

NEURofeedback for self-stimulation of the brain as therapy for ParkInson DisEaSe

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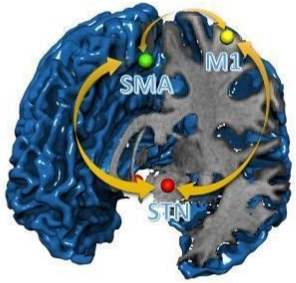
Béchar Jarraya, Université de Versailles-Paris-Saclay, France

Andres Lozano, University Health Network, Canada

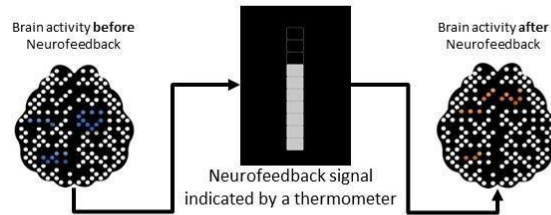
Tolga Cukur, Bilkent University, Turkey

The NEURIPIDES concept: NEURofeedback for self-stimulation of the brain as therapy for Parkinson DisEaSe

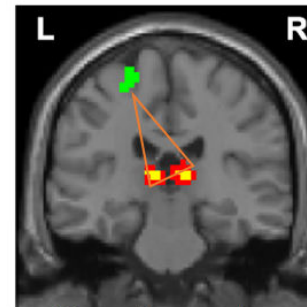
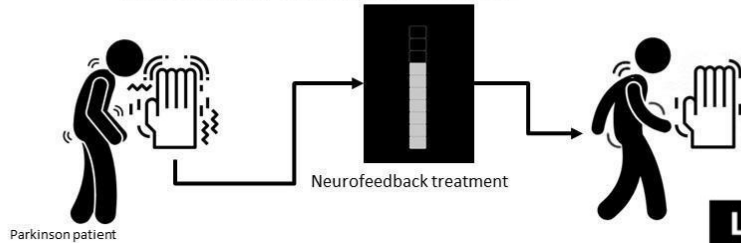
Project 1: Mapping of neurofeedback target networks with high-field MRI



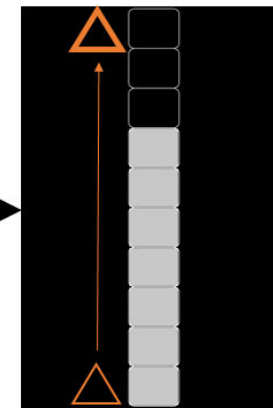
Project 2: Proof-of-concept of fMRI-neurofeedback using the multivariate signals identified in WP1



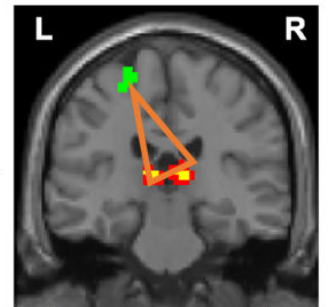
Project 3: Early-stage clinical evaluation



Network strength
before Neurofeedback
intervention



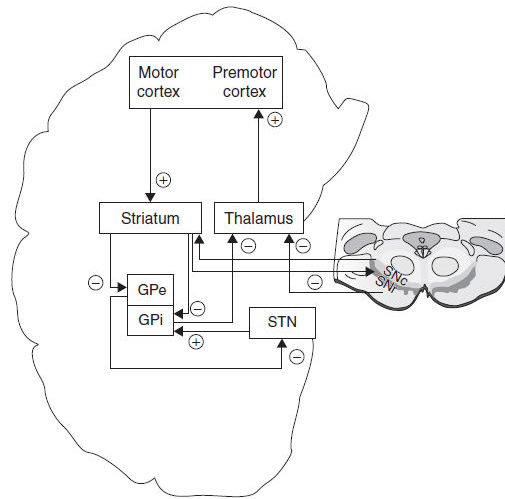
Neurofeedback signal indicated by a thermometer



