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**Talk Title:**

Decision uncertainty as a context for motor memory

**Abstract:**

In a tennis match, one may decide to hit a ball to the right corner, knowing confidently that the opponent stands on the other side, or one may decide to make the same move while being unsure about where the opponent stands. Execution of an action requires retrieval of a specific muscle activity pattern suitable for the given context (i.e. motor memory), but are these two apparently identical movements retrieved from a same mnemonic motor representation in the brain?

Similar to non-motor episodic memory, motor memory is also retrieved based on the contextual cues. Contextual cues for motor memories are often regarded as to directly related to motor control, such as the state of the other body-parts or the plan of the future action. Here, we show that uncertainty of decision preceding an action contextualizes the motor memory.

Participants judged the direction (left or right) of a visual motion (random-dot motion) presented on the screen. They were asked to reach towards the target of the perceived motion direction by moving a manipulandum with their right hand. The reaching following the decision was performed under a velocity-dependent force-field. The learning (retrieval) of the force-field was assessed after the learning.

The match of the preceding decision uncertainty between learning and retrieval was critical for the successful retrieval of the motor memory. Two different motor memories can be assigned to a same movement trajectory if each memory was associated with different decision-uncertainties. Finally, we showed that the motor-memory can be tagged by the uncertainty of decision itself, beyond the type of input in which the uncertainty was evaluated.

Encoding motor memories based on decision contexts may maintain the robustness of control under variable neural activities elicited by different cognitive states, showing the

tight coupling between cognition and action.