

Summary:

The mechanisms of weight gain or behavioral and affective changes known to occur in patients with Parkinson's disease (PD) treated with deep brain stimulation of the subthalamic nucleus (STN DBS) are incompletely understood. We hypothesize that some of these non-motor side-effects may be related to changes in motivational processing due to STN DBS. Motivational processing to appetitive and aversive stimuli can be assessed using subjective evaluation of emotional relevance (i.e. incentive salience attribution) or affective modulation of the auditory blink reflex (ABR). The latter provides an objective measure of changes in emotional reactivity: ABRs are physiologically potentiated by unpleasant and inhibited by pleasant stimuli, reflecting activation of the aversive and appetitive motivational systems.

Our aim was to assess the effects of STN DBS on motivational processing of pictures from 4 categories, two representing primary rewards, erotica and food, one aversive fearful and one neutral, using the subjective evaluation of motivational relevance (Study 1.) and the modulation of the ABR reactivity (Study 2.) in off-medicated PD patients with DBS switched ON and OFF. The results were compared with those obtained in healthy controls using the same paradigms.

Study 1. Twenty PD patients in bilateral STN DBS switched ON and OFF conditions and 18 matched controls rated total 84 selected pictures (21 from each category) according to emotional valence (unpleasantness / pleasantness) and arousal on two independent visual scales ranging from 1 to 9. The mean postoperative weight gain in PD group was 8.1 ± 8 kg. In STN DBS ON condition the PD patients attributed lower valence scores to the aversive pictures (i.e. pictures were rated as more aversive) compared to OFF condition and when compared to controls. The difference between OFF condition and controls was less pronounced. Furthermore, postoperative weight gain correlated with arousal ratings from the food pictures in STN DBS ON condition.

Study 2. The ABR elicited during the viewing of 30% out of the 84 selected pictures was recorded together with the subjective ratings of affective valence and arousal in 11 off-medicated PD patients with the STN DBS switched ON and OFF, and in 11 control subjects. The mean postoperative weight gain in PD group was 5.6 ± 7 kg. Aversive stimuli caused a larger increase in the ABR in patients in ON condition than in controls. The ABR to erotic stimuli was larger in patients in ON condition compared to OFF condition and controls. No detectable differences in subjective ratings were found. In addition, the ABR magnitude to food pictures in ON condition showed a significant negative correlation with postoperative weight gain.

Both subjective and objective measures of STN DBS effects on motivational processing indicated that STN DBS may increase activation of the aversive motivational system. They also suggest that the postoperative weight gain may be related to changes in the processing of food cues due to STN DBS. In addition, STN DBS may disturb engagement of the appetitive motivational system by erotic cues, which is not reflected in subjective ratings.