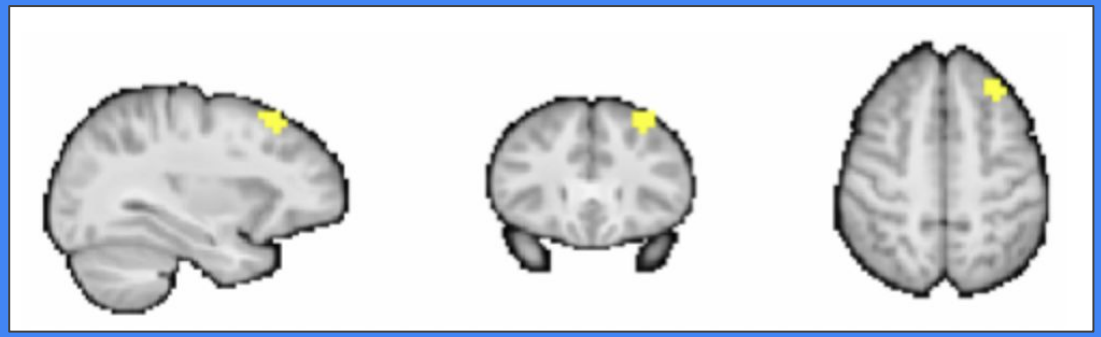


Individual Differences in **Delay Discounting** are Associated with **dmPFC** **(dorsomedial prefrontal cortex)** Connectivity in Youth

Outline

- Background
- Limitations of prior work
- Methods
- Results
- Conclusions
- Limitations/ future directions

Background

- DD predicts many real-life outcomes (Hirsh, Morisano, and Peterson, 2008; Mahalingam et al., 2016)
- DD is considered a transdiagnostic feature across multiple clinical disorders (Amlung et al., 2019; Lee, Stanger, and Budney, 2015; Levin et al., 2018).

Limitations of prior work

- Small sample size increases chance of Type I error (Marek et al., 2022; Button et al., 2013)
- ROI approach: does not consider entire functional connectome

Our Study

Methods

Delay Discounting Task

- **PNC Cohort (N = 293; ages 9-23)** (Satterthwaite et al., 2014)
- **Smaller reward sooner or larger reward later?**
- **Part of a CNB administered previously** (Gur 2010; Gur 2012)

$$V=A/(1+kD)$$

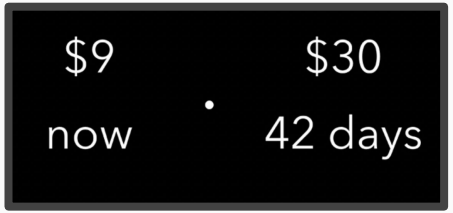
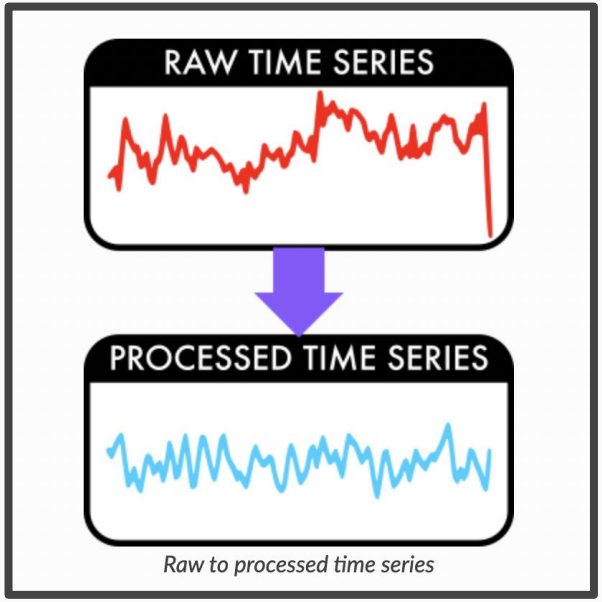


