PROGETTO

Supervisor: Elisa Canu

Titolo	Tailored neuromodulation intervention to enhance speech and language training in patients with Primary Progressive Aphasia: EEG and MRI targeted Transcranial Magnetic Stimulation.
Curriculum:	Scienze Cognitive e Comportamentali
Link alla pagina personale del sito web di Ateneo o del polo ospedaliero di riferimento:	https://research.hsr.it/en/institutes/institute-of-experimental-neurology/neuroimaging-of-neurodegenerative-diseases/elisa-canu.html

Descrizione del progetto (max 3.000 caratteri spazi inclusi)

Background/Lacune di conoscenza

Neuromodulation is a promising therapeutic avenue for focal neurodegenerative disorders such as primary progressive aphasia (PPA), for which no disease-modifying treatments currently exist. Speech-language therapy (SLT) shows partial efficacy, but results are heterogeneous and often transient. Non-invasive brain stimulation, particularly TMS, offers the possibility to directly modulate dysfunctional neural circuits. Here we propose a multimodal patient-specific assessment to guide neuro-navigated rTMS targeting functional plasticity and optimizing treatment outcomes in PPA.

Razionale e ipotesi

Non-invasive brain stimulation has gained significant attention in the treatment of patients with neurodegenerative disorders, including PPA. However, while these methods offer promise, the consistency of their effects and the magnitude of their impact often fall short of expectations. This inconsistency could be attributed to suboptimal protocols employed in neuromodulation interventions. Collective efforts are required to refine and develop more effective stimulation protocols. Such advancements are critical, as they hold the potential to offer safe and impactful treatments for severe neurological disorders that currently lack specific cures.

Obiettivi e finalità specifiche

1. To assess the effects of SLT alone vs SLT + Neuromodulation (standard and targeted rTMS) on PPA speech and language features

2. To assess the effects of two different modalities of non-invasive stimulation (standard vs targeted rTMS) along with SLT on PPA speech and language features

3. To evaluate the generalization of clinical benefits of SLT alone vs SLT + STIM, and according to the two stimulation modalities (standard vs targeted rTMS) in PPA

4. To evaluate the maintenance of clinical benefits of SLT alone vs SLT + STIM, and according to the two stimulation modalities (standard vs targeted rTMS) in PPA

Risultati attesi

1. Patients with PPA who receive a combination of SLT and rTMS will exhibit greater clinical improvement compared to those receiving SLT alone.

2. Choosing the rTMS approach and stimulation site based on individualized MRI and EEG characterization will be more effective as compared to using the standard rTMS approaches described by the literature.

3. The integration of specific clinical, cognitive, language, neuroimaging, neurophysiological, and blood features will enable the prediction of individual responses to SLT and rTMS, facilitating the development of optimized, personalized treatment plans for PPA.

Competenze che dovrà acquisire la/il Dottoranda/o(in inglese, max 600 caratteri spazi inclusi)

1) Experimental use of novel cognitive tools to investigate language and non-language features in PPA
2) Neuropsychological definition of each PPA variant
3) Pre-processing and analysis of brain structural, task-based and resting state functional MRI data
4) Pre-processing and analysis of EEG data combined and not with MRI
5) Procedure of standard and tailored neuromodulation with rTMS
6) Analysis of the relationship between brain changes and cognitive/behavioural profile of each PPA variant
7) Interpretation of data
8) Drafting of research reports and articles

Bibliografia (massimo 15 voci)

Cotelli M, et al. Brain Sci 2023;13(7):1060.
Croot K, et al. Cortex 2019;115:133-158.
Dial HR, et al. Cortex 2023;158:158-175.
Henry ML, et al. J Speech Lang Hear Res 2019;62(8):2723-2749.
Huang, Y. et al. J Neural Transm 130, 111–123 (2023).
Margolis SA, et al. Brain Stimul 2019;12(5):1340-1342.
Neri F, et al. Clin Neurophysiol 2021;132(10):2481-2484.
Pytel V, et al. J Alzheimers Dis. 2021;84(1):151-167.
Touroutoglou et al., NeuroImage: Clinical http://dx.doi.org/10.2139/ssrn.4611535
Tsapkini K, et al. Alzheimers Dement (N Y) 2018;4:461-472.

Tsapkini K, et al. Aphasiology 2014;28(8-9):1112-1130.
Volkmer A, et al. Pract Neurol 2020;20(2):154-161.
Weintraub S, et al. Am J Alzheimers Dis Other Demen 2009;24:408-416.
Wertz R, et al. New York: Grune and Stratton 1984.
Wilson SM, et al. J Neurosci 2010;30:16845-16854.