Network strength after
Neurofeedback
intervention

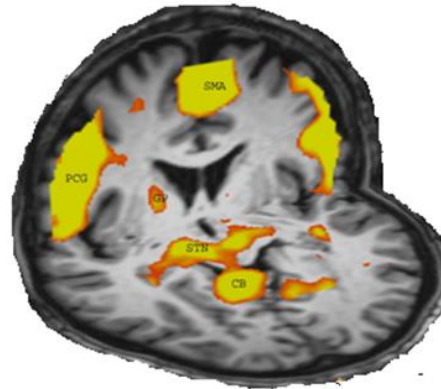
NF in PD: Activating motor programmes

Motor networks of PD

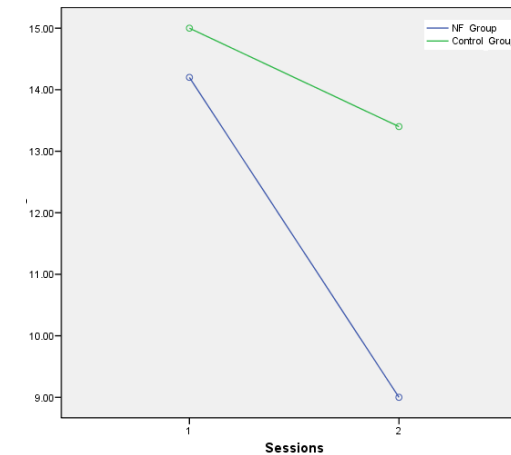


Linden, The Biology of Psychological Disorders, 2019

Activation during NF

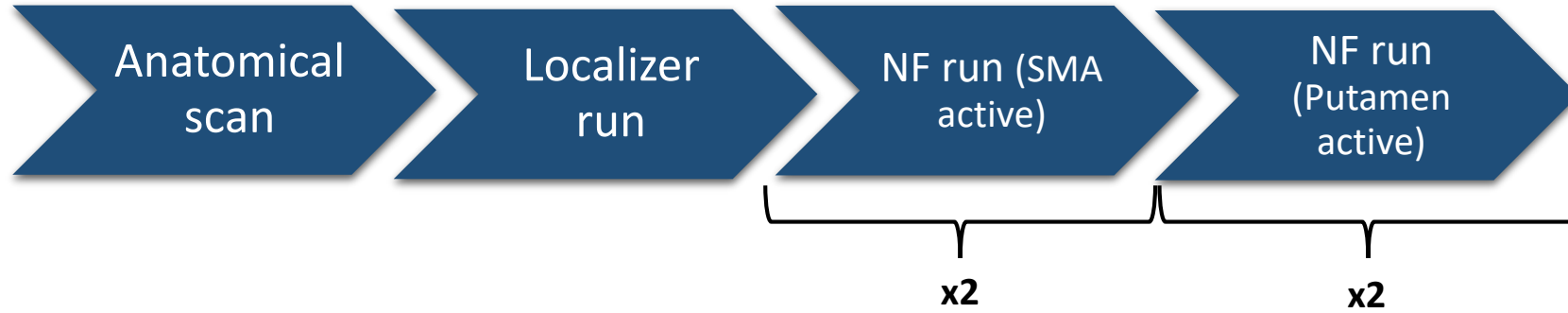


