

Can you say that again? – Are practice effects on verbal fluency tasks sensitive to healthy ageing and early cognitive impairment?

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Background

- Verbal fluency tasks (VFT) are **sensitive to early Alzheimer's disease (AD)-related cognitive decline** ¹
- VFTs are low cost, low resource, and time efficient, and hence **promising** for repeat screening and monitoring ²
- In research, **practice effects (PE)** are commonly a confounding factor, however, recently, PEs have been shown to predict **AD progression**, plus reduced PEs discriminate those at **greater AD risk** ³
- VFT PE seem to better classify CN and MCI ⁴, but **PE features in VFT are still underexplored**

Aims

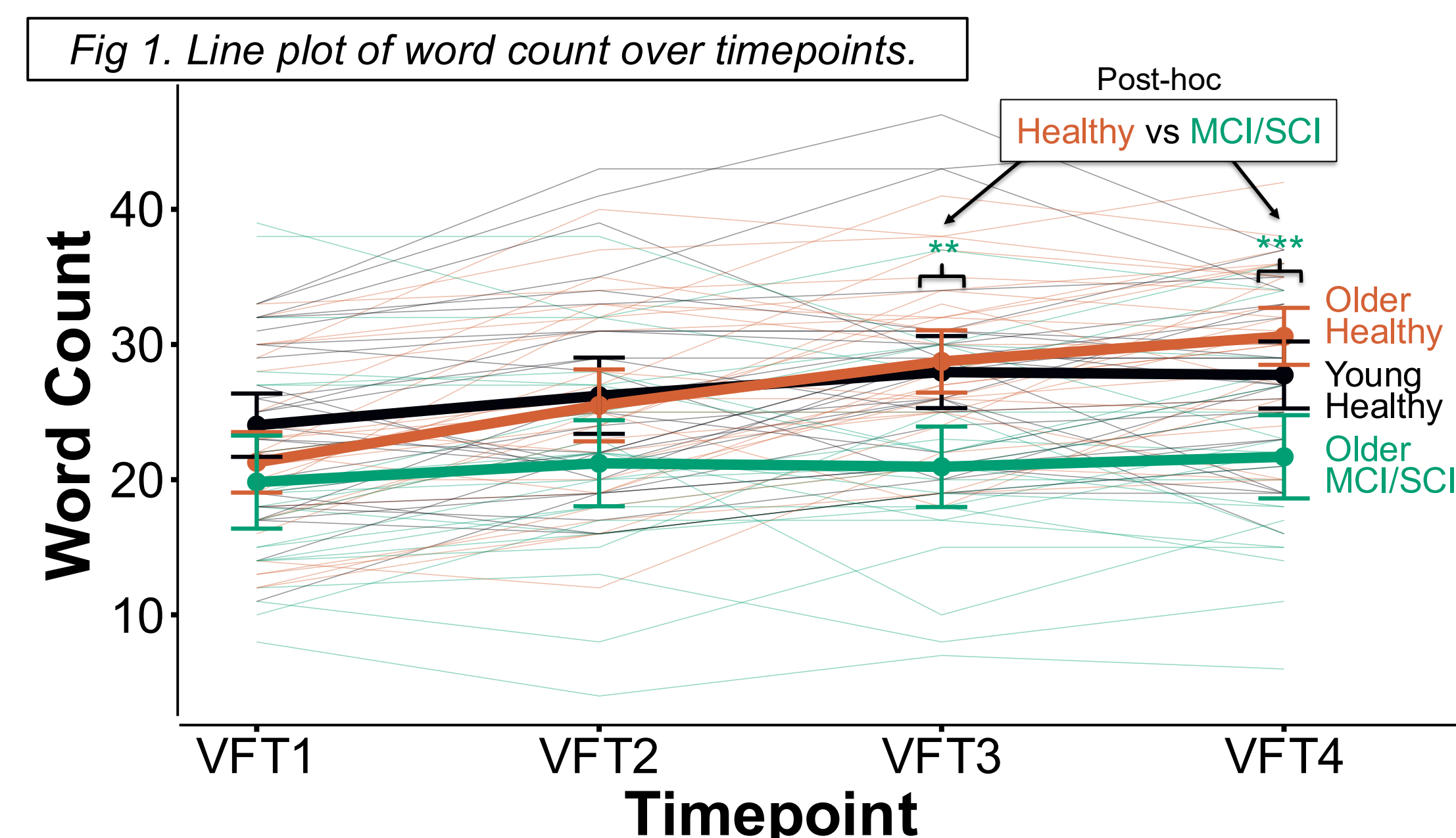


- Establish the **effect of age and cognitive status on PE** from repeated semantic VFTs
