F009: Similarity in brain functional connectome predicts response to a dopamine challenge

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Introduction

- Effectiveness of treatment for mental disorders might be improved by individually assigning patients to tailored interventions
- Psychoactive drugs are characterized by marked heterogeneity in efficacy
- Connectomic “fingerprinting” based on functional connectivity matrices re-identifies persons with strikingly high accuracy (Finn et al., 2015)

Research question:

Will similar brains react likewise to a dopamine challenge?

Can we identify participants who will benefit from receiving a drug (i.e., L-DOPA) based on their functional connectome at rest?

Is similarity in the functional connectome associated with dopamine (DA) tone as assessed in an independent F-DOPA PET imaging session?

Methods

Sample: 60 healthy participants (49 male; M_age: 33.8 ± 3.6; 30-42 years)
Procedure: Administration of 100mg L-DOPA + 25mg benzserazide

Summary of the design

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<th>Session 1</th>
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<td>6 min rest</td>
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Effective volume distribution ratio of f’/f”-DOPA: Single subject

Features defining subgroup clusters:

- 25 ROI-to-ROI differences between subgroups, p < .001:
  - 11 caudate → temporal cortex/parahip. gyrus
  - 4 nucleus accumbens (NAcc) → temporal cortex

Features defining subgroup clusters:

- Individual connectome may constrain likely responses to a drug
- Striato-temporal edges were among the strongest discriminating features
- Functional connectivity at rest might confer information on neurotransmitter function such as dopamine washout

Summary & Conclusion

The brain’s function at rest may serve as a blueprint for pharmacological effects

- Individual connectome may constrain likely responses to a drug
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L-DOPA improves model-based behavior in Subgroup 2

Benefits (SG2) are characterized by higher DA tone driven by reduced dopamine washout

Summary & Conclusion

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- Individual connectome may constrain likely responses to a drug
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- Functional connectivity at rest might confer information on neurotransmitter function such as dopamine washout

Improved understanding of the neurobiological mechanisms driving unique patterns of functional connectivity at rest might foster the use of fMRI-based classification as a potential diagnostic tool

References

Burrasch et al. (2013). Hierarchical clustering (Ward) based on distance matrix derived from FC matrices: 6 FC-based leave-one-out prediction of dopamine PET

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