

Predicting Future Cognitive Decline with Smartphone-Based Episodic Memory Tasks

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Background

Alzheimer's disease is a neurodegenerative disease that causes **progressive memory loss** and ultimately dementia. Understanding who is **at risk of cognitive decline** is important for clinicians and researchers, as well as patients.

Remote digital cognitive assessments can capture concurrent change in clinically relevant measures¹. Here, we investigate their **prognostic ability** and test whether they can predict who will show cognitive decline, building upon previous work².

Methods

Participants

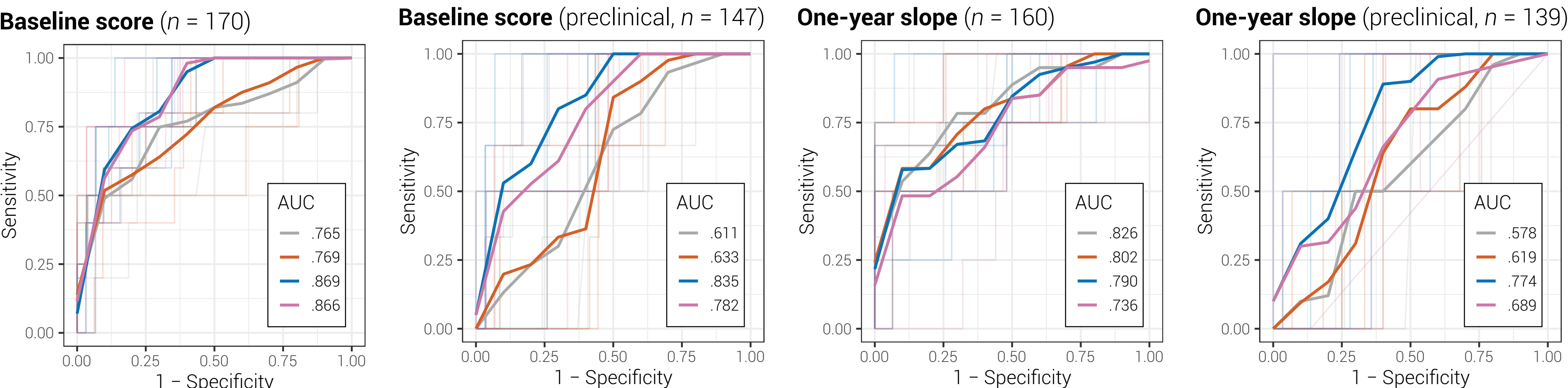
	CU	SCD	MCI
N	100	63	38
Aβ+	17 (17%)	16 (25%)	20 (53%)
Age	69.3 ± 6.1	71.5 ± 7.3	71.6 ± 7.2
Female	70 (70%)	36 (57%)	16 (42%)
Education	16.0 ± 2.6	15.5 ± 2.6	13.5 ± 2.4
DELCODE	30 (30%)	40 (63%)	13 (34%)
Wisconsin	70 (70%)	16 (25%)	0 (0%)
Memory clinic	0 (0%)	7 (11%)	25 (66%)
Change < -1.5 SD	6 (6%)	8 (13%)	21 (55%)

Mnemonic Discrimination Task for Objects and Scenes

Object-in-Room Recall

Complex Scene Recognition

Remote digital task performance predicts future decline



Models

- Model 0: Decline ~ diagnostic status + age + sex + education
- Model 1: Decline ~ diagnostic status + age + sex + education + **Aβ status**
- Model 2: Decline ~ diagnostic status + age + sex + education + **ORR + MDT-O + MDT-S + CSR**
- Model 3: Decline ~ diagnostic status + age + sex + education + **Aβ status + ORR + MDT-O + MDT-S + CSR**

