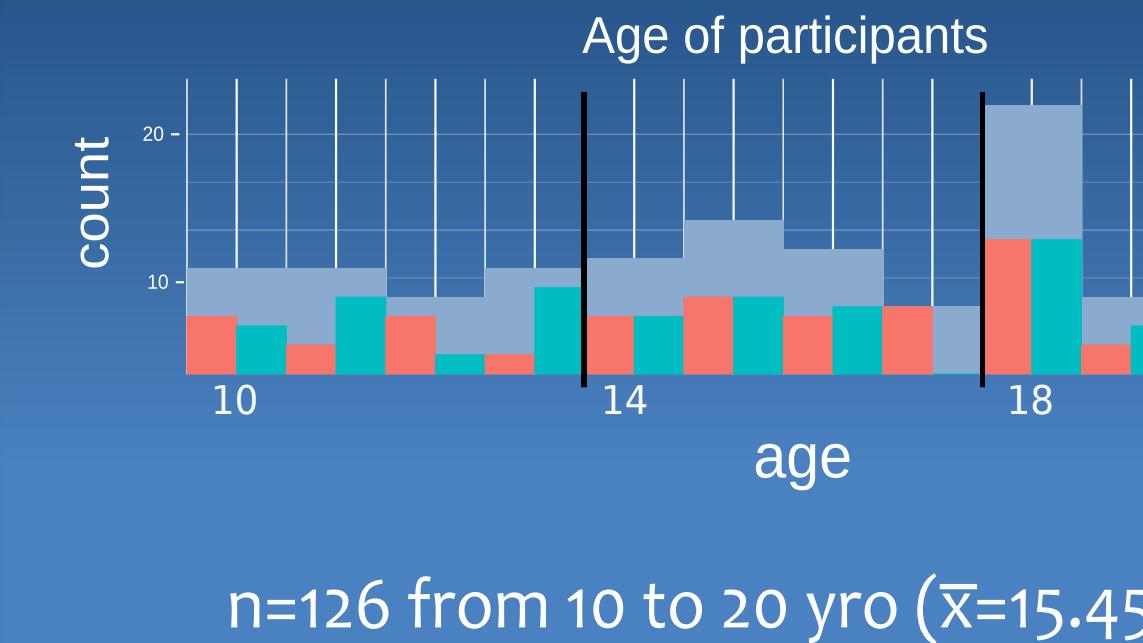


## Intro

- Existing evidence suggests that resting-state fMRI connectivity can be confounded by physiological parameters (Birn et al., 2008; Chang et al., 2009).
- Controlling for physiological noise is particularly important for developmental studies because respiration and heart rate could systematically differ across age groups, potentially reflecting age-related differences in physiological reactivity to the MR environment.
- The goal of the current study is to investigate whether or not correcting for physiological noise could alter developmental changes in resting-state correlations.

## Participants



# The Importance of Applying Physiological Regression to rsfMRI

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## Physiological Recordings

Respiration and heartbeat were continuously recorded using a respiration belt and a pulse oximeter attached to the left index finger.

### Regressors

- 5 RVT regressors, time shifted versions of one another
- 8 Retroicor, 2 sin and 2 cosine for each card and resp

