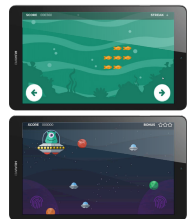


Repeated, self-administered, wireless dry EEG in the home reliably measures the neurophysiological basis of cognitive processes in older adults.

Cumulus Dry EEG Headset



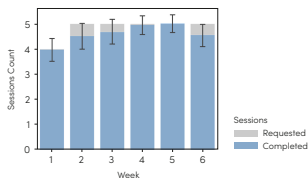
Flanker and Oddball Gamified Tasks



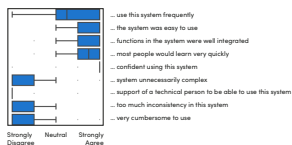
MOTIVATION

- Slowly developing neurodegenerative disorders need to be monitored longitudinally [1][2]
- Wet EEG is costly and cumbersome
- Wireless dry EEG could provide an easy-to-use, scalable and objective measure of neuronal function
- Home-recorded EEG sessions are less controlled, but aggregation of repeat sessions may compensate for this

Mean Number of At-home Sessions Per Participant – Older Adult



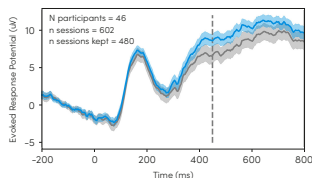
System Usability Scale Older Adult (N=32)



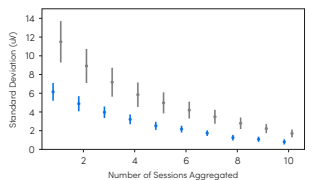
METHOD

- 50 healthy older adults (55+ years; 25 female) completed 6 weeks of self-administered dry EEG at-home recordings (5 days/week)
- Visual Oddball task assesses attention and decision making
- Flanker task assesses inhibition and executive function
- Usability was evaluated via participant adherence, percentage of sessions successfully completed, and quantitative feedback using the System Usability Scale [3]

Oddball Task Grand Study Average Stimulus Locked Target Trials Cz

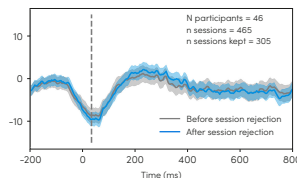


P300 (t=452ms) – Cz

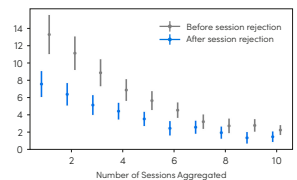


- EEG signals were pre-processed with frequency domain filtering and automatic artefact removal methods. Low quality epochs and sessions were removed using a correlational approach
- Signal variability was quantified by computing standard deviation across multiple session aggregates. Only participants that contributed 10 sessions were kept in the analyses (N=46)

Flanker Task Grand Study Average Response Locked Difference Waves FCz



Error Related Negativity (t=32ms) – FCz



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RESULTS

- 1,499 EEG sessions were collected. On average, participants who completed the 6 weeks recorded 28.9 sessions (of 29 sessions requested, std: 7.6)
- Older adults successfully completed 93% of the sessions attempted and reported a mean usability score of 84.5
- Signal variability decreased nonlinearly with increasing sessions aggregated. Error bars and shaded areas correspond to the 95% confidence intervals

CONCLUSIONS

- Aggregation of 3-5 repeat sessions yields data of similar quality to lab-collected data [4]
- Wireless dry-sensor EEG enables the collection of clinically relevant domain-specific markers of brain function and cognitive performance – remotely and without researcher supervision
- These findings have strong implications for AD and PD research as it suggests that larger scale brain electrophysiology studies evaluating cognitive function are possible for the first time

	Oddball Task		Flanker Task	
	Session	%	Session	%
Requested	725		725	
Attempted	750	103	699	96
Successfully completed	705	94	643	92
Passed Step 1 quality control (epoch rejection)	631	90	486	76
Passed Step 2 quality control (session rejection)	508	81	319	66

REFERENCES

- (1) A. Burns and S. Iliffe, "Alzheimer's disease," BMJ, 2009.
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- (4) Cassidy, S. M., Robertson, I. H. and O'Connell, R. G. "Retest reliability of event-related potentials: Evidence from a variety of paradigms", Psychophysiology, 2012.