Coordinating motor plans for skilled sequence production

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Motor planning is a key element of skilled motor control [1, 2, 3, 4, 5], particularly for sequences of movements [6, 7]. Until recently, our knowledge of motor sequence planning in humans has been indirect. Primarily, it was derived from invasive recordings in animal models, computer simulations and behavioural markers during sequence execution. I will present an approach which employs pattern classification of non-invasive neurophysiological signals (MEG/EEG) to assess the neural evolution of finger movement patterns during the retrieval, planning and production of well-trained sequences produced from memory. Our results show that sequence planning can entail a parallel [8] and a serial [9] pre-ordering of the movements in the upcoming sequence and is partially driven by a high-level positional code. Secondly, I will present behavioural work, which provides a window into the internal state of sequential movements before sequence execution and its modulation by preparation duration and sequence timing [10]. Together, our findings favour a hierarchical and modular model of sequence control, with timing, position and movement being controlled independently.

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