

Response to the Commentary of Quoilin & Derosiere

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The commentary by Quoilin & Derosiere makes the valuable point that our results do not rule out the possibility that multiple inhibitory mechanisms might operate in parallel during the preparation of responses. We agree with this point and appreciate that the multi-process models are based on results from a range of experimental methods. We do want to emphasize that the unitary mechanism developed in our discussion, one that can account for inhibition of selected, non-selected, and task-irrelevant muscles, is not a global process: As reflected in the spotlight metaphor, inhibition is centered at a specific representation associated with the prepared response, with the spread of inhibition constrained by the task demands.

An important question is whether anticipating the need to abort a prepared response, referred to elsewhere as “proactive control,” recruits the same inhibitory mechanisms as those used to prepare a response. Quoilin & Derosiere offer the hypothesis that the MEP suppression we observed in task-irrelevant muscles during the simple reaction time task may be due to the inclusion of a greater proportion of catch trials in our experiments compared to previous studies. They argue that inhibition of task-irrelevant muscles could arise from anticipating the need to cancel the prepared response. We have since replicated our result using a task with only 5% catch trials (Labruna et al., *in preparation*), showing that task-irrelevant muscles are suppressed even when the proportion of catch trials is small. Moreover, previous studies have investigated proactive inhibition within the context of cued stopping paradigms, and these studies reported that inhibition was selectively targeted at the cued responses (Claffey et al., 2010; Cai et al., 2011). We recognize that these studies only measured excitability in task-relevant muscles. If inhibition of task-irrelevant muscles reflects proactive control, as Quoilin & Derosiere suggest, it will be important to distinguish between mechanisms for proactive control and mechanisms for response preparation.

References

- Cai W, Oldenkamp CL, Aron AR (2011) A proactive mechanism for selective suppression of response tendencies. *J Neurosci* 31:5965–5969.
- Claffey MP, Sheldon S, Stinear CM, Verbruggen F, Aron AR (2010) Having a goal to stop action is associated with advance control of specific motor representations. *Neuropsychologia* 48:541–548.
- Duque J, Lew D, Mazzocchio R, Olivier E, Ivry RB (2010) Evidence for two concurrent inhibitory mechanisms during response preparation. *J Neurosci* 30:3793–3802.
- Labruna L, Cazares C, Greenhouse I, Lebon F, Duque J, Ivry RB. Effector dependent levels of inhibition in response preparation. *in preparation*