- Evaluate specific PE features across repeated VFTs to **determine markers of healthy aging and impaired cognition**

Results

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With practice, word count significantly increases distinction of cognitively healthy and MCI/SCI OA, but not YA vs OA



- Word count differs sig. between cognitive status ($\beta=.766$, $p=.0009$), not age. Post-hoc suggest only at later timepoints (Table 2).
- Healthy OA show greatest PE slope ($\beta=.118$) compared to YA ($\beta=.049$) and MCI/SCI OA ($\beta=.034$).

Table 2. Welch's T test, Bonferroni adj. p-values

	Age	Cognitive Status
VFT1	.815	1
VFT2	1	.391
VFT3	1	.001
VFT4	.729	.0002

Methods

Participant and demographic

80 participants recruited

Young Adult (YA)
(18-35 y.o.)
n = 28

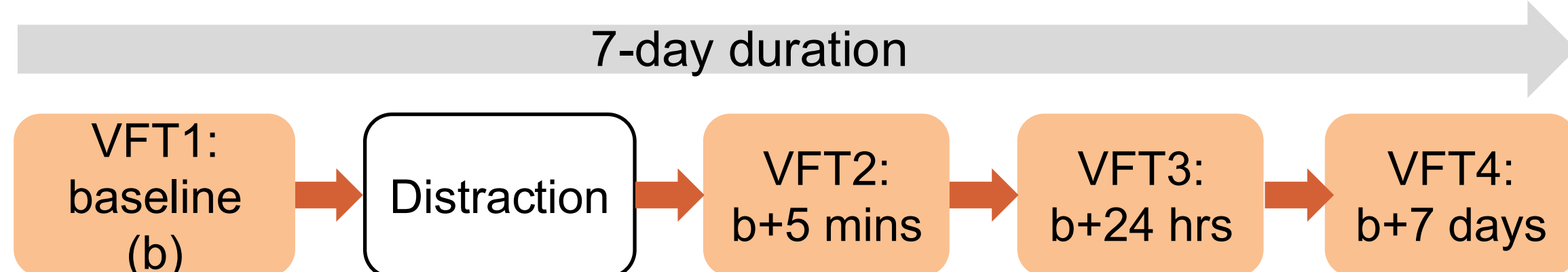
Healthy Older Adult (OA)
(60+ y.o.)
n = 28

