Contributions of task set inertia and task set preparation on voluntary task selection

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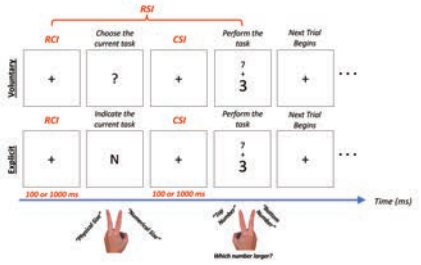
Introduction

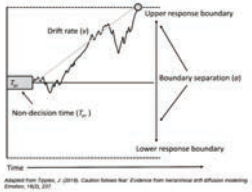
- Inertia has typically been manipulated by varying the Response-to-Stimulus Interval (RSI) with inertia decreasing with decreasing RSI
- Task set preparation is typically manipulated by varying the Cue-to-Stimulus Interval (CSI)
- Separating inertia and preparation is difficult in voluntary task switching paradigms, because tasks can be prepared during RSI.
- Drift diffusion modeling (a form of evidence accumulation model) may be useful for separating the contributions of inertia and preparation
- Previous explicit task switching studies suggest that *drift rate* is worse for switches, reflecting decreased SNR the new task due to *task set inertia*.
- *Nondecision* time is longer on switches, reflecting increased time to *prepare a new task set*
- However, drift diffusion has not been applied to voluntary task selection

Methods

- 116 A&M undergrads performed explicit cued task switching
- 100 A%M undergrads performed voluntary task switching
- Intro psych students, mean aged ~19y (demos on right)
- RCI and CSI manipulated to dissociate task-set inertia (TSI) and task set preparation
- Log-transformed RTs were analyzed using Bayesian multilevel regression via the 'brms' R package; separate analyses for explicit and voluntary
- All drift diffusion model analyses were conducted using the HDDM Python module (Wiecki, Sofer, & Frank, 2013)

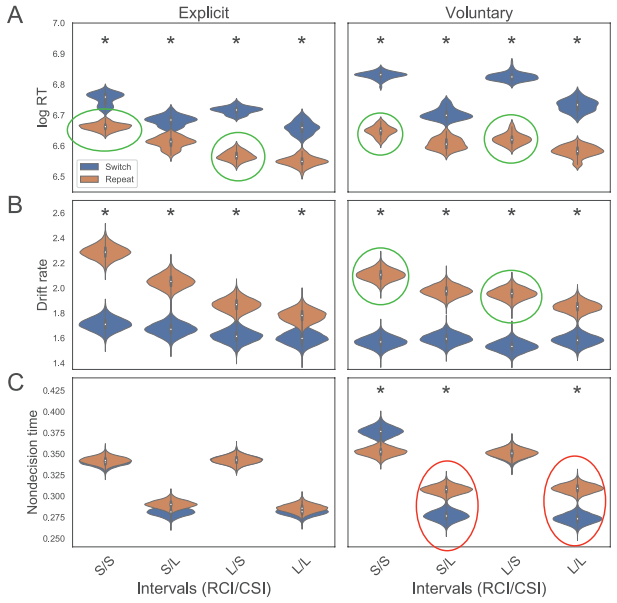


Drift Diffusion Model



Reductions in *switch cost* caused by reduced inertia related to *impeding repeat performance* rather than facilitating switch performance

Figure 1



Changing the RSI while holding CSI short (S/S vs. L/S) increased repeat RT, i.e., less facilitation on repeat trials.

This was mirrored by worse drift rates on repeats (P>99.2%).

Together, these findings demonstrate that allowing inertia to dissipate harms repeat trials rather than facilitating switch trials, counter to many previous suggestions.

Interestingly, inertia switch costs were primarily observed in explicit trials (see Figure 2B).

Reverse switch effect for nondecision time at long CSI suggests that participants better prepared for voluntary switches.

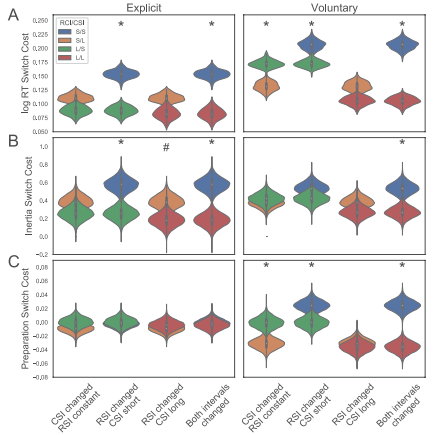
Overall, this suggests that preparation offsets inertia in voluntary task switching.

Study Sample Demographics

Race/ Ethnicity	Gender Identity			
Hispanic	Female	Male	PNTS/DNA	Grand Total
American Indian/Alaska Native	2	2	0	4
Black or African American	1	0	0	1
White/Caucasian	30	20	1	51
Other	0	1	0	1
Unknown	1	1	0	2
PNTS/DNA	3	0	0	3
Hispanic Subtotal	**34**	**24**	**1**	**59**
Not Hispanic	Female	Male	PNTS/DNA	Grand Total
Asian	11	4	0	15
Black or African American	6	5	0	11
Native Hawaiian/Pacific Islander	1	0	0	1
White/Caucasian	69	48	0	117
PNTS/DNA	1	0	0	1
More than one	3	2	0	5
Not Hispanic Subtotal	**88**	**57**	**0**	**145**
PNTS/DNA	0	0	1	1
Grand Total	**122**	**81**	**2**	**205**

PNTS/DNA: Prefer Not to Answer/ Did Not Answer

Figure 2



Main takeaways:

1. Inertia effects repeat trials more than switch trials (RT and drift rate effects).

2. RSI manipulations that are normally thought to affect inertia instead affected preparation on voluntary trials.

Materials will be made available on OSF:
http://bit.ly/Components_VTS

References:
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