Image Processing

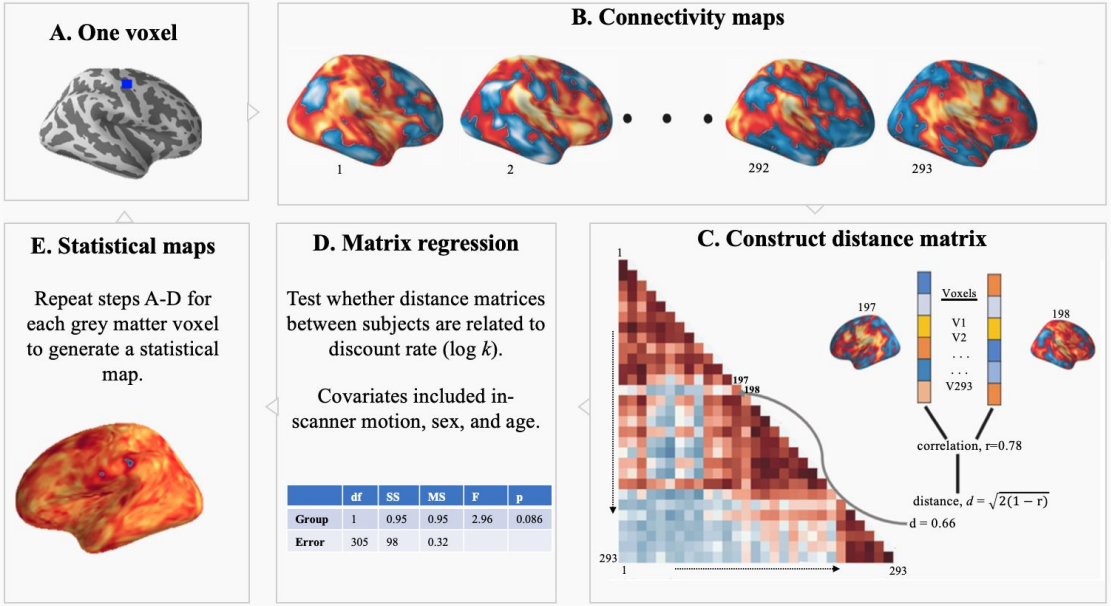


Raw to processed time series

- **3T Siemens at HUP**
- **XCP Engine** (Ciric et al., 2018)
- **T1 (MPRAGE), rsMRI, B0 field maps**
- **Distortion correction, despiking, detrending, regression, Butterworth filtering**
- Quality assurance: RMS > 0.2 mm or 20 frames with motion > 0.25 mm

Analysis

CWAS (connectome-wide association study) and MDMR (multivariate distance-based matrix regression)



	df	SS	MS	F	p
Group	1	0.95	0.95	2.96	0.086
Error	305	98	0.32		

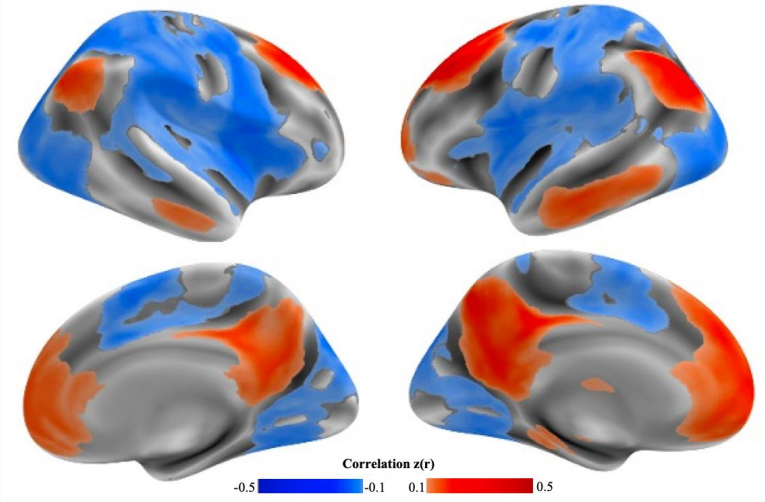
$$distancematrix = f(logk) + relMeanRMSmotion + sex + age$$

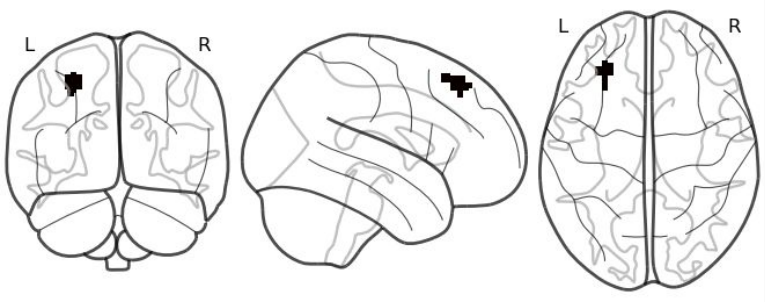
Additional analyses

- Follow-up seed based analyses with *flameo*
- Interaction effects with age and sex
- Sensitivity analyses with SES variables
- Simple bivariate regression with age and sex

