

Brain Health in Everyday Life: Predicting and forecasting Cognitive and Affective changes from passive digital data

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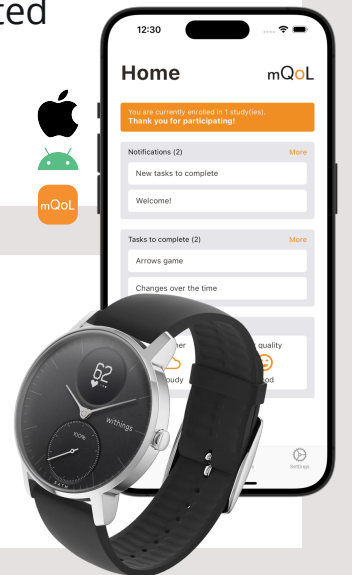
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PROBLEM

- Cognitive performance and affective states **fluctuate naturally** over time, even in healthy adults
- Current assessments are **episodic, burdensome**, and **poorly suited** to capturing these
- Consumer-grade wearables enable **continuous sensing**, but remain insufficiently validated

We ask "Can passively behavioural, physiological, and environmental data meaningfully reflect longitudinal changes in **cognition** and **affect** under everyday conditions?"



DATA

Prediction (contemporaneous)

N = 82, 60% female, M age 58 ± 8.5
4 waves (repeated assessments), **10 months**

Forecast (3, 6, 9 months)

N = 75, 61% female, M age 58 ± 8.7
9 waves, **24 months**

METHODS

Prediction

- Machine learning
- **1 outcome per model**
- Random Forest and Support Vector Machine performed best

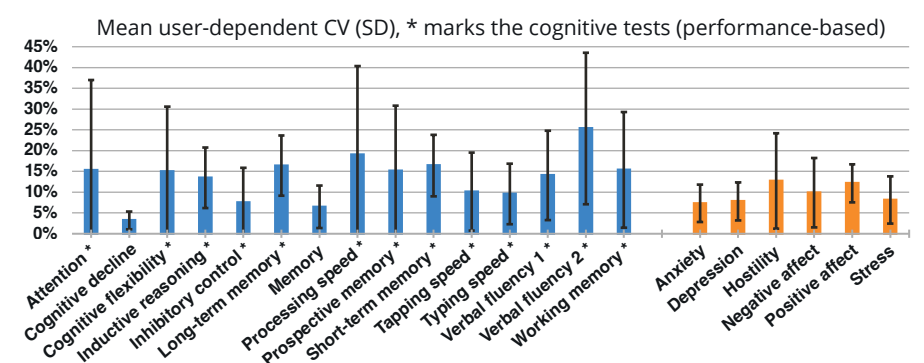
Forecast

- Deep learning (neural networks)
- **All outcomes in one single model**
- Temporal data modeling at daily and hourly level using Long Short-Term Memory model

PREDICTION

21 outcomes predictable with **Scaled MAE 3 - 25%**

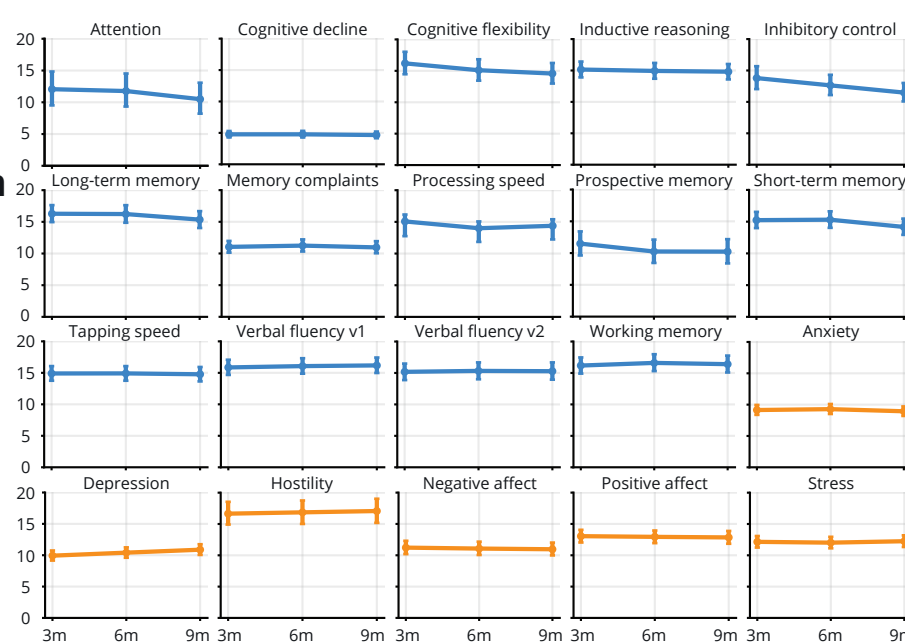
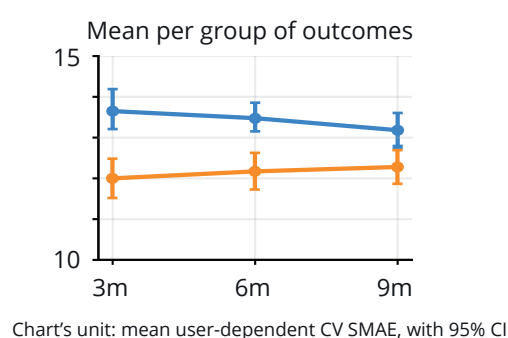
- **Cognition**: mostly 10 - 20%
Mean SMAE 13.5%
- **Affect**: mostly 5 - 10%
Mean SMAE 9.7%



FORECAST

20 outcomes forecastable up to **9 months** < 20% SMAE

- **Cognition** best in **long-term**
- **Affect** best in **short-term**



Support/funding



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QoLife Technologies
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