

# 1/f and Attention: Examining the Relationship Between Attention and Aperiodic Neural Activity in Resting-State EEG in Ageing



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## Background

- **Ageing** is accompanied by a **decline in cognitive functions** and is a major risk factor for **dementia**.
- Recent studies show **age-related changes** in 1/f-like **aperiodic neural activity** is linked to differences in **cognitive performance**<sup>1-3</sup>.
- 1/f may be a biomarker for attention impairments in ageing, however, **the association between aperiodic activity and sustained attention in older adults is unknown**.

## Methods

- **Cross-sectional** sample of healthy Older Adults enrolled in LEISURE study, **50-84 years** (N=86; M=64.6 years; 20.9% male).
- Spectral parameterisation of 4-minute **eyes closed rsEEG** to reveal aperiodic exponent and offset in averaged **frontal** and **parietal** region.
- **Sustained attention** measured using **CANTAB Rapid Visual Information Processing** task.

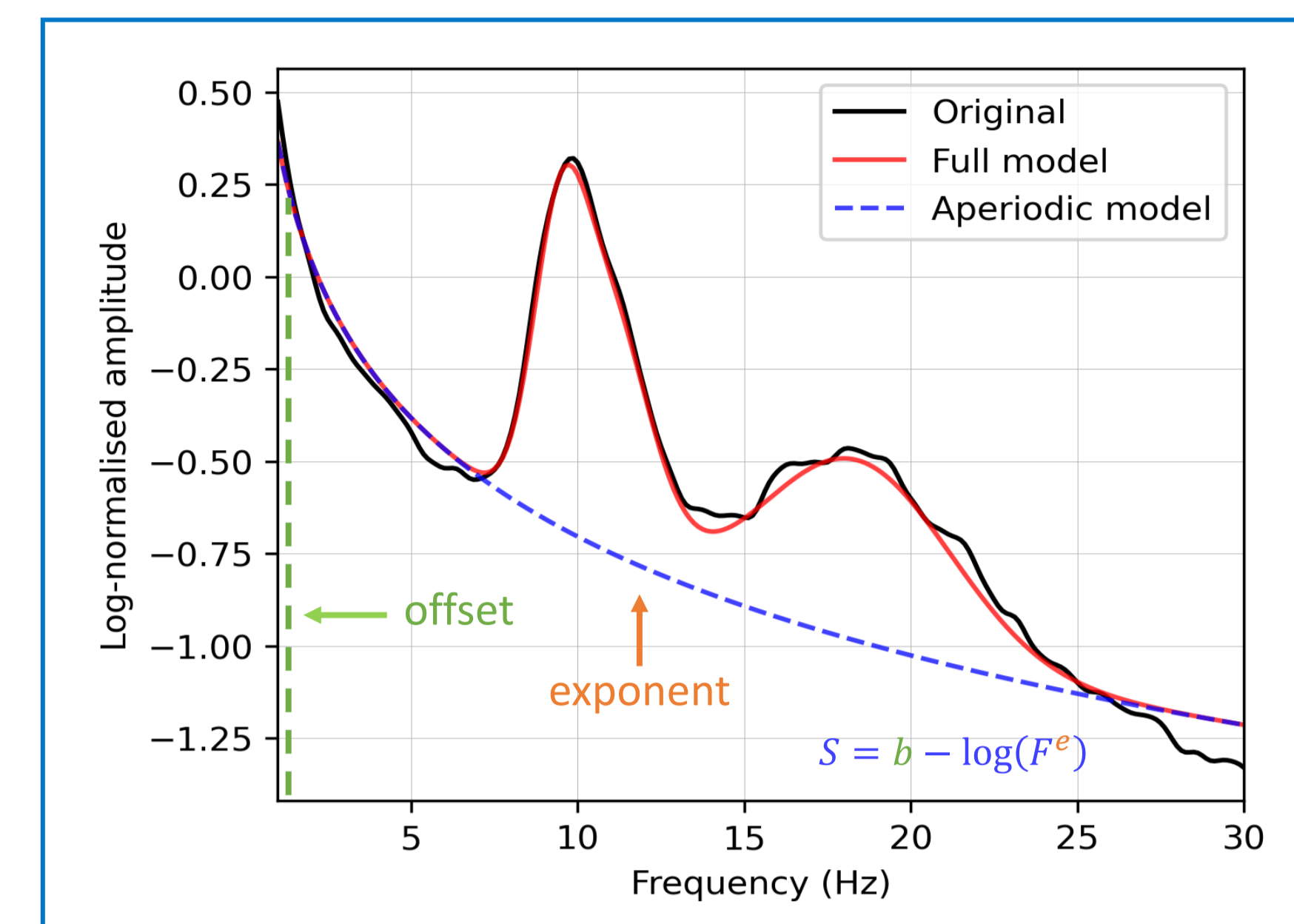


Figure 1: Example specparam<sup>4</sup> (F000F) model fit from a single subject showing the aperiodic exponent (blue) and offset (green) across the analysed frequency range (0.5-30 Hz).