Results

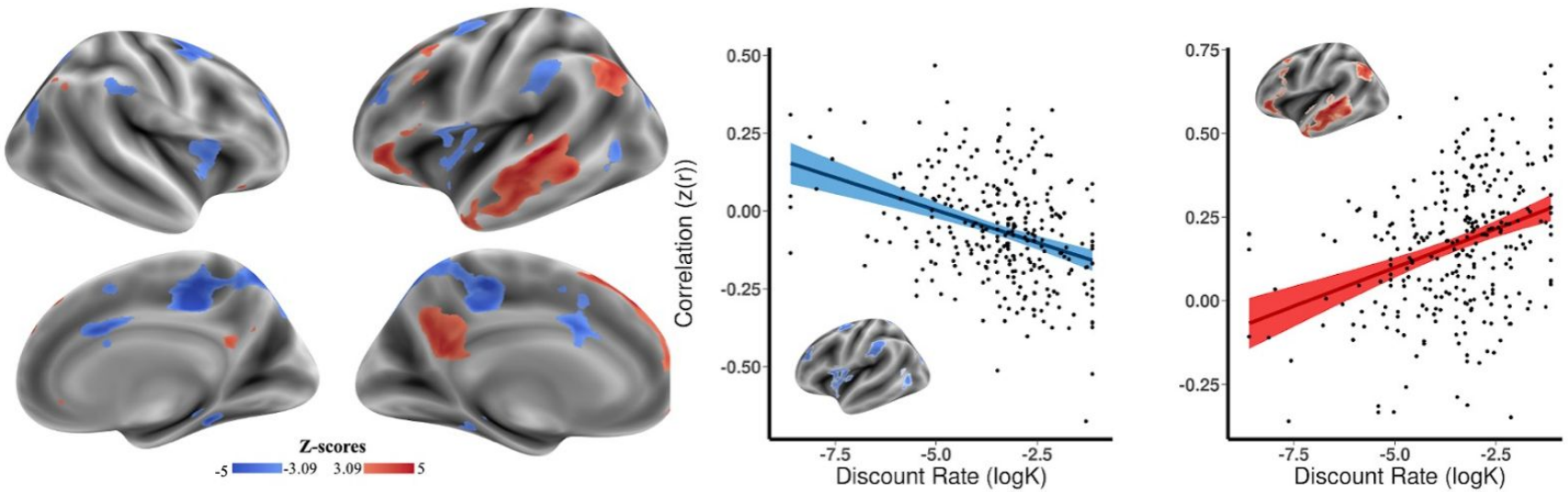
dmPFC mean connectivity





Cluster in the dmPFC, correlated with parts of DMN; anti-correlated with attention network and FPN regions

Follow up seed analyses

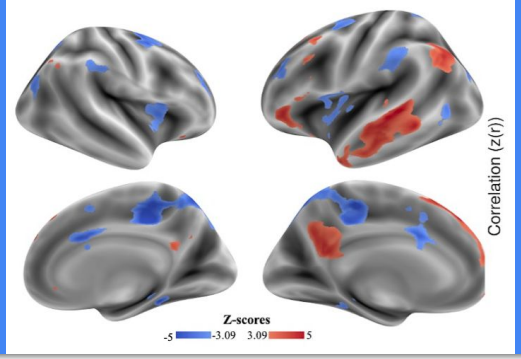


Cluster in the dmPFC, higher within-DMN and lower FPN/attention-DMN connectivity for those with higher log K values

Additional analyses: results

- No significant interaction effects
- No correlation with age or sex
- Cluster maintained after adding SES variables

Conclusions



dmPFC

1. **increased connectivity within the DMN**
2. **diminished connectivity between attention networks and the FPN**

- **dmPFC** and DD (Wang et al., 2014; Wang et al., 2016)
- **DMN** and DD (Dohmatob, Dumas and Bzdok, 2020; Vanyukov et al., 2015)
- Functional **segregation** between **cognitive control** and **reward regions** (Chen, Guo, Suo, and Feng, 2018; Sadaghiani, and D'Esposito, 2014, Fox et al. 2005)

Limitations/ Future Directions

- **Our study is cross-sectional, not longitudinal**
  - dmPFC and DMN connectivity evolves with age (Xiao, Zhai, and Friederici et al., 2015; Bowman et al., 2019; Sydnor et al., 2021)
  - *We did not find age effects*
- **Our task is hypothetical in nature**
- **The MDMR approach has been shown to have limited sensitivity in many settings** (Misaki et al., 2018)
- **Future directions: neuromodulation, longitudinal research, replication**

Questions?

Thank you!