MCI/SCI OA
(60+ y.o.)
n = 24

Table 1. Demographics of the 3 study groups

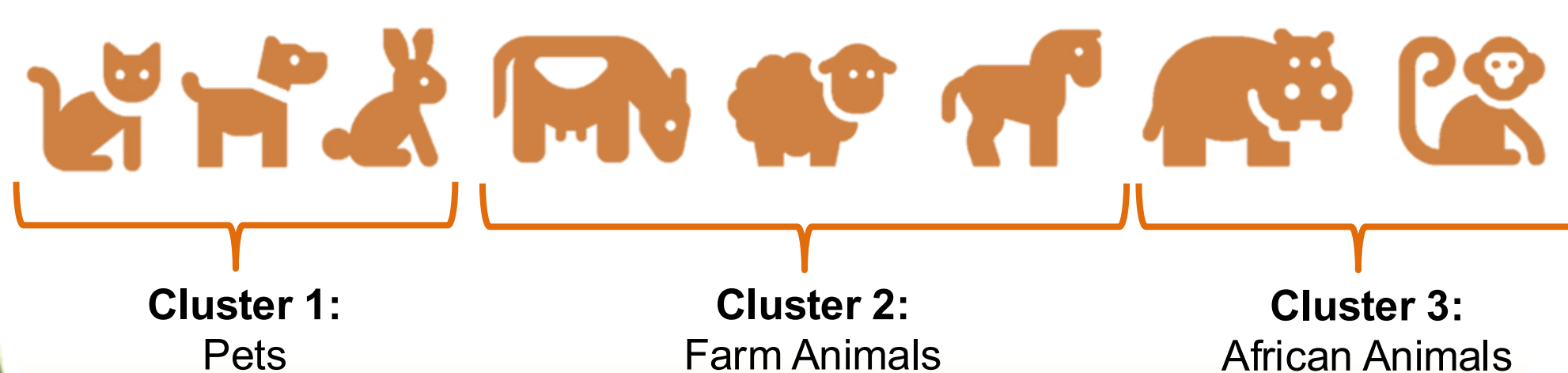
Group	Age, mean (SD)	Sample size, N	Percentage Male, %	MoCA Scores, Mean SD
YA Group	21.7 (2.45)	28	57.1	27.4 (1.88)
OA Group	70.1 (6.69)	28	40	26.0 (2.59)
MCI/SCI Group	73.1 (7.35)	24	47.8	23.8 (4.66)

Study Design



Say as many animals as you can within one minute!

Uh.. Ok. Cat, dog, rabbit, cow, sheep ... um ... horse, hippo, and ... monkey ...



