

Alpha, Sensorimotor Rhythms and Beta Event-Related Desynchronisation during Kinesthetic Motor Imagery of experts and novices

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Kinesthetic Motor Imagery (KMI), consists in imagining movements’ associated sensations such as muscular contractions. It is widely used by athletes as it can increase motor skills [1-4]. Whereas movement execution produces physiological outputs, used as feedback to correct one’s practice, KMI does not allow athletes to objectify their strategies. However, KMI is associated with an event-related desynchronisation (ERD) of sensorimotor rhythms (SMRs) [5] making BCIs adapted to provide real time feedback. Through a better guidance of athletes, sport performance and brain modulation ability may be optimised [6-8]. Many KMI-BCI protocols reward maximum SMR-ERD [9], considering growing expertise will be associated with a higher desynchronisation of neurons in the sensorimotor cortices [10]. However, the neural efficiency hypothesis [11, 12] suggests we might need to reward different neuromarkers. To contribute to the debate, we investigated neural correlates of expertise, in sport expertise and perceived KMI expertise. We hypothesised that experts’ SMR-ERDs would differ from novices’ and suggested groups would have different solicitations of Alpha, SMRs and Beta. Indeed, as a reflection of temporal stability, experts would have specific modulations in comparison to novices’ that would be more widespread across frequency bands. Thus, we planned an experimental design with "Expertise" (basketball-experts, novices; between groups) and "Frequency band" (Alpha, SMR, Beta; within groups) as factors. Self-reported KMI ability allowed us to observe potential differences between groups and if so, add it as a covariable. Our results show that experts reported higher perceived KMI abilities than novices. In addition, ANOVA revealed a main effect of the group and frequency band, as well as a tendency towards a main effect of the interaction group x frequency band. Group effect was only weakly mediated by perceived KMI ability, and seemed to be mainly driven by sport expertise.

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