Response conflict tasks rely on different underlying network dynamics, despite overlapping activity profiles

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RESEARCH QUESTION

Do observed similarities in brain activation patterns reflect also similar task-based connectivity profiles?

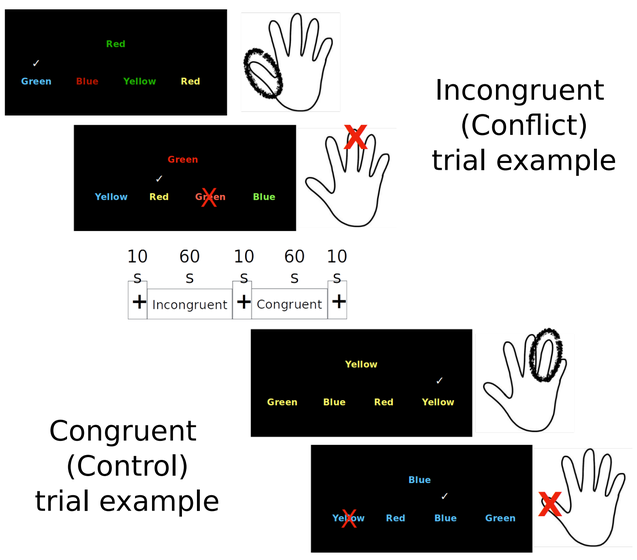
DATA

242 healthy subjects ([30-51] years, 123 males) that completed two information-conflict tasks (Stroop, MSIT) and one resting-state scan.

TASKS

Interleaved blocks (~60s each) of Congruent and Incongruent trials [1,2]

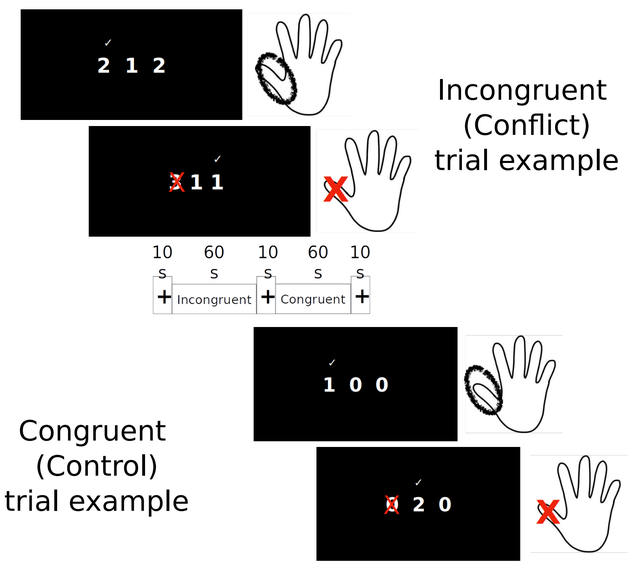
(color-word) Stroop



Incongruent (Conflict) trial example

Congruent (Control) trial example

Multi-source Interference Task (MSIT)

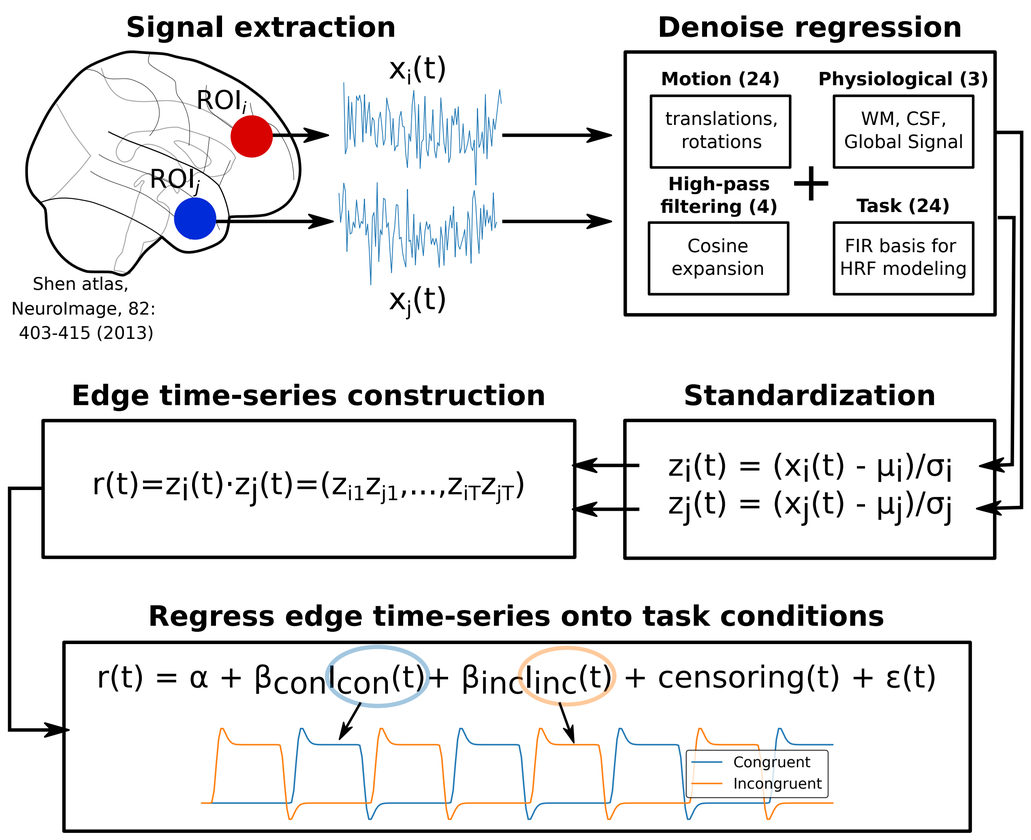


Incongruent (Conflict) trial example

Congruent (Control) trial example

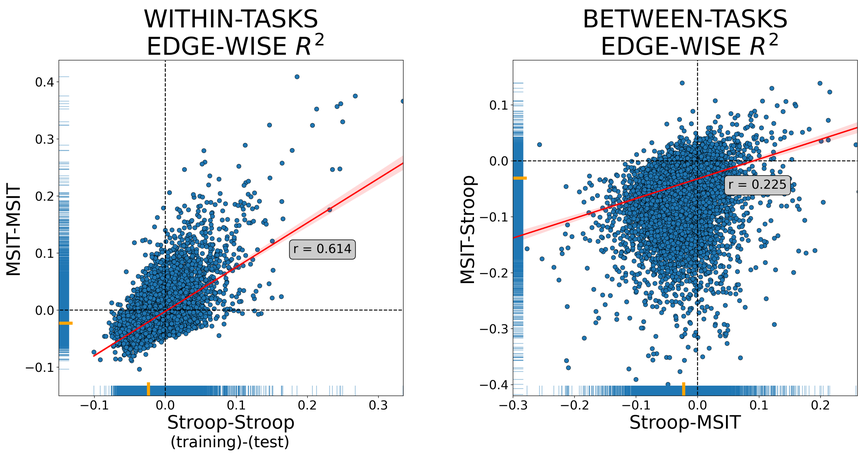
TASK-BASED CONNECTIVITY PROFILES

We used edge time-series by temporally unwrapping Pearson correlations [3] in order to infer intrinsic and task-dependent network profiles in a 268-parcel atlas.

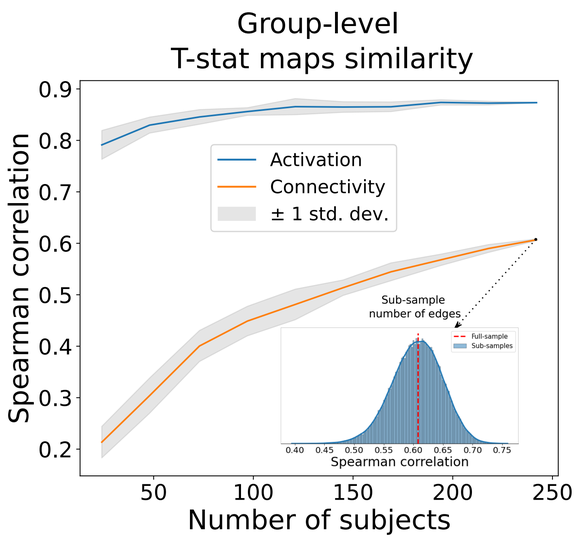


EDGE-WISE GENERALIZABILITY

We find edges associated with the tasks that generalize to unseen data, particularly within tasks.

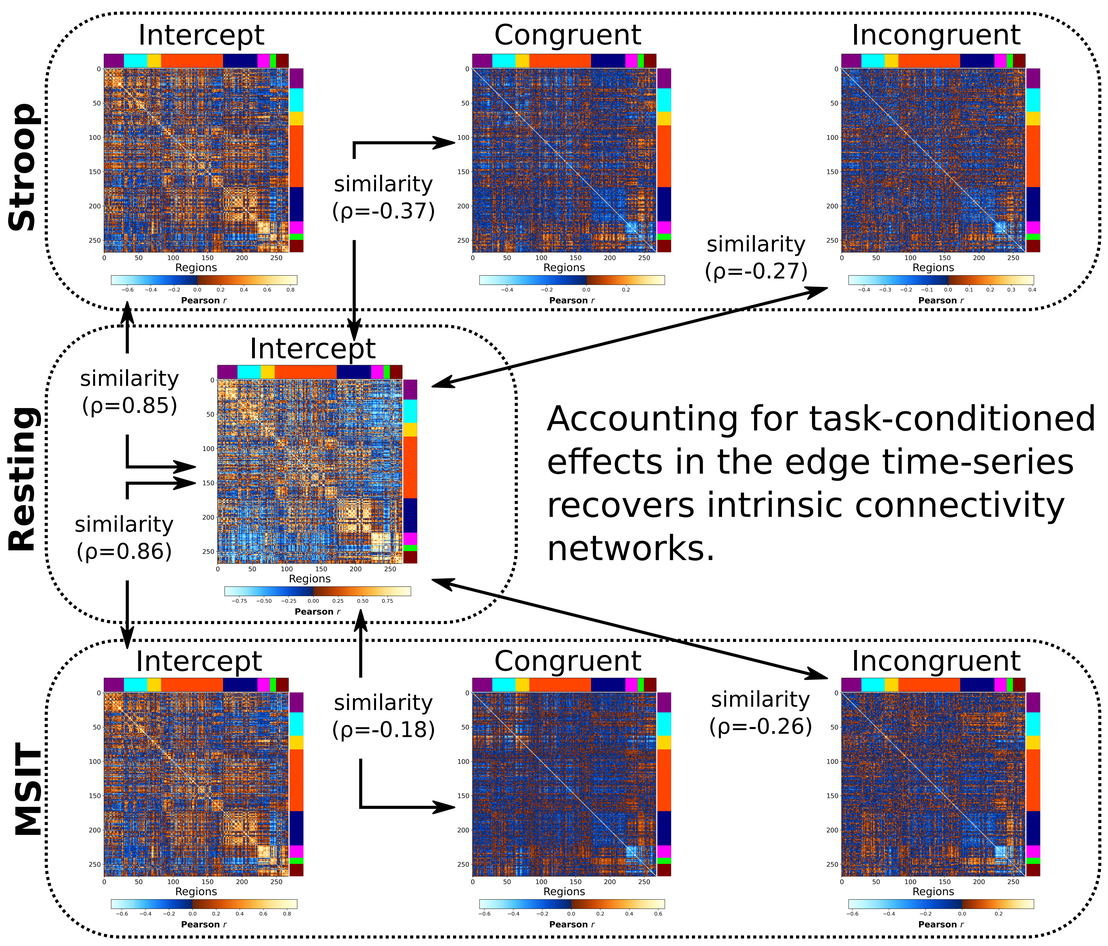


INCONGRUENT VS CONGRUENT MAPS

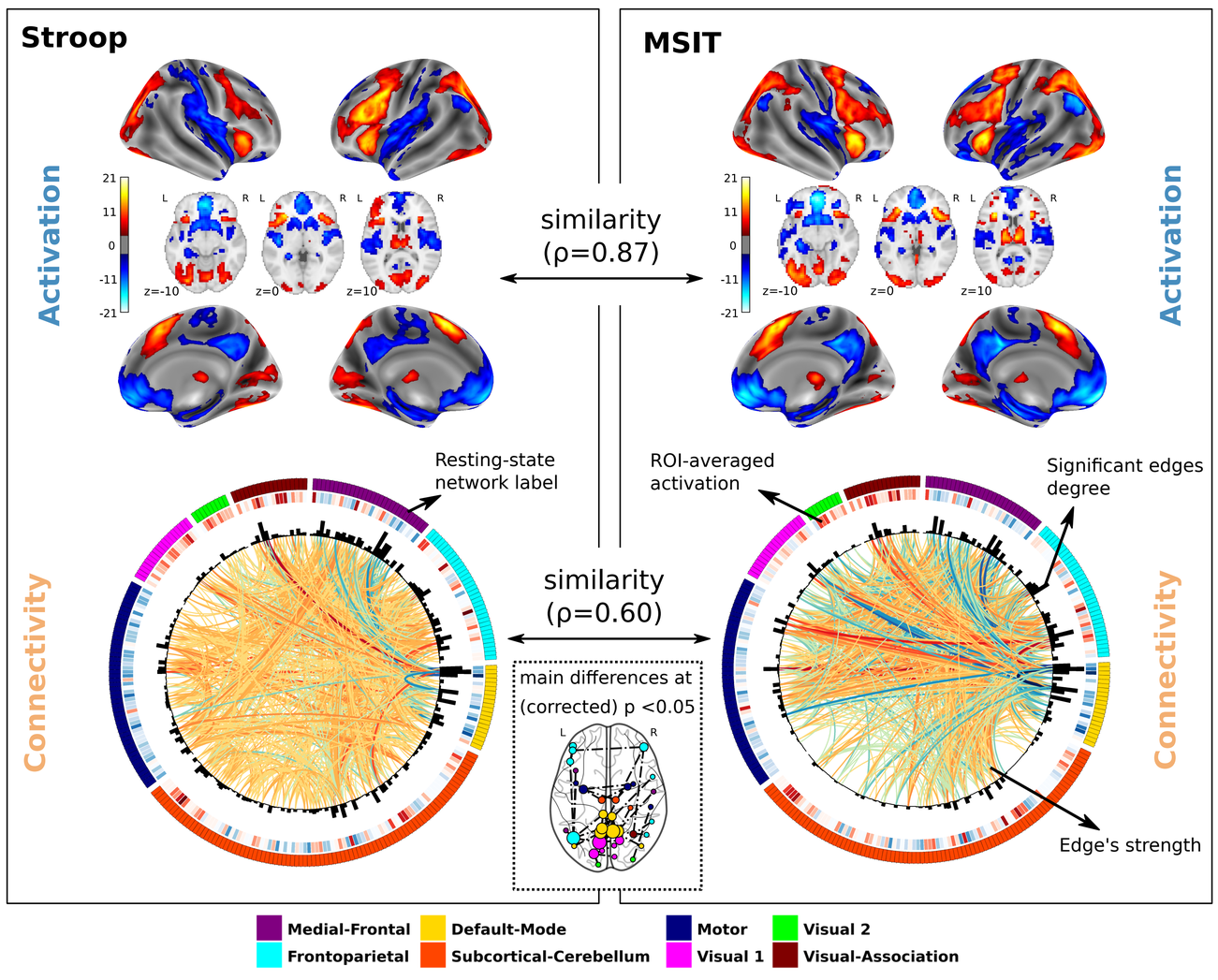


- The two tasks produce two largely similar brain activation patterns; however, a greater dissimilarity occurs at the connectivity level.
- Major task connectivity differences concentrate on frontoparietal, default-mode and visual networks.

GROUP-LEVEL NETWORKS



Accounting for task-conditioned effects in the edge time-series recovers intrinsic connectivity networks.



TAKE-HOME MESSAGE

Similar activity profiles do not necessarily reflect the same, or even similar, underlying connectivity profiles [4], suggesting the importance of investigating the moment-to-moment synchronization dynamics in the brain along with local evoked activity during cognitive tasks.

REFERENCES

[1] Sheu, Lei K et al, Psychophysiology, 49(7), 873-84.
[2] Bush, George et al, Nat Protoc, 1(1),308-313.
[3] Farnaz Zamani Esfahlani et al, PNAS, 117(45), 28393-28401.
[4] Prinz et al, Nature Neuroscience, 7, 1345–1352.