

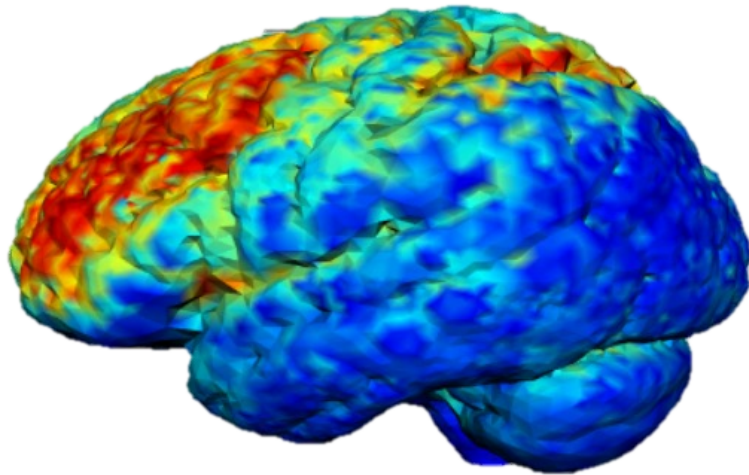


4 DIFFERENT PROJECTS ON Understanding Human Brain Connectivity

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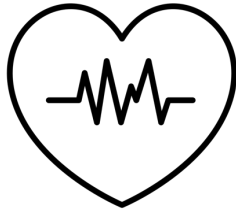
Functional connectivity map



- ...→ Brains mapped on the same ATLAS
- ...→ 36000 nodes
- ...→ 272 subjects some affected by 3 neuropsychiatric disorders
 - ADHD
 - BIPOLARISM
 - SCHIZOPHRENIA

	V1	V2	V3	V4	V5	V6
sub-10159	0.083000110	0.359322719	0.067584469	-0.001502492	4.490323e-02	0.341327394
sub-10171	0.056418793	0.296799322	-0.295383092	0.005626179	-7.573424e-02	0.346636990
sub-10189	-0.119718062	0.162367112	-0.129336174	0.292743680	-1.702825e-01	-0.043088139
sub-10206	-0.049239719	0.042913206	-0.082404095	-0.048617320	8.962487e-02	0.192960804
sub-10217	0.136976908	-0.085110136	0.135835123	-0.005055667	2.546098e-02	0.187825148
sub-10225	0.104872331	0.269777458	-0.306619907	0.048749775	6.828436e-02	0.206662438
sub-10227	-0.073755954	0.098704681	-0.018859581	0.015473355	-3.796358e-02	0.106514096
sub-10228	NA	0.168466422	NA	-0.107036893	NA	0.225311928
sub-10235	NA	0.244138110	NA	-0.053092017	-6.568406e-02	0.442105771
sub-10249	0.179991295	0.149358737	-0.069591043	0.039382093	-2.555627e-02	0.254855848

Medical, demographic and psychological background of subjects



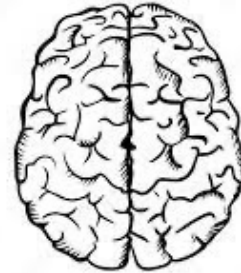
Health conditions

- Smoking habits
- Comorbidity



Demographic data

Cultural and ethnic identity



Behavioural test results

- Barratt Impulsivity Scale (SCHZ)
- Dickman Impulsivity Scale (BIP)
- California Verbal Learning test (ADHD)

Neuroimaging data shared by the UCLA Consortium for Neuropsychiatric Phenomics

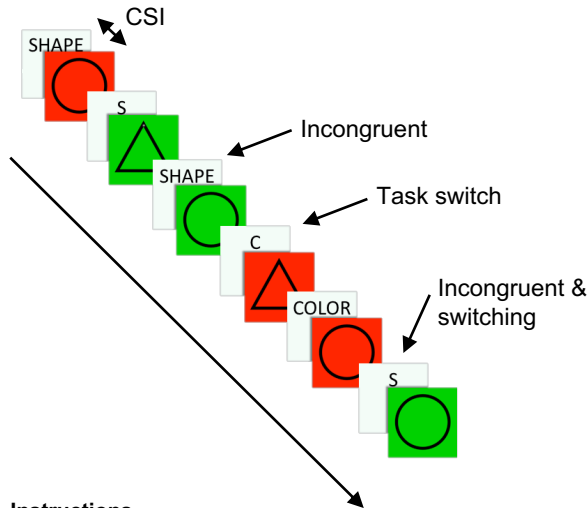


Understanding Human Brain Connectivity

TASK SWITCHING IN SCHIZOPHRENIA

Costanza Cantalini
Erica Bistacchia
Lorenzo Ferarra
Scott Pesenti

Task-switching test



Instructions
 Red or Circle = Right button
 Green or Triangle = Left button



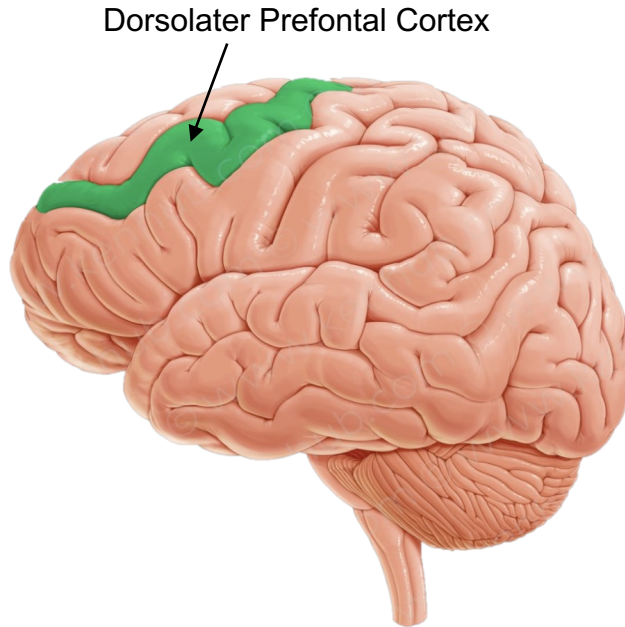
How does the test work?

It measures the changes in RT between trials requiring vs. not requiring a switch in responding



- 96 trials for each participant
- **Goal:** Respond as fast and accurate as possible for each trial
- 4 possible stimuli: red circle, red triangle, green circle, green triangle
- **Task Cue:** respond to the image's colour or shape
- On 33% of trials the instructions switched, while in 67% remains the same but the cue changes
- **CSI:** Long or Short

Main goals of our analysis



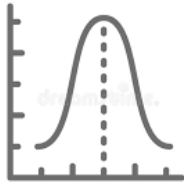
...→ Understanding the inner working of a schizophrenic brain analyzing:

- Brain connectivity with respect to our Region Of Interest (ROI)
- Mean differences in Reaction Time (RT) and outcomes

...→ Explore possible effect of experiment design on results

- Switch / No Switch
- A longer exposure to the cue (CSI)
- Congruency between tests

Initial and foreseen problems



NON NORMALITY



DIMENSIONALITY



INTERPRETATION
OF HEALTH DATA

Non-normality of RT

In order to perform test on reaction time we first need to:

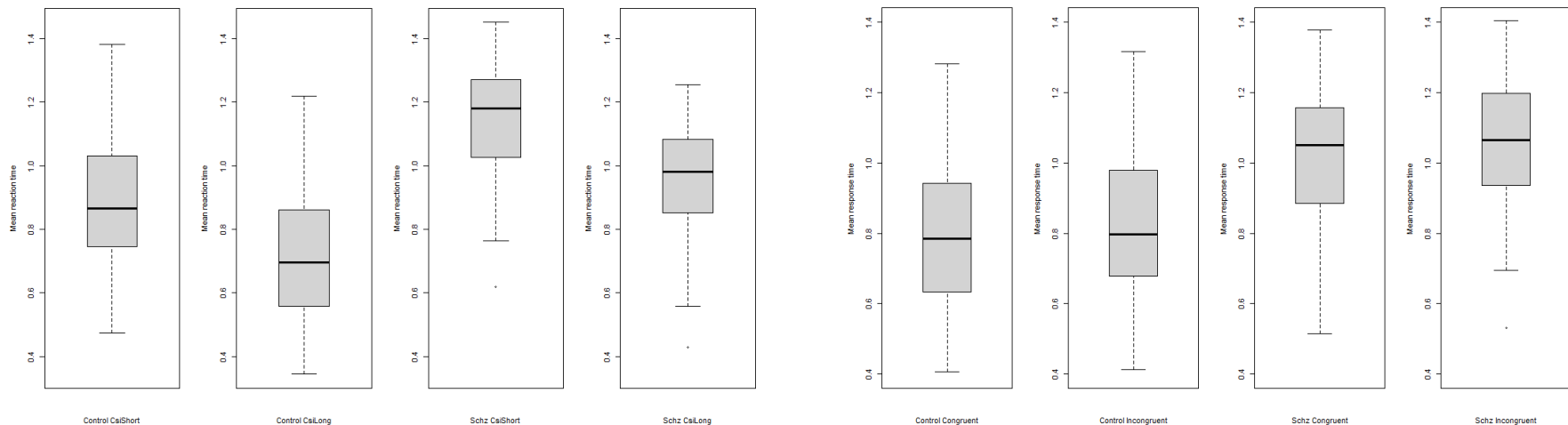
- visualize data
- test their normality

Non-normality of RT

In order to perform tests on Reaction Time we first need to:

- visualize data
- test their normality

Representation of Reaction Time

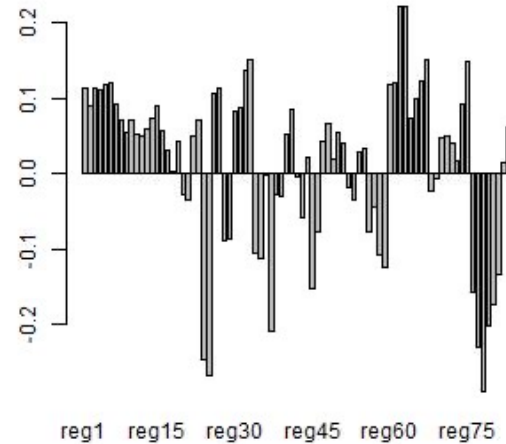
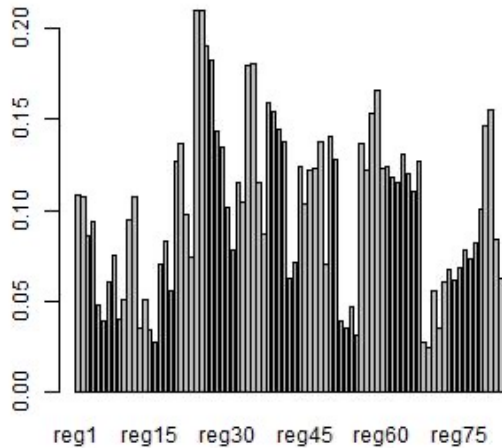


Dimensionality

- **Reduction to a 83-features dataset** by aggregating nodes into regions

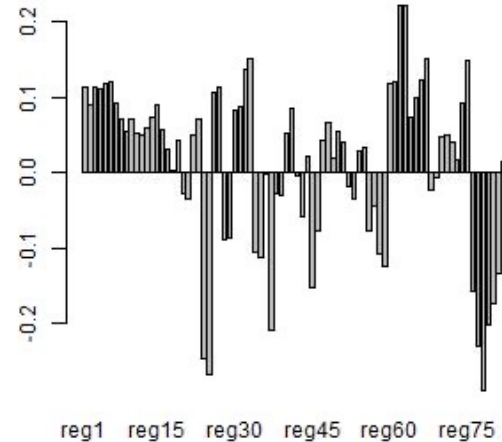
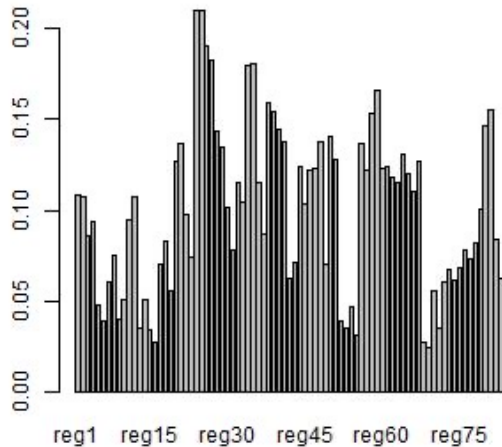
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- **Perform PCA on the reduced dataset**



Dimensionality

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- **Possible incompatibility of PCA with clustering:**
performing clustering separately

Interpretation of health data

- **Excessive demographic information**

e.g. race, education and general information

- **Some incoherent/missing data on health/demographics**

e.g. smoking habits

- **Excessively specific data on health covariates**

Interpretation of health data

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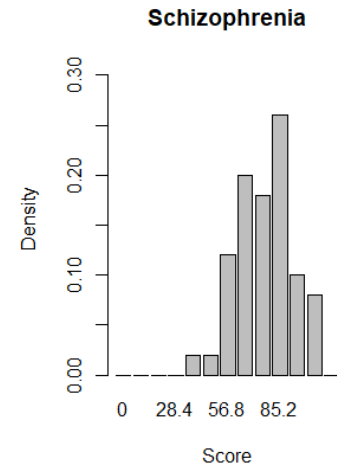
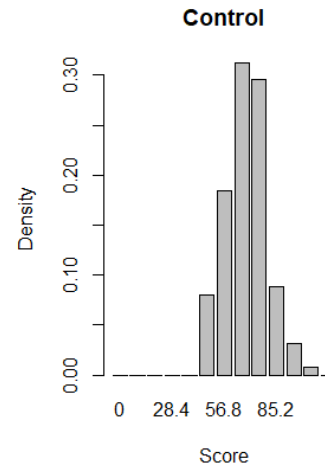
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e.g. smoking habits

- **Excessively specific data on health covariates**

- **Detailed personal result on Barratt test**

impulsiveness measure



In the next episode ...

TECHNIQUES TO BE IMPLEMENTED

- **PCA**

Reducing dimensionality of Z-maps

- **Clustering (on Z-maps)**

In order to identify different “shades” of schizophrenia

- **Three-way ANOVA**

In order to identify differences between groups:

- RT control vs. schizophrenic
- RT Switch vs. No Switch
- RT congruency vs. incongruency

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POTENTIAL FUTURE DEVELOPMENTS

- **Mixed effect models**

- **Spatial Analysis**

THANK YOU
FOR YOUR ATTENTION
