Getting Ready (Not) to Act: How Preparation Time Determines Inhibitory Control Underlying Dual-Action Benefits in Multiple Action Control

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Abstract No.: 2103

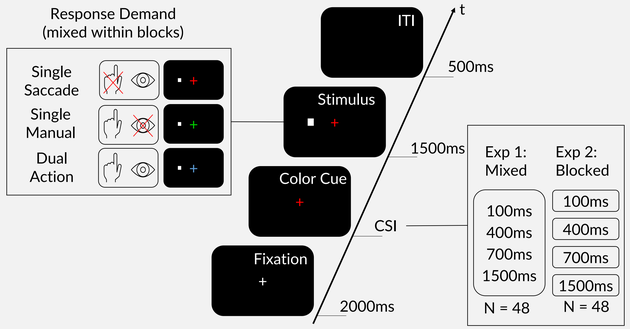
BACKGROUND:

- Executing two actions at the same time (instead of one) is typically associated with performance costs (dual-action *costs*; e.g., Pashler, 1994)
- Sometimes, executing two actions can be easier when the execution of one action requires the simultaneous inhibition of another, prepotent action (dual action *benefits*; Huestegge & Koch, 2014; Kürten et al., 2022)
- Failures to inhibit a prepotent action under single-action requirement characterized by false-positive executions → the more inhibition failures, the greater the relative dual-action benefit

PRESENT STUDY

- Prepotent eye-movements (saccades) *and/or* manual button presses
  - Single peripheral visual target (cf., Fagot & Pashler, 1992)
  - Spatially compatible actions
  - Randomly switching single-action and dual-action requirements
- Manipulation of preparation time via the cue-stimulus interval (CSI)
  - Cue only indicated the relevant effector system(s) in the current trial
  - If participants flexibly use this information for simultaneous preparation of inhibitory and executive control, we expect decreasing rates of inhibition failures (and thus decreasing dual-action benefits) as well as decreasing RTs with prolonged preparation time

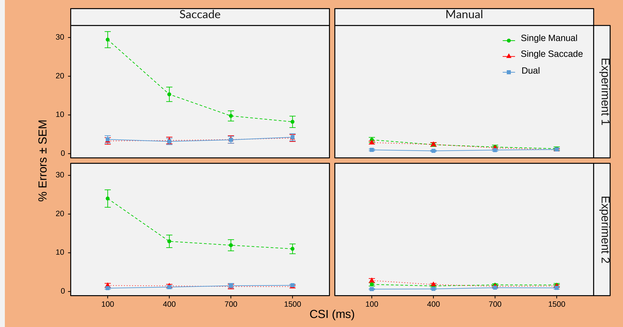
METHODS (Trial Structure)



Flexible preparation for concurrent **inhibitory and executive** action control is possible on the level **effector-system representations.**

RESULTS

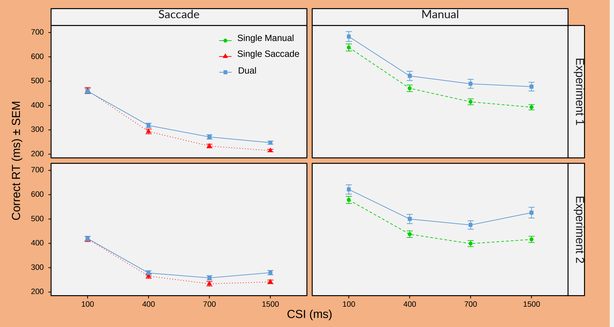
Errors



	Saccade				Manual			
	df	*F*	*p*	η_p^2	*df*	*F*	*p*	η_p^2
RD	2, 94	56.1	< .001	.54	2, 94	6.6	.005	.12
CSI	3, 141	91.6	< .001	.66	3, 141	13.9	< .001	.23
RD:CSI	6, 282	92.8	< .001	.66	6, 282	4.9	.002	.10
RD	2, 94	116.40	< .001	.71	2, 94	10.5	< .001	.18
CSI	3, 141	24.70	< .001	.35	3, 141	1.9	.149	.04
RD:CSI	6, 282	24.60	< .001	.34	6, 282	2.6	.039	.05

Exp 1 / Exp 2

RTs



	Saccade				Manual			
	df	*F*	*p*	η_p^2	*df*	*F*	*p*	η_p^2
RD	1, 47	20.9	< .001	.31	1, 47	24.7	< .001	.34
CSI	3, 141	597.9	< .001	.93	3, 141	617.3	< .001	.93
RD:CSI	3, 141	17.4	< .001	.27	3, 141	10.3	< .001	.18
RD	1, 47	22.3	< .001	.32	1, 47	47.6	< .001	.50
CSI	3, 141	288.4	< .001	.86	3, 141	112.7	< .001	.71
RD:CSI	3, 141	9.7	< .001	.17	3, 141	13.3	< .001	.22

Exp 1 / Exp 2

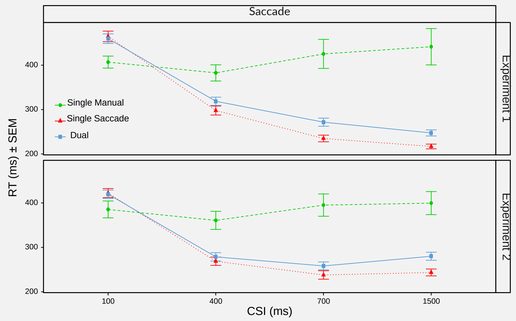
SUMMARY & DISCUSSION

- Errors
  - Stronger inhibition-based dual-action benefits in saccades compared with manual responses
  - Reduction of inhbition failures with increasing preparation time in both action modalities
- RTs
  - Dual-action costs in both action modalities
  - Reduced response latencies in both action modalities with increasing preparation time

ADDITIONAL DATA

- Exploratory analyses of false-positive saccade RTs in Single Manual Trials

Saccade Error RTs



	Saccade							
	df	*F*	*p*	η_p^2				
RD	2, 94	16.33	< .001	.37				
CSI	3, 141	49.73	< .001	.64				
RD:CSI	6, 282	19.84	< .001	.42				
RD	2, 94	25.70	< .001	.43				
CSI	3, 141	44.83	< .001	.57				
RD:CSI	6, 282	14.84	< .001	.30				

Exp 1 / Exp 2

SUMMARY (Error RTs)

- Saccade Error RTs
  - False-positive saccades slower than correct responses
  - Error RTs unaffected by CSI

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