Ninth International Symposium on Biology of Decision Making

SBDM 2019

May 27-29

Oxford, United-Kingdom

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[POSTER 19]

The role of Dopamine in Preparatory Inhibition: What can we learn from Parkinson's disease?

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By measuring the amplitude of motor-evoked potentials (MEPs) elicited by transcranial magnetic stimulation (TMS) over the primary motor cortex during choice reaction time (RT) tasks, many studies have revealed a strong suppression of corticospinal excitability when preparing an action [1-4]. This phenomenon - called "preparatory inhibition" - still remains a matter of investigation and debate: neither its functional role as part of action preparation nor the neural structures at its basis have been clearly elucidated yet [5-9]. Furthermore, this phenomenon has never been investigated in Parkinson's disease (PD). Yet, it would allow addressing the role of basal ganglia and dopamine in the generation of preparatory inhibition [10].

In the present study, preparatory inhibition was probed on two consecutive days in 11 right-handed PD patients (ON and OFF dopamine replacement therapy [DRT]; randomized order) and 11 matched healthy subjects. Participants performed an instructed-delay choice RT task, in which they had to choose between a left or right index finger response based on the position of a preparatory cue, but had to wait until the onset of an imperative signal to release their movement [11]. Single-pulse TMS was applied concurrently over both primary motor cortices at rest and during the preparatory delay, eliciting MEPs in both hands [12-14]. Preparatory inhibition was assessed by expressing MEP amplitudes obtained during the preparatory delay relatively to those obtained at rest.

Our preliminary results showed that PD patients with a relatively short disease duration (4 ± 1.3 y) exhibited MEP suppression during action preparation, similarly to healthy subjects. However, preparatory inhibition was less obvious in PD patients with a long disease duration (12.3 ± 2.3 y). In fact, in those patients, MEPs were only suppressed when the finger was not selected for the response. Interestingly, the lack of suppression found in the selected finger was even worse in the presence of DRT, especially in the dominant hand, where MEPs became facilitated.

Taken together, those results confirm the presence of preparatory inhibition in healthy subjects, as previously shown in the literature. This phenomenon is also evident in PD patients, but seems to decline throughout the disease. Most importantly, DRT medication appears to decrease the strength of preparatory inhibition, especially in the dominant hand, suggesting a role of dopamine in the mechanisms at the very basis of preparatory inhibition.

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