

TITLE: Duration processing and mental time travel in Parkinson's disease

ABSTRACT: Parkinson's patients often present striking deficits in time processing. While their difficulties in tracking the passage of time are known, it is not clear whether similar effects hold when they have to conceptually "move" in time, as happens when for instance we imagine to go back with memory to where we have been on holiday last summer. The present project aims on first at providing new clinical and experimental tools to effectively measure the performance of Parkinson's patients in both conceptual and sensory time tasks. Then, correlations will be performed with respect to both neuropsychological scores and brain connectivity (resting state EEG/fMRI). Our prediction is that both Parkinson's symptoms severity and executive function performance should be associated with impaired performance in the sensory task. Patients' performance in conceptual timing tasks should be comparatively less impaired. Their impairment is expected to correlate with spatial processing and mnemonic abilities. The neuroimaging part will provide not only correlations with the connectivity measures but will also allow to characterize the involvement of specific dopaminergic circuits in time processing as well as the relative contribution of other degenerative processes, i.e. amyloid deposition. The project is expected to have a clinical impact because a test to quantify time processing deficits in everyday life, multitasking settings will be newly designed and clinically tested. A control group of age and education matched healthy persons will also be studied. The characteristics and variability of their profiles will be important not only to determine which aspects of Parkinsons' performance are to be considered pathological but also to understand how normal aging affects the ability to process time.

REFERENCES:

- Antonini, A., et al., (2011)... Impulsivity and compulsivity in drug-naïve patients with Parkinson's disease. *Movement Disorders* 26 (3), 464-468
- Bonato, M., Saj, A., & Vuilleumier, P. (2016). Hemispatial neglect shows that "before" is "left" *Neural Plasticity*. vol 2016, 1-11. <http://dx.doi.org/10.1155/2016/2716036>.
- Bonato, M., Zorzi, M. & Umiltà, C. (2012). When time is space: Evidence for a mental time line. *Neuroscience and Biobehavioural Reviews* 36, 2257-2273.
- Parker, K.L., Lamichhane, D., Caetano, M.S., Narayanan, N.S. (2013). Executive dysfunction in Parkinson's disease and timing deficits. *Front Integr Neurosci*. 31;7:75.

PARTICIPANTS:

PI: Mario Bonato (Dept. General Psychology)

Co-PI: Angelo Antonini (Dept. Neurosciences)

Proposed period abroad supervised by Nicky Edelstyn (Keele University)

EXPERIMENTAL DATA:

To be acquired	<p>About 60 patients with early Parkinson to be tested on/off medication. Experimental tasks will encompass the processing of visual/auditory durations (e.g. discrimination and reproduction tasks) as well as conceptual time tasks (mental time travel). A subset of tasks will investigate the spatial characteristics of time processing. The protocol will also encompass a full neuropsychological profiling allowing to detail which executive functions/mnemonic subcomponents are mostly impaired. Ecologic testing allowing to quantify the impact and distress of timing deficits on everyday life will also be implemented.</p> <p>Neuroimaging resting state (EEG or fMRI) will be collected. Some patients will have also DATSCAN imaging data available.</p> <p>The control group will consist in about 70 age/education matched healthy controls.</p> <p>The project will encompass several training opportunities in clinical and neuropsychological assessment, experimental procedures, neuroimaging and in general about the biological basis of neurodegenerative diseases.</p> <p>The ideal candidate should have strong methodological/clinical background. Programming/data analysis skills and fluency in Italian are a plus.</p>
Already acquired (ready to be used)	

If data need to be acquire, please provide a brief description of the Experimental setup, methods, instruments and scheduling (e.g. # of subjects, images/signals...): max 300 words

ETHICS COMMITTEE:

Obtained	
Conditioned submission*	Expected time response (in months): 2-4
Not required	

* request will be submitted only if a PhD student will be associated to the project