## Results

Multiple linear regression (bootstrapped; 2000 samples, 95% BCa CI) revealed that after controlling for age, sex and education (years), sustained attention performance was:

- **Significantly associated with frontal aperiodic exponent.**  
( $R^2 = 0.210$ ;  $p = 0.047$  corrected; BCa, 95% CI = [0.865, 1.031]).
- **Significantly associated with parietal aperiodic offset.**  
( $R^2 = 0.217$ ;  $p = 0.030$  corrected; BCa, 95% CI = [0.905, 1.042]).

The same association was not seen for frontal aperiodic offset ( $p = 0.077$ ;  $R^2 = 0.202$ ) and parietal aperiodic exponent ( $p = 0.163$ ;  $R^2 = 0.190$ ).

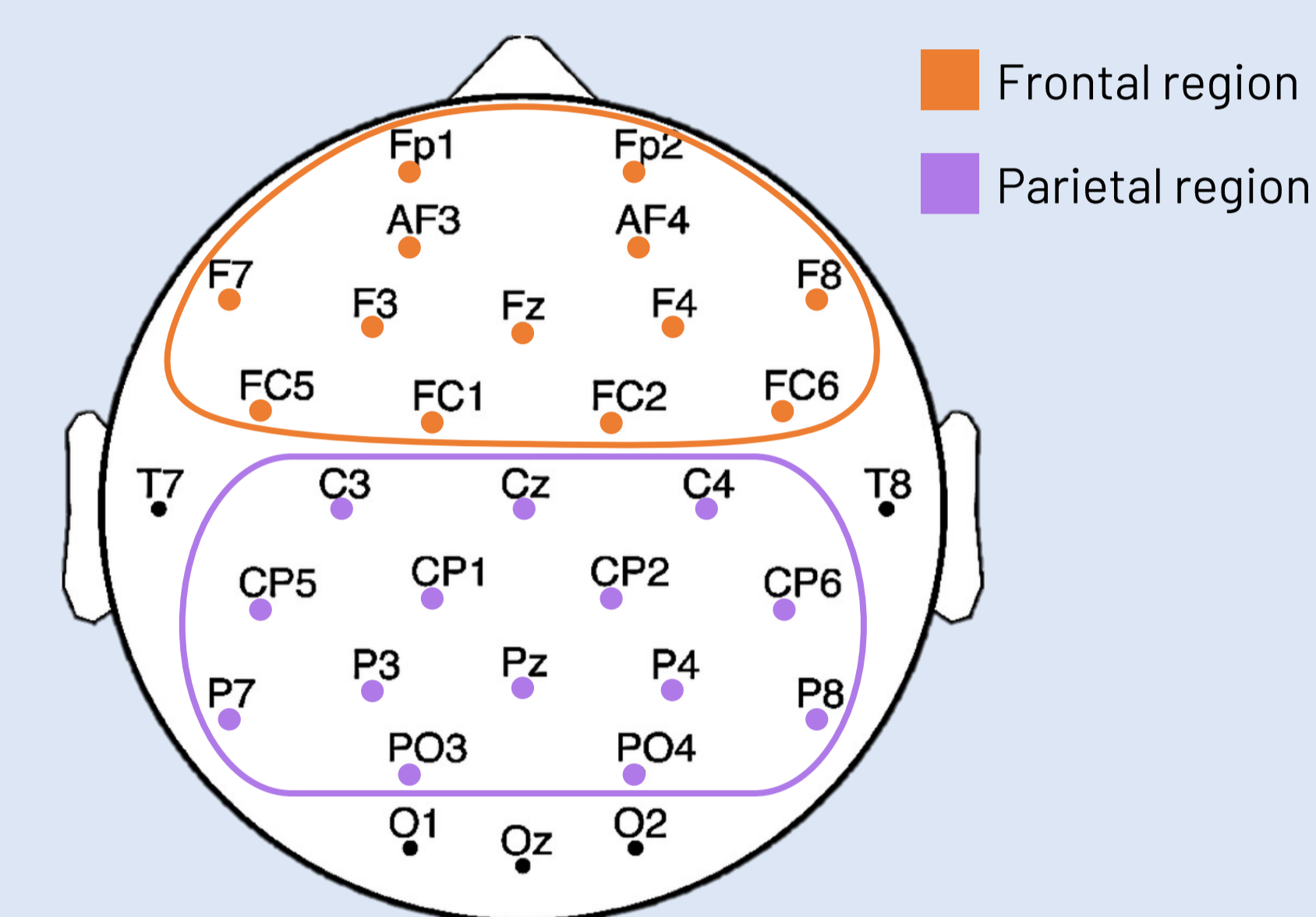


Figure 2: Electrode configuration for 32-channel EEG used in the current dataset.

