Pro-social reward-effort decision-making in at-risk aging

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INTRODUCTION

- Pro-social shift occurs with aging (SST) [1,2]
- Apathy correlated with health problems[3]
- Neural correlates of REDM poorly understood in cognitive aging[4]
- Brain-based prevention for healthy aging

Aim

- Examine RSFC of reward-effort networks decision-making in older adults at-risk of AD

METHODS

Demographics (n = 44)

Demographic variable	
Age, M (SD)	72.06 (5.23)
Sex, n (%)	31 (70.5) female
APOE4 Status, n (%)	13 (29.5) APOE4 carriers
Education (years), M (SD)	16.23 (3.91)
Ethnicity	43 Caucasian and 1 African American

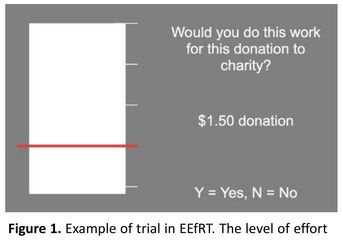


Figure 1. Example of trial in EEfRT. The level of effort to expand is 2. The amount of the reward $1.50 and will be given to a charity, a pro-social reward.

Seed-to-voxel analysis

- Hypothesis-driven, correlation between average time series in each ROI and time series of all other voxels

Modeling Reward-Effort Discounting curves

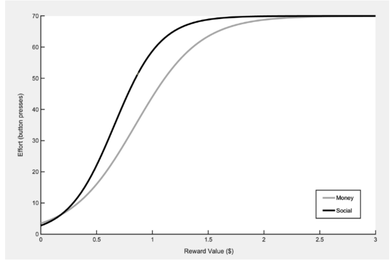
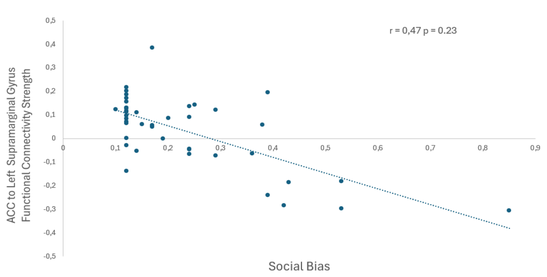


Figure 2. The left-right translation of the function reflects bias towards inactivity. Sigma reflects the slope of the function, which represents reward insensitivity.

RESULTS



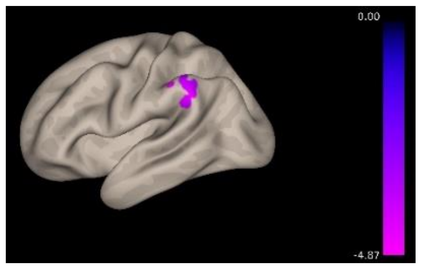
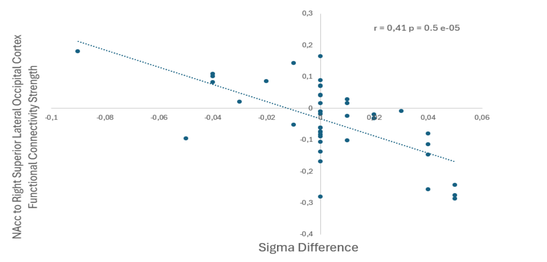


Figure 3. GLM and seed-to-voxel analysis of the seed-to-voxel results from the ACC seed.

Higher social bias was associated with lower resting-state functional connectivity between the ACC and a cluster in the supramarginal gyrus.

(SMG l; t(42) = -1.21, voxel p < 0.001 uncorrected, cluster p-FWE < 0.05, peak voxel MNI coordinates = [-66, -28, 36], k = 129).



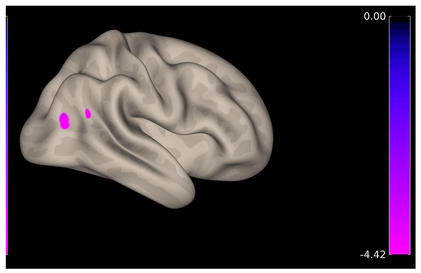
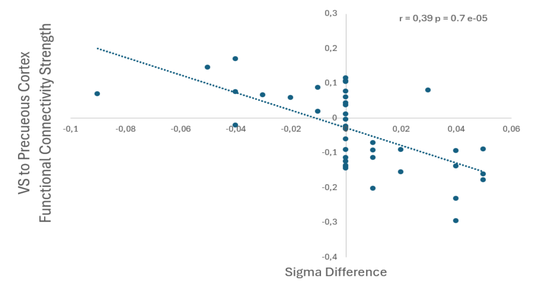


Figure 4. GLM and seed-to-voxel analysis of the seed-to-voxel results from the NAcc seed.

Lower sigma difference was associated with higher resting-state functional connectivity between the NAcc and a cluster in the lateral occipital cortex.

(sLOC r; t(42) = -5.24, voxel p < 0.001 uncorrected, cluster p-FWE < 0.05, peak voxel MNI coordinates = [60, -64, 20], k = 98).



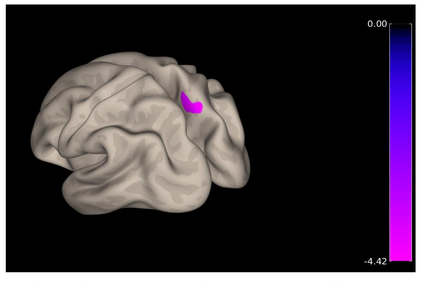


Figure 5. GLM analysis of the seed-to-voxel results from the VS seed.

Higher sigma difference was associated with lower resting-state functional connectivity between the VS and a cluster in the precuneous cortex.

(PC; t(42) = -5.15, voxel p < 0.001 uncorrected, cluster p-FWE < 0.05, peak voxel MNI coordinates = [04, -58, 48], k = 124)

- *Controlling: Age, Sex, APOe4 carriership, Mean motion, and Time Delay*

CONCLUSIONS

- Many **neurobehavioral correlates of reward-effort decision making in at-risk aging** including:
  - Social bias & ACC-SMG
  - Sigma difference & NAcc-PC, NAcc-lOC, VS-PC
  - Monetary sigma & vmPFC-lSFG, vmPFC-lFP
- Need further investigation to establish causality

RELEVANT LITERATURE

[1]Chen, Y.-C., Hung, N., Lau, B. H. P., Choy Yung, R. M. P., Fung, E. S. M., & Chan, C. L. W. (2022). Generativity and Gendered Pathways to Health: The Role of Human, Social, and Financial Capital Past Mid-Life. *International Journal of Environmental Research and Public Health*, *19*(9), Article 9. https://doi.org/10.3390/ijerph19094956

[2]Crawford, J. L., English, T., & Braver, T. S. (2023). Cognitive Effort-Based Decision-Making Across Experimental and Daily Life Indices in Younger and Older Adults. *The Journals of Gerontology: Series B*, *78*(1), 40–50. https://doi.org/10.1093/geronb/gbac167

[3]Walker, C. S., Li, L., Baracchini, G., Tremblay-Mercier, J., Spreng, R. N., & Geddes, M. R. (2023). The influence of generativity on purpose in life is mediated by social support and moderated by prefrontal functional connectivity in at-risk older adults. *bioRxiv*, 2023.02.26.530089. https://doi.org/10.1101/2023.02.26.530089

[4]Pizana, G. R. C. (n.d.). *Linking Motivation to Effort and Reward Processes in Older Adults in Health and Chronic Illness*.

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