Personality Traits and Cortical Activity Explored by Optical Imaging Affect Gambling Behavior in Parkinson's Disease

Laura Angioletti (Catholic University of the Sacred Heart, Milan), Chiara Siri (Parkinson Institute, ASST G. Pini-CTO, ex ICP, Milan), Nicoletta Meucci (Parkinson Institute, ASST G. Pini-CTO, ex ICP, Milan) and Michela Balconi (Catholic University of the Sacred Heart, Milan)

Pathological Gambling (PG) in Parkinson's Disease (PD) manifests as a persistent and uncontrollable gambling behavior, characterized by dysfunctional decision-making and emotional impairment related to high-risk decisions, despite financial losses and social problems. So far, several neuroimaging studies investigated the contribution of specific frontal brain areas that seem to be crucial for successful decision-making. However, different advantages seem to characterize the application of a safe, non-invasive, portable (closer to real-life situations) and relatively new optical imaging measure, the functional Near-Infrared Spectroscopy (fNIRS).

Thus, the aim of this study was to explore the relationship between personality traits and prefrontal cortex activity in PD patients with and without PG. Hemodynamic cortical activity measured by fNIRS and the Iowa Gambling Task (IGT) performance were recorded in forty-six PD patients (37 males and 9 females; Mage = 62.93, SD = 7.76), divided into three groups according to their gambling status: Parkinson's Disease patients with active gambling behavior (Parkinson's Disease Gamblers, PDG); PD patients who remitted from PG (Parkinson's Disease Non-Gamblers, PDNG); and a Control Group (CG) composed by patients with PD only. Reward sensitivity and impulsivity were assessed respectively by using the Behavioral Activation System scale (BAS) of BIS/BAS questionnaire and the Barratt impulsiveness scale, version-11 (BIS-11).

Results indicates that PDG patients differed from PDNG and CG both on behavioral and brain responses related to decision-making processes. In PD patients, gambling behavior is strongly predictive of dysfunctional cognitive strategy (e.g., worse IGT performance), it affects
anomalous cortical response with a left hemispheric unbalance in dorsal areas revealed by an increase of oxy-Hemoglobin responses and it is related to more reward sensitivity (BAS measure) than impulsivity personality components. Overall, these effects confirm a pathological condition related to cognitive and emotional aspects which makes the Parkinson's Disease patients with Pathological Gambling victims of their dysfunctional behavior.