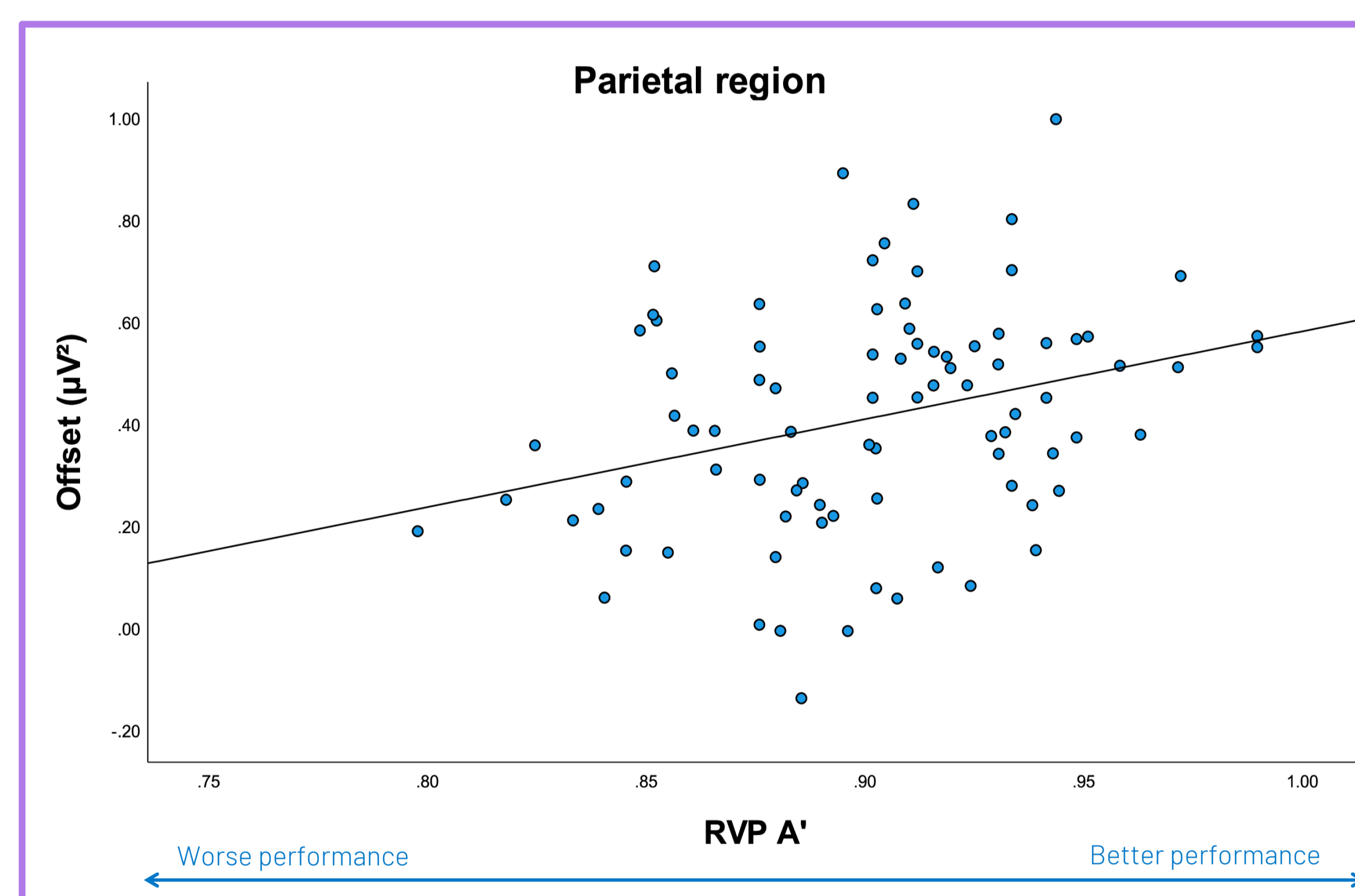
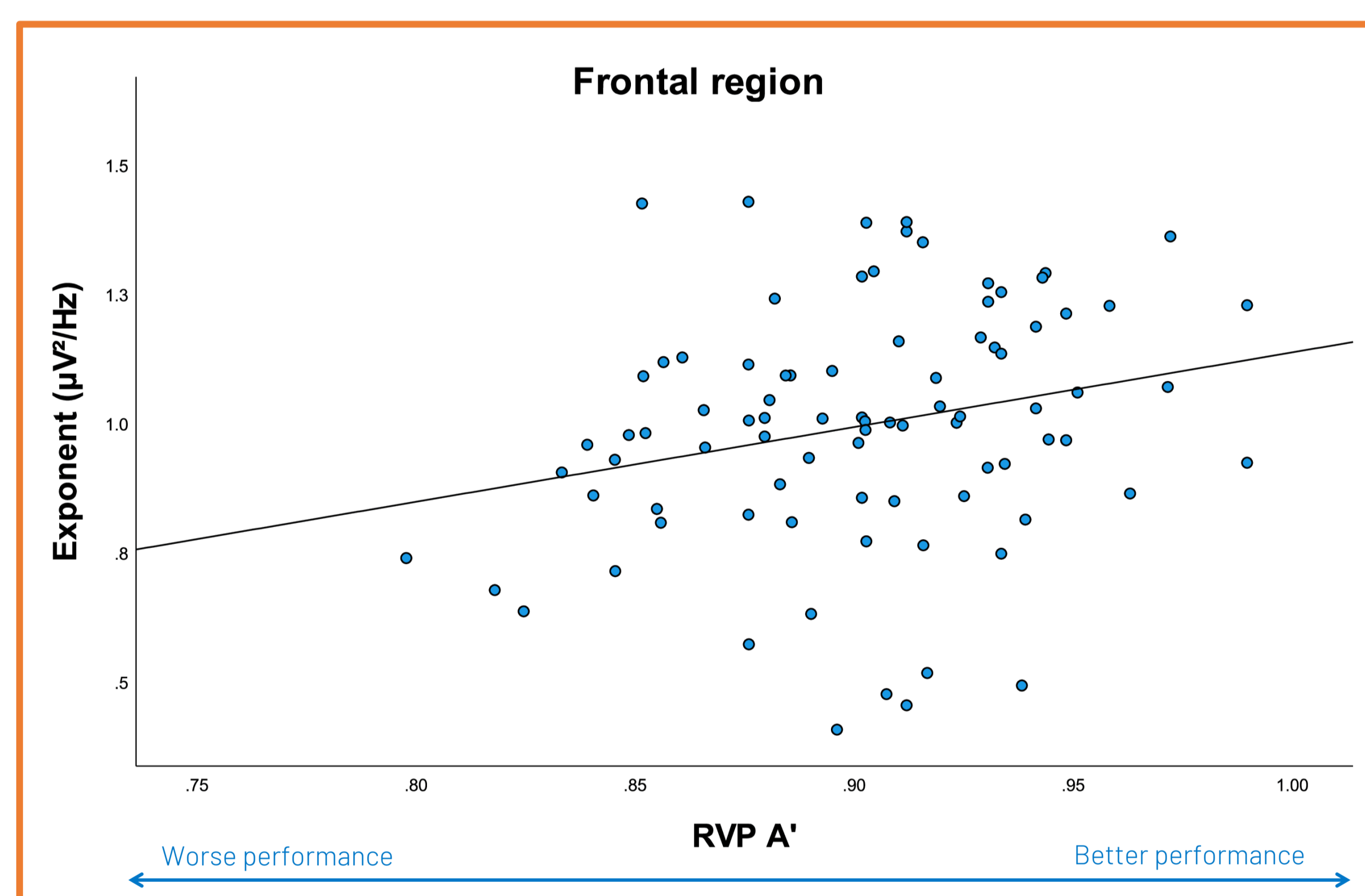


Figure 3: Linear regressions between EEG aperiodic activity parameters (i.e., exponent and offset) at **frontal** and **parietal** regions and CANTAB Rapid Visual Information Processing task scores, see associated statistics above.

## Conclusion

- These findings indicate that **frontal and parietal 1/f-like aperiodic neural activity may be a biomarker of sustained attention abilities in older adults**.
- This has implications for **illuminating the underlying neural basis of cognitive declines observed in dementia**.

## Acknowledgements

This study was conducted using data from the LEISURE study (Lifestyle Intervention Study for Dementia Risk Reduction).

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## References

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