Manual transcription & manual clustering ⁵

Animal words extracted

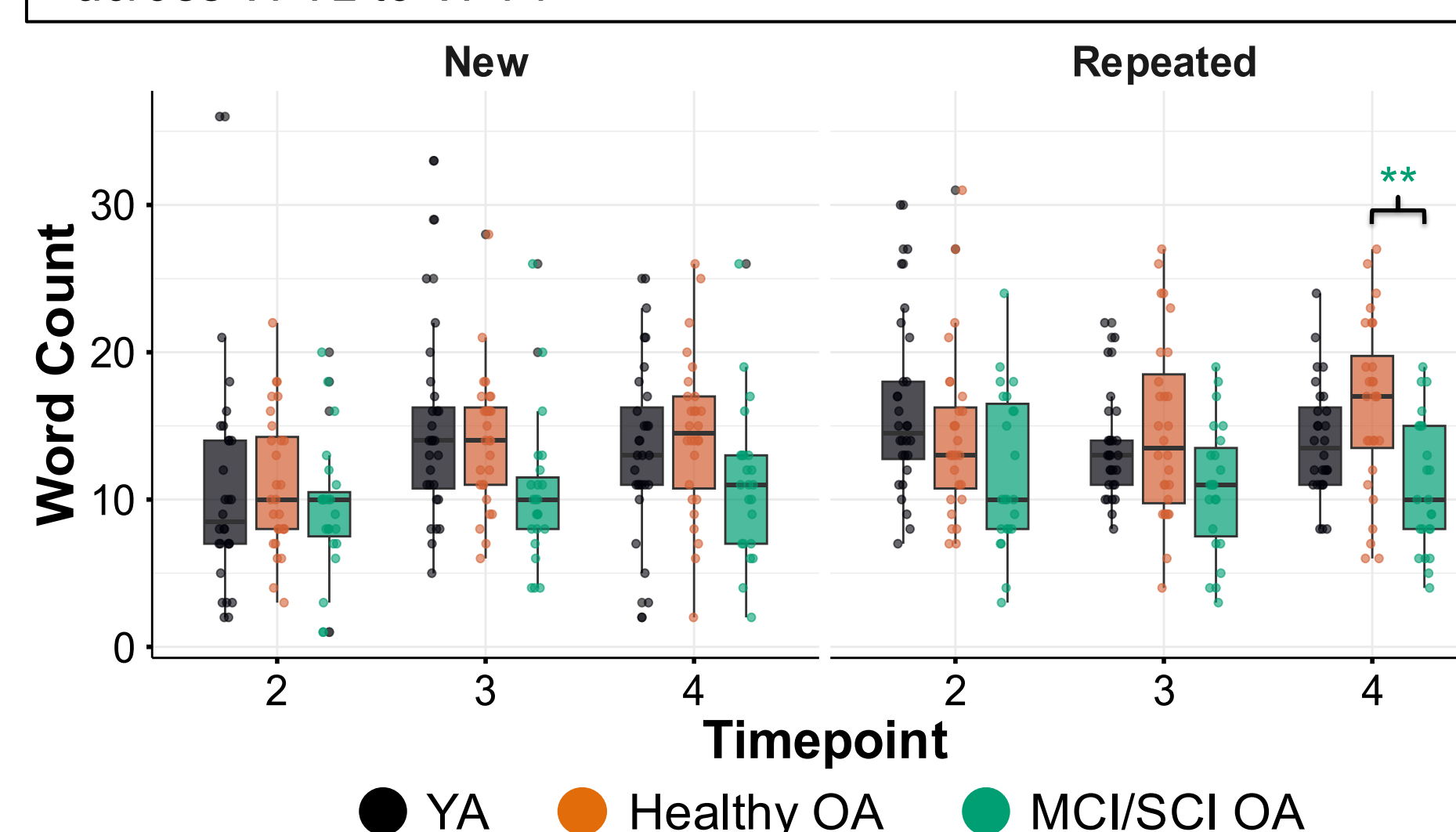
Cluster count and sizes extracted

Other tests: Sleep assessment, MoCA, task strategy questions

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Healthy OA repeats more words at subsequent timepoints in comparison to MCI/SCI OA

Fig 2. Boxplot of new and repeated word count between group across VFT2 to VFT4



Versus healthy OA, MCI/SCI OA produce sig. fewer new ($\beta=.766$, $p=.004$) and repeat words ($\beta=.728$, $p=.001$).