Clinical effects:
UPDRS scores

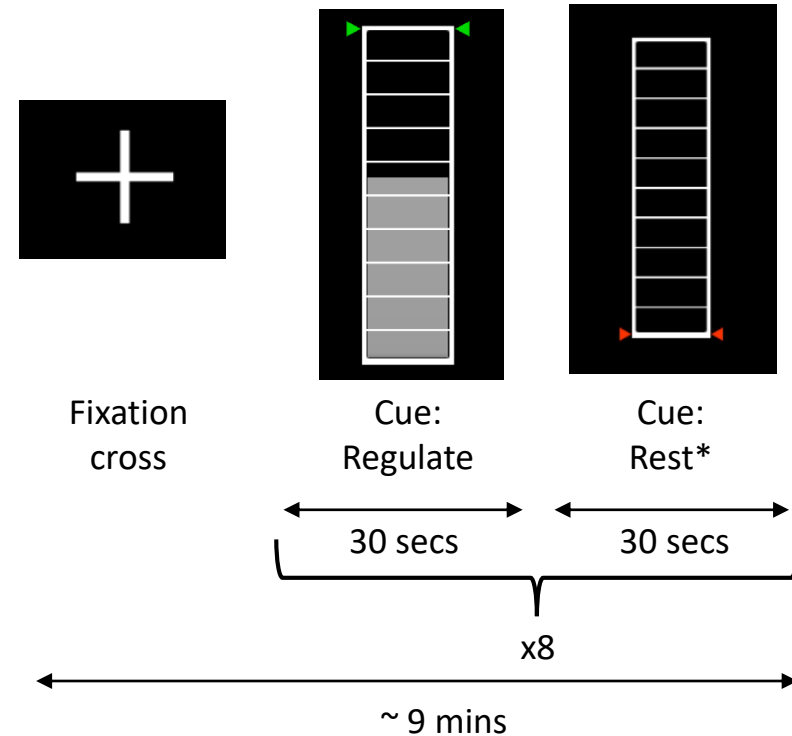


Subramanian et al., J. Neuroscience 2011, Frontiers Behav. Neurosci. 2016

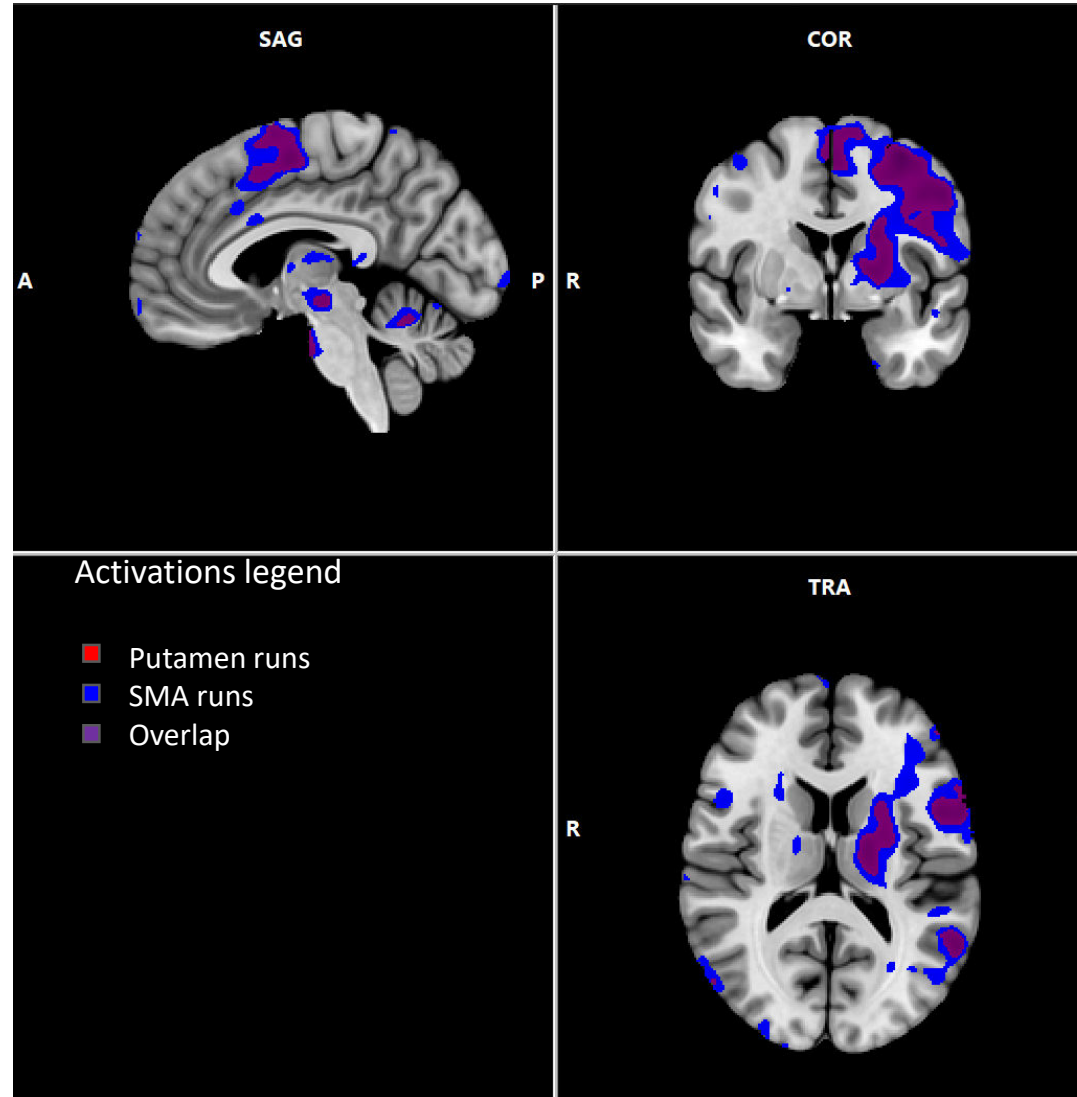
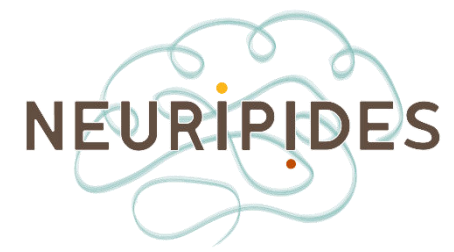
Pilot study design (slides courtesy of Halim Baqapuri)