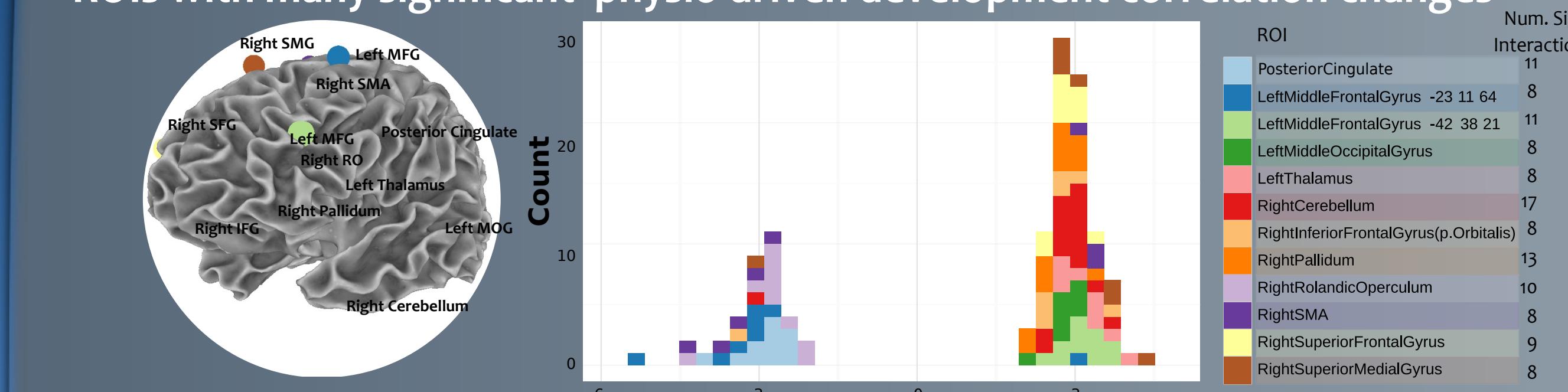
## Regions of Interest

### ROIs for full brain coverage

5mm radius around 244 coordinates  
adapted from Power et al. (2007)



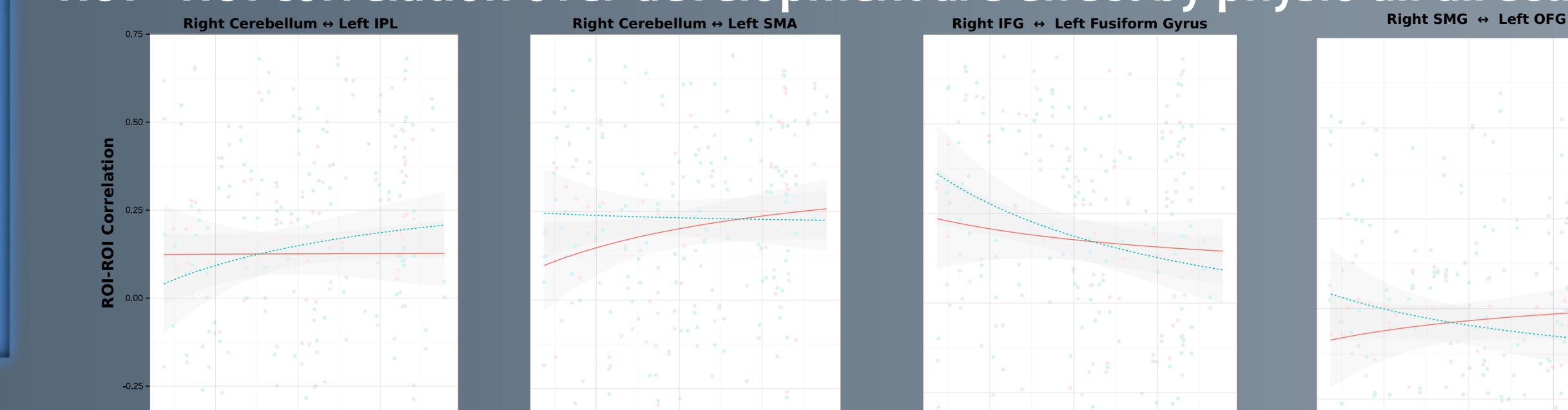
### ROIs with many significant physio driven development correlation changes



### Developmental ROIs

Subset of ROIs preselected with expectation of correlation changes along developmental

