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Introduction: Phantom limb is a common sensation after a limb has been amputated. Sometimes people with phantom limbs report vivid experiences of voluntarily moving their phantom. Several studies investigated the phantom movement, showing that it can be functionally disentangled from an imagined movement and very similar to the actual movement of an intact limb. How and to what extent phantom movements and real movements share similar physiological mechanisms? In this EEG study, we focused on a specific aspect of motor control, the motor inhibition, and we asked whether inhibitory motor responses are implemented when a phantom movement has to be suppressed.

Methods: A left upper-limb amputee with phantom movement underwent a classical Go/Nogo paradigm. During the task, the event-related potentials (ERPs) were recorded. The task was performed with both the (right) intact and the (left) phantom hand, either in real or in imagined conditions. Sixteen healthy controls performed the same task. Peak amplitudes were analyzed at midline locations and single-subject analysis was performed by means of Crawford's Test (two-tailed) to compare the phantom-movement case with the healthy controls.

Results: The results showed that, in response to *nogo* stimuli, the phantom-movement case presented the classical ERP pattern associated to response inhibition, with a large P300 component at Fz when the movements of both (right) intact and (left) phantom limbs have to be suppressed. Furthermore, as in healthy controls, the P300 amplitude was greater during "real" than imagined movements with the phantom limb. Single-subject analysis showed that, in the phantom-movement case, this inhibitory motor response was not different from that found in healthy controls, actually performing the Go/Nogo task with an existing hand (Real condition; $Z = -0.157$, $p = 0.88$), but, crucially, it was significantly different from the Imagery condition of controls ($Z = 3.621$, $p < 0.003$).

Conclusions: Taken together, these findings provide the first evidence that phantom movements share the same neurophysiological correlates of real movements, not only when an action has to be executed, but also when it should be inhibited.