Mu rhythm: State of the art with special focus on cerebral palsy

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Résumé en anglais	Various specific early rehabilitation strategies are proposed to decrease functional disabilities in patients with cerebral palsy (CP). These strategies are thought to favour the mechanisms of brain plasticity that take place after brain injury. However, the level of evidence is low. Markers of brain plasticity would favour validation of these rehabilitation programs. In this paper, we consider the study of mu rhythm for this goal by describing the characteristics of mu rhythm in adults and children with typical development, then review the current literature on mu rhythm in CP. Mu rhythm is composed of brain oscillations recorded by electroencephalography (EEG) or magnetoencephalography (MEG) over the sensorimotor areas. The oscillations are characterized by their frequency, topography and modulation. Frequency ranges within the alpha band (~10Hz, mu alpha) or beta band (~20Hz, mu beta). Source location analyses suggest that mu alpha reflects somatosensory functions, whereas mu beta reflects motor functions. Event-related desynchronisation (ERD) followed by event-related (re-)synchronisation (ERS) of mu rhythm occur in association with a movement or somatosensory input. Even if the functional role of the different mu rhythm components remains incompletely understood, their maturational trajectory is well described. Increasing age from infancy to adolescence is associated with increasing ERD as well as increasing ERS. A few studies characterised mu rhythm in adolescents with spastic CP and showed atypical patterns of modulation in most of them. The most frequent findings in patients with unilateral CP are decreased ERD and decreased ERS over the central electrodes, but atypical topography may also be found. The patterns of modulations are more variable in bilateral CP. Data in infants and young children with CP are lacking and studies did not address the questions of intra-individual reliability of mu rhythm modulations in patients with CP nor their modification after motor learning. Better characterization of mu rhythm in CP, especially in infants and young children, is warranted before considering this rhythm as a potential neurophysiological marker of brain plasticity.

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