### ROI $\leftrightarrow$ ROI correlation over development are effect by physio all directions



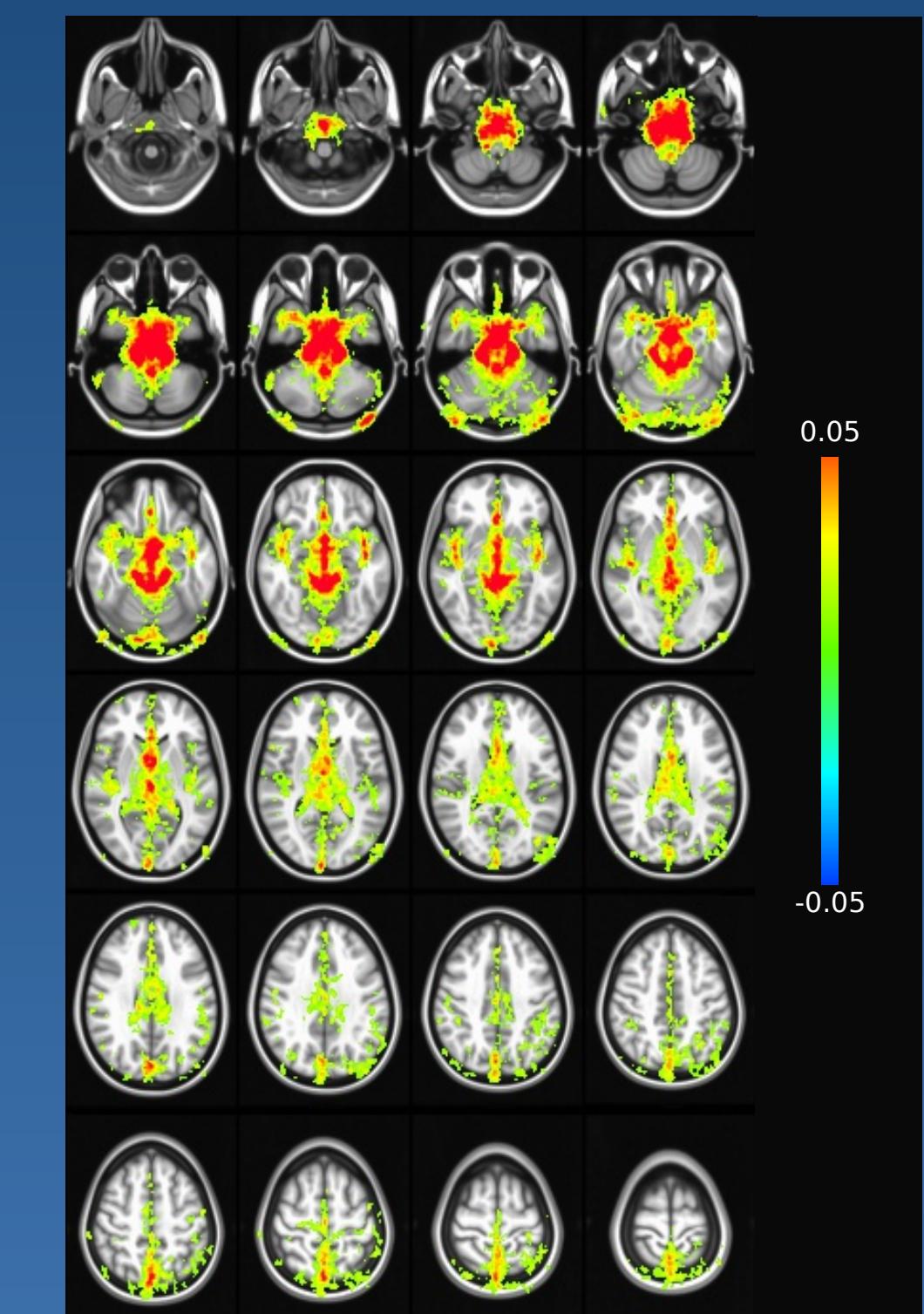
## References

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 H. Jo, Z.S. Saad, W.K. Simmons, L.A. Milbury, R.W. Cox (2010). Mapping sources of correlation in resting-state fMRI, with artifact detection and removal. *NeuroImage*, Vol 52 (2), 571-582.  
 Per Birn et al NeuroImage 2007

