# Differential Emotional Modulations of STN Deep Brain Stimulation and L-Dopa in Parkinson's Disease.a

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## Abstract

Deep Brain Stimulation of the Subthalamic Nucleus (STN DBS) is a widely used surgical technique to avoid motor symptoms in Parkinson's disease (PD), which improves patient quality of life. However, STN DBS may produce emotional disorders such as a reduced ability to recognize emotional facial expressions (EFE). Previous studies did not considered the fact that STN-DBS and L-Dopa can have differential or complementary consequences on EFE processing. An alternative way of investigating the differential effects of STN-DBS and L-dopa medication is to compare patients' performances after surgery with both therapies turned 'on' vs. 'off'. We therefore used an EFE recognition paradigm under the four conditions (L-Dopa and STN-DBS 'on' vs. 'off', ) in surgically treated PD patients compared to healthy controls. The results confirmed previous studies by emphasising significant detection impairment on some facial expressions relative to controls. More interestingly, interaction between STN-DBS and L-Dopa modalities revealed that the combined effect of the two therapies seemed much more beneficial for emotional skills than when each is administered separately. We discuss the implications of these findings regarding the "so called" "inverted U curve" function related to the differential effects of dopamine (DA) level on the right Orbitofrontal cortex (OFC). Although L-Dopa overdoses the ventral stream of the OFC, STN-DBS could compensate for this overactivation by decreasing its activity, restoring the necessary OFC-amygdala interplay. In addition, and in line with the embodiment theories, PD patients exhibited higher neutral faces recognition, but their performance did

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not correlate with their degree of facial amimia. Nevertheless, we consider that these theoretical frameworks constitute an original and innovative basis for further investigations into emotional recognition impairment in PD.
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