

# ***The Point of No Return in Planar Hand Movements: An Indication to the Existence of High Level Motion Primitives***

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Previous psychophysical studies have sought to unravel whether the processes of movement engagement and termination are dissociable, whether stopping an action is a generic process, and is there a point in time in which the generation of a planned action is inevitable ("point of no return"). Moreover, recent surface EMG studies have attempted to locate the anatomical locus in the central and peripheral nervous system beyond which the intended action must be produced. It is not clear yet, however, whether the action of stopping is merely a manifestation of low-level, dynamic constraints, or is it also subject to high-level, kinematic plan. In the present study, stopping performance was studied while 10 subjects, who generated free scribbling movements looking for the location of an invisible circular target, were requested unexpectedly to impede moving. Temporal analysis of the data shows that in 87% of the movements, which superseded the stop cue, the tangential motion velocity profile was not a decelerating function of the time but exhibited a complex pattern that comprised of one, or more, velocity peaks. Furthermore, geometrical analysis shows that the figural properties of the path, generated after the stop cue, were part of a repetitive geometrical pattern. Altogether, these findings imply that the "point of no return" phenomenon in humans reflects a high level, kinematic plan and may serve as a new operative definition for the notion of motion primitives.