- N = 12
- Within subject design
- Counterbalanced runs
- Statistical comparison: Putamen (Put. actv. > SMA act.)
- Feasibility of Putamen

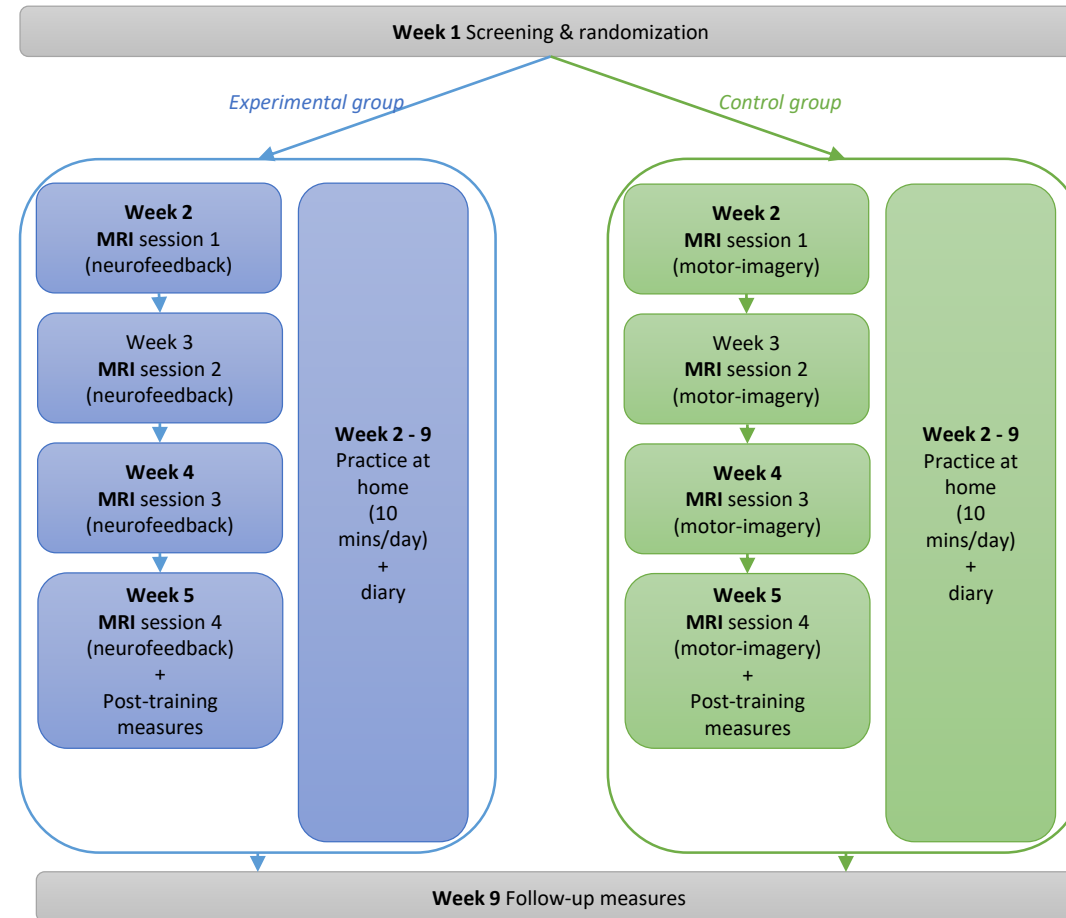


Activation of the cortico-subcortical motor network with neurofeedback



Baqapuri et al., Neuripides Study Group, under review

Overview of new trial



Consortium Work

- Toronto (A Lozano): Prospective fMRI-DBS Programming Clinical Trial
- Cologne (V Visser-Vandewalle, M Kocher): Correlation between clinical effects and connectivity of VTA (see poster by Ricardo Loucao!)
- Paris (B Jarraya): Dynamic functional connectivity analysis of DBS effects on brain networks
- Ankara (T Cukur): Deep learning models to identify disease- and state-related functional biomarkers
- Prague (R Jech): Imaging, cognitive decline and neuropsychiatric symptoms



PPI

- Very active group of patient advisors from Dutch Parkinson's Association
- Advice on study design, feasibility, ethics process
- Regularly attend the monthly meetings, actively engaged in scientific discussion
- Presentations at annual meetings
- Reflection on NF strategies and importance of mental imagery
- Spur us on to work on therapeutic innovation in PD



Funding

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 - Germany, Federal Ministry of Education and Research (BMBF);
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 - France, French National Research Agency (ANR);
 - Canada, Canadian Institutes of Health Research (CIHR);
 - Turkey, Scientific and Technological Research Council of Turkey (TUBITAK).