UNDER REVIEW

RESCIENCE C

Replication / Computational Neuroscience

[Re] Stimulation-Based Control of Dynamic Brain Networks

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Introduction

- 'Brain stimulation is increasingly used in clinical settings'
- stimulation protocols not optimized
- link control theory and brain modelling to predict the effect of stimulation
- FitzHugh Nagumo vs Wilson-Cowan

Transcranial electrical and magnetic stimulation (TES and TMS, respectively) have been increasingly used in clinical studies over the last decades. TES for example has been used to enhance memory consolidation by boosting slow-wave oscillations in deep sleep [], and to ...insert another prominent example... [].
Furthermore, deep brain stimulation (DBS) has shown remarkable results in the treatment of tremor symptoms in Parkinsons diesease [] and also great potential in the treatment of psychiatric disorder such as obsessive-compulsive disorder [].
However, despite this growing success in clinical settings, a principled understanding of the effects of stimulation on the dynamical processes in the brain is still lacking.

Methods

Briefly recapitulate

- FitzHugh Nagumo
- Oscillatory transition parameters
- Intraclass correlation coefficient (ICC)
- Linear network control theory
- Functional and structural effect, fractional activation

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The authors have declared that no competing interests exists.
Code is available at https://github.com/ChristophMetzner/Muldoon-Replication.

Reproduction of experiments

- Replicate Figure 2 (b),c) and d)), 3 states of the FitzHugh Nagumo and comparison to the Wilson-Cowan in b), and for c) our box plots for all subjects, and d) bar plots with our data
- Replicate Figure 3
- Replicate Figure 4 c)
- Replicate Figure 5 a)-d)
- Replicate Figure 6 (?)

I don't think we need to repicate Figure 7 (Structure-function landscape)

Reimplementation

- Details on the new implementation (packages/dependencies, other stuff?, maybe just a paragraph in the methods section)

Discussion

- Main similarities and differences between our and original results. Replication: full, partial or not at all?