Control schedule learning: An exploratory examination with the Multi-Source Interference Task

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A talk-through video for this presentation is also available

Introduction

Executive function is “a process used to effortfully guide behavior toward a goal” (Banich, 2009, p. 89).

Interference tasks are oft-used tasks for executive function (Diamond 2013).

Experimental manipulations affect performance in interference tasks (e.g., the list-wide proportion congruency effect; Logan & Zbrodoff, 1979), which suggests adjustments of executive function (Braem et al., 2019).

The purpose of the current study
We aimed to explore whether and how control schedule learning (i.e., adjustments of executive function based on temporal regularity) is possible by manipulating temporal regularity of conflict detection and need for control.

Method

Task: The Multi-Source Interference Task (Bush & Shin, 2006) was used online.

Control Trial	Interference Trial	Stimulus-Key Mapping
100	221	1 2 3 / J K L

Note. Participants found an oddball (e.g., “1”) and pressed its corresponding key (e.g., “J”). The Simon and Flanker effects lead to interference.

Groups: We set blocks of 5 trