Recognition of body motion: from visual sequence analysis to structured dynamic motor representations

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The recognition of biological motion and actions integrates processes at multiple cortical levels. On the one hand, and consistent with physiologically inspired neural models, accumulating evidence suggests a critical influence of the visual processing of temporal sequences of form and motion patterns. On the other hand, a huge literature has emerged showing influences of motor representations on the visual recognition of imitable actions. The exact relationship between these different representations remains largely unknown. We will first show how learning-based visual processing mechanisms account not only for the processing of biological motion stimuli, but also for the recognition of goal directed actions, at the same time reproducing critical visual tuning properties of 'mirror neurons' in premotor cortex. We then show that biological motion recognition is influenced by concurrently executed motor behavior in a spatio-temporally highly selective manner. This indicates the existence of highly structured interactions between dynamic representations for the recognition and execution of motor behavior. We finally show how constraints, potentially resulting from the motor control of complex full-body movements, can be exploited for a detailed study of critical features that determine the perception of emotions from body movement.

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