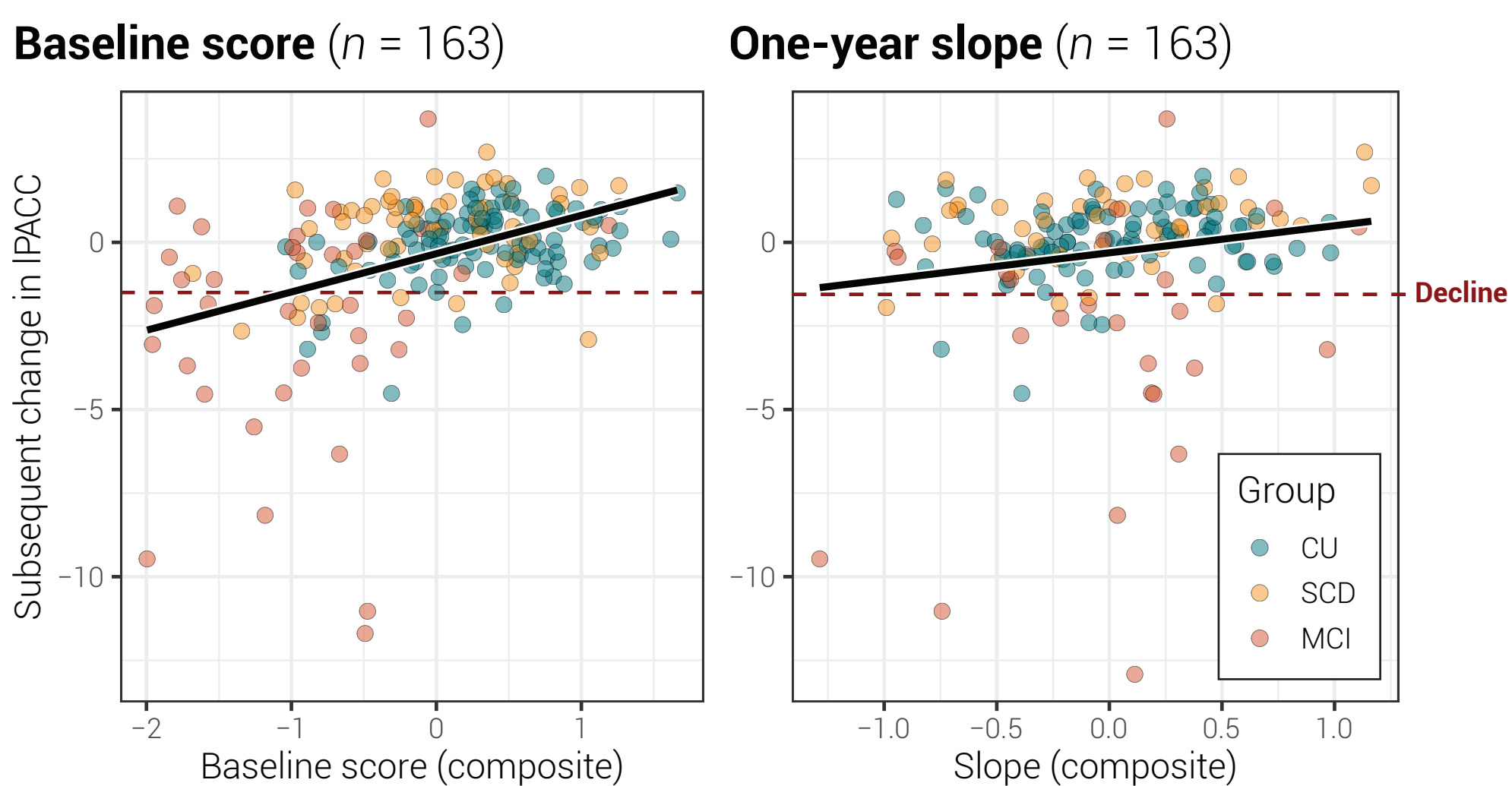
Decline defined as change in IPACC score of < -1.5 SD compared to the CU Aβ- group.

Model performance evaluated with 5-fold cross-validation. Mean AUCs are reported.

Model Comparison	Baseline (all)	Baseline (CU/SCD)	Slope (all)	Slope (CU/SCD)
Model 0	113.14	83.15	89.16	65.49
Model 1	108.88	83.09	88.36	66.48
Model 2	104.77	67.65	94.98	49.47
Model 3	105.75	69.57	94.80	51.01
Model 0 vs. 1	6.26*	2.06	2.80	1.01
Model 0 vs. 2	16.37*	23.50*	2.18	24.02*
Model 1 vs. 3	11.13*	21.52*	1.56	23.47*
Model 2 vs. 3	1.02	0.08	2.19	0.47

*p < .050

Continuous associations



Change in IPACC score in the subsequent four years is correlated with **remote cognitive task performance at baseline**, $r = .43, p < .001$, as well as **change over one year**, $r = .18, p = .020$.

Conclusion & future directions

Remote digital cognitive assessments can predict who will show cognitive decline in the next four years **better than Aβ status alone**.

Change in remote digital task performance is predictive of decline **before objective cognitive impairment** is established.

Remote digital cognitive assessments may **reduce the need for more expensive and invasive screening tests** in clinical trials, as well as **improve prognostic work-ups for patients at risk for Alzheimer's disease**.

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