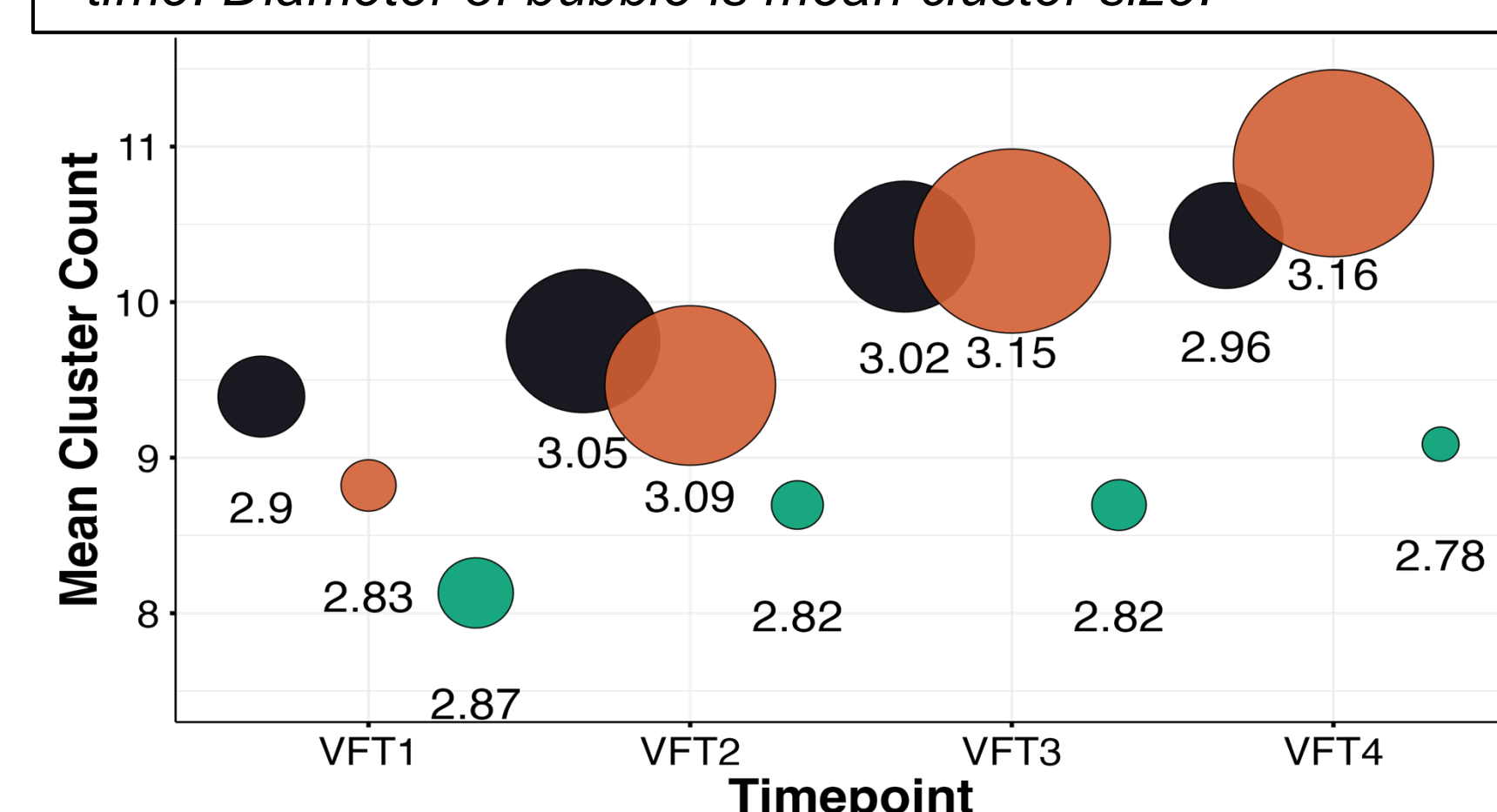
Table 3. Welch's T test, Bonferroni adj. p-values

	New		Repeat	
	Age	Cognitive Status	Age	Cognitive Status
VFT2	ns	1	1	.744
VFT3	1	.068	1	.064
VFT4	1	.182	.551	.002

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Healthy OA produce more and bigger semantic clusters than MCI/SCI OA at later timepoints

Fig 3. Bubble plot of mean cluster count per group over time. Diameter of bubble is mean cluster size.



Compared to MCI/SCI OA, healthy OA cluster count increases sig. ($\beta=.0873$, $p=.014$). Cluster size follows a similar trend, albeit non sig. ($\beta=.0913$, $p=.095$).

Table 4. Bonferroni adj. p-values

	Welch's T-test		Mann Whitney U	
	Cluster Count		Cluster Size	
	Age	Cognitive Status	Age	Cognitive Status
VFT2	1	1	1	1
VFT3	1	.082	1	.749
VFT4	1	.300	1	.460

Conclusion

- Repeating verbal fluency assessment better distinguishes those at risk of converting to future AD.
- Healthy OA produce more words with practice by repeating words (episodic memory) and utilising semantic clustering to greater effect (semantic, executive function)

Future Directions

- Changes to speech features (temporal, acoustic properties) with practice may enhance PE value more for discrimination
- The value of repeated VFT remains to be established in real-world clinic settings

References: 1. McDonnell, et al. (2019) International Psychogeriatrics. 2. Wright, et al. (2023) Psychology Research and Behavior Management. 3. Oltra-Cucarella, et al. (2022) Neurobiology of Ageing 4. Dörr F, et al. (2025) Clinical Neuropsychology. 5. Troyer, et al. (1997) Neuropsychology.