## Results and Conclusions

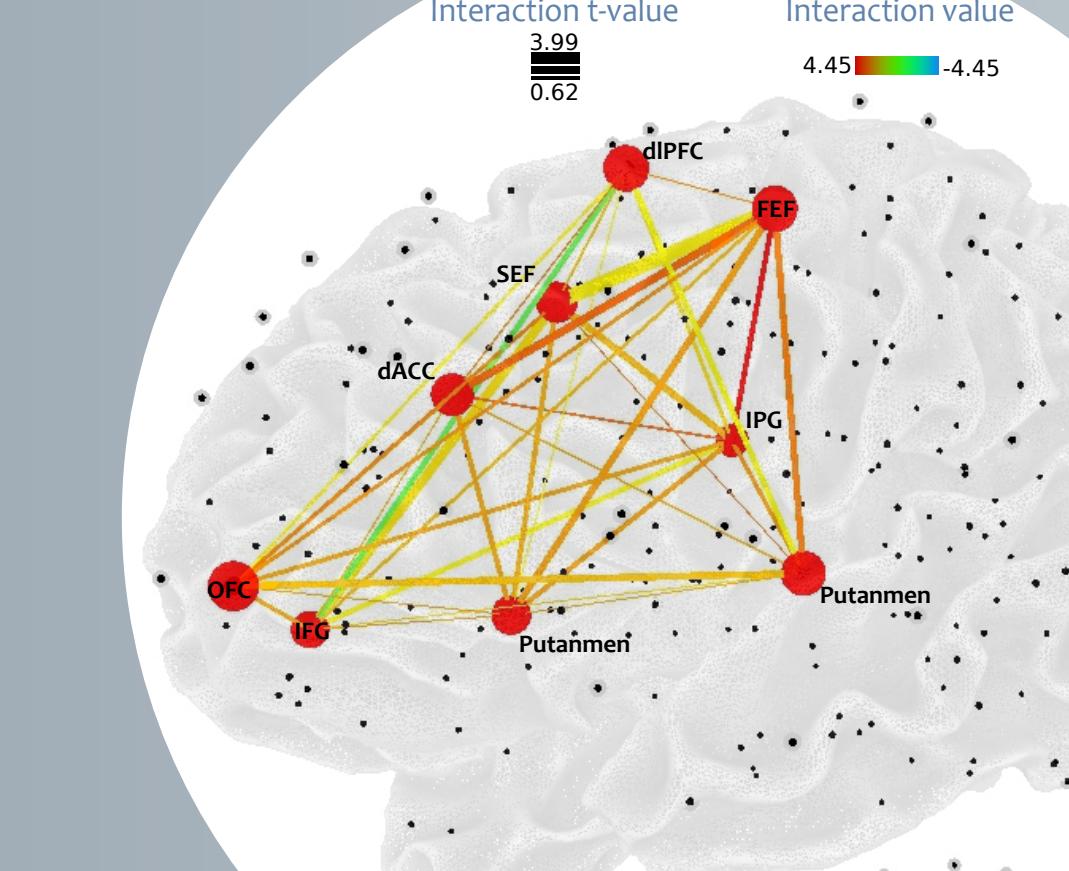
- Physiological measures explain some signal
- Physio and nophysio pipelines are significant in only a few ROI-ROI correlations
- Including physiological regressors increases developmental findings
  - Development trajectories with and without physio can be opposite!
- Physio has an obvious impact on cerebellar and brain stem regions
- Including physio can also change interpretation of other areas (SEF)

## Physiological regressors explain brain stem, midline and subcortical signal



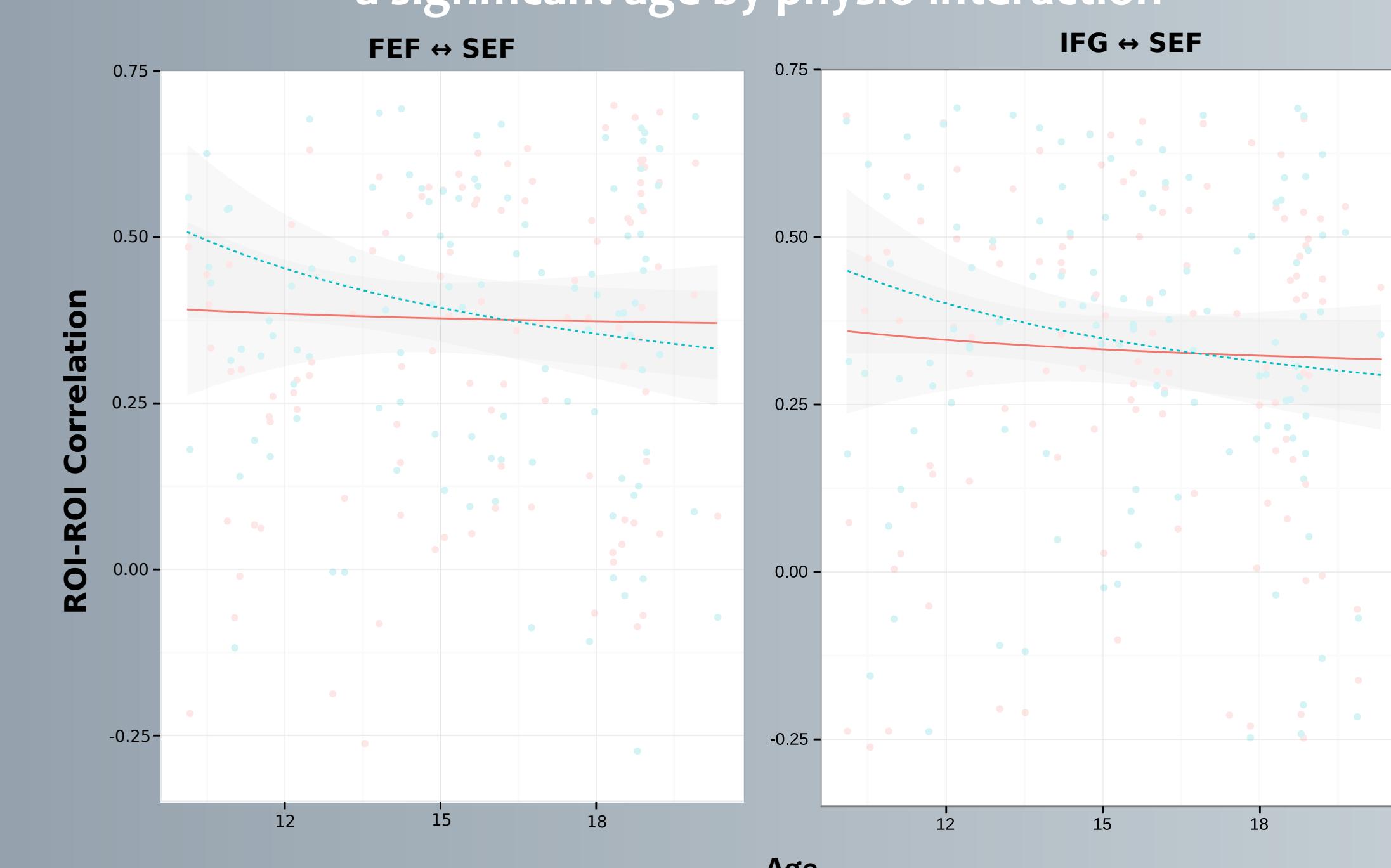
of the most connected nodes  
XX voxles / YY voxles have coverage in  
The R2 map. mu=ZZ

developmental ROIs only



The development ROI graph illustrates the effect of accounting for respiration and cardiac measures has on modeling correlation over development

2/36 predefined developmental ROIs show a significant age by physio interaction



## Future Directions

- Test Physiological estimation software (PESTICA)
- 
- 

## Source Code

<https://github.com/WillForan/physioCompare>

