

PUPIL DIAMETER TRACKS BRAIN STATES CHANGES DURING SUBTHALAMIC STIMULATION

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Introduction Studies on the relationship between deep brain stimulation (DBS) in the subthalamic nucleus (STN) and psychophysiological markers of brain state changes, such as pupil diameter, are scarce. We aimed to investigate the relationship between phasic fluctuations in pupil diameter and emotional processing type (explicit/implicit) in unmedicated patients with Parkinson's disease (PD) during sequential sessions of STNDBS On/Off. Methods Thirteen STN-DBS PD patients and 17 age-, gender- and educationmatched healthy controls were recruited. Patients performed the experimental session with STN-DBS On and STN-DBS Off in a randomized order and without dopaminergic medication. Participant's initial constriction and later pupil dilation were recorded while viewing emotional scenes under varying explicit (emotional valence) and implicit (stimuli characteristic) attention demands. Results Pupillary constriction and dilation were reduced during STN-DBS Off when compared to STN-DBS On and to healthy controls. Comparing STNDBS On/Off states, a significant initial contraction was detected during implicit processing, while late dilation differences were more evident during explicit processing. Pupil constriction differences were particularly marked during Off medication-STN-DBS Off states, while pupillary responses returned to normal followed by STN stimulation despite Off medication. Conclusions These results suggest that STN-DBS modulate the response of the autonomic nervous system, reflected in the pupillary recovery to normal levels. Remarkably, our results also show the role of STN in parasympathetic-dopaminergic function, and his cortical influences when attention demands are manipulated. Pupillary response is a potentially useful psychophysiological marker that could be used in the on-line assessment of symptomatic effects of levodopa and DBS therapies