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Error signal processing in Online Control and Adaptation

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ABSTRACT OF THE TALK

When visually guided motor responses deviate from their goal, online corrections can be performed either under voluntary control with additional sub-movements or under fast automatic control with smooth velocity profiles. When errors cannot be corrected online and are repeated over trials, subsequent responses can be improved iteratively through adaptation, a progressive adjustment of motor commands that acts to reduce the magnitude of error. Two innovative hand-reaching paradigms are compared that provide the subject with undistorted hand sensory feedback. Both paradigms induce motor planning errors unknown to the subjects. The former yields a continuous retinal and visuomotor feedback allowing fast and complete automatic online corrections. The latter eliminates all visual feedback during movement execution, which prevents online correction and provides information on hand-to-target visual error at movement end only. Despite a reiterated motor planning error and an automatic online correction of the whole error, the former shows a complete lack of adaptation. In contrast, the latter which yields the same motor planning error exhibits a robust and generalized adaptation, although devoid of limb inter-sensory mismatch. These results demonstrate independence between the induced motor adaptation and automatic online correction, both characterized by the lack of any cognitive interference.