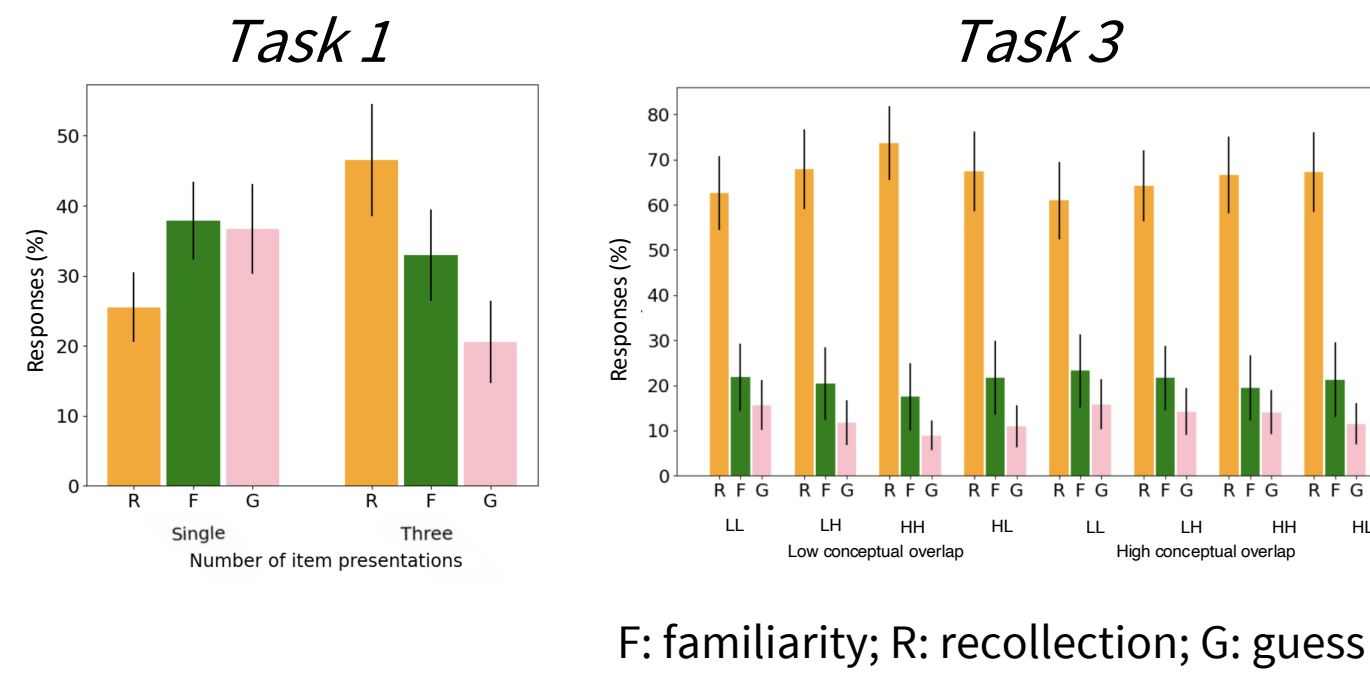
References

1. Braak, & Del Tredici (2015), *Brain*.
2. Bowels et al. (2016), *Neuropsychologia*.
3. Duke et al. (2017), *Cortex*.
4. Frick et al. (2023), *Neurobiology of Aging*.

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