Abstract Submission Form – PET is Wonderful 2020

Title

Max. 250
characters
inc. spaces

The negative relationship between brain metabolism and its network dynamics: stability requires more energy

Authors
Max. 250
characters
inc. spaces

Tommaso Volpi[1], Marco Aiello[2], Maurizio Corbetta[1,3], Alessandra Bertoldo[1,4]

Affiliations
Max. 250 cha-
racters inc.
spaces

[1]Padova Neuroscience Center, Padova, Italy, [2]NAPLAB - SDN, NeuroAnatomy and image Processing LABoratory, Naples, Italy, [3]Department of Neuroscience, University of Padova, Italy, [4]Department of Information Engineering, University of Padova, Italy.

Body of abstract (1500 characters inc. spaces)

The brain's metabolic consumption, imaged by 18F-FDG PET, is partially explained by the functional connectivity (FC) architecture emerging from resting state fMRI (rs-fMRI) studies. Correlations between 18F-FDG and static FC were reported, but the role of FC temporal variability has never been investigated.

Simultaneous 18F-FDG and rs-fMRI data were acquired in 28 healthy subjects (Riedl *et al., J.Neurosci.,* 2014; Aiello *et al., NeuroImage*, 2015), and standard uptake value relative (SUVR) to brain's global mean was extracted from 18F-FDG data.
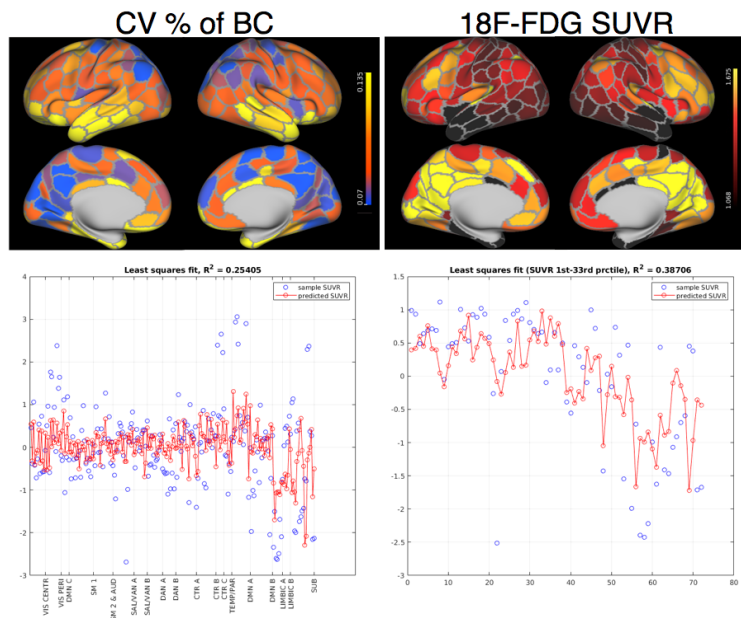Sliding window time-varying FC was computed from rs-fMRI (window size: 30 TRs, step: 1 TR, TR=2s); strength (STR), betweenness centrality (BC), clustering coefficient (CC), local efficiency (LE) were calculated for each window and their node-wise coefficient of variation (CV%, i.e. temporal median absolute deviation divided by median) were computed.
Spearman's correlation and multiple linear regression were performed on group median values.

There were statistically significant anti-correlations between SUVR and CVs% of STR (rho = -0.33, $p < 0.01$), BC (rho = -0.42, $p < 0.01$), CC (rho = -0.19, $p < 0.01$), LE (rho = -0.25, $p < 0.01$), implying that the slower the FC dynamics, the higher the glucose consumption.
The multivariate model explained ~25% of the SUVR variance ($R^2 = 0.25$), with FC variability accounting for metabolic variance mainly in low SUVR nodes ($R^2 = 0.39$).
These findings require further investigation using 18F-FDG absolute quantification.

CV % of BC   18F-FDG SUVR

Least squares fit, $R^2 = 0.25405$

Least squares fit (SUVR 1st-33rd prctile), $R^2 = 0.38706$

Top: Group-wise CV% of BC (*left*) and SUVR (*right*) sampled on the Schaefer atlas' cortical parcels: regions with high SUVR (*yellow*) tend to have low FC variability (*blue*).

Bottom: Agreement between SUVR (*blue dots*) and prediction (*red line and dots*) by multivariate model with CVs% as predictors for a) the whole brain (*left*) b) nodes belonging to the lower third of the SUVR distribution (*right*).

Figure legend max. 400 characters inc. spaces

If you wish to enter the virtual and multi-national "Gamma Prize" competition at the next *PET is Wonderful* meeting, please select country from list:

☐ Austria

☐ Belgium

☐ Denmark

☐ France

☐ Netherlands

☐ Switzerland

☐ UK

☐ USA

☒ Other

If other, please specify: **Italy**

Abstracts submitted will be judged by the international chairs. One abstract per country will enter the competition for best proffered oral presentation and the best presentation will win the "Gamma Prize". Delegates attending the PET is Wonderful 2020 will vote on the best presentation online during the meeting. One member of the winning group will be invited to present at the PET is Wonderful 2021 in Edinburgh, Scotland, on the 26th October 2021. Prize includes free meeting registration in 2021 and travel costs up to a maximum of £750.

Please email complete form as Word file to: PiWTeam@ed.ac.uk

Abstract submission closes on the 15th September 2020 at 5pm (UK time).

••

For Reviewers use ONLY:

Importance of the problem or topic	**The approach (design/ methods)**	**Findings**	**Consequences (significance)**
☐ Very High	☐ Excellent	☐ Ground-breaking	☐ Ground-breaking
☐ High	☐ Very Good	☐ Very Interesting	☐ Very Interesting
☐ Moderate	☐ Good	☐ Interesting	☐ Interesting
☐ Low	☐ Poor	☐ Not Interesting	☐ Not Interesting
☐ Very Low	☐ Very Poor		

Overall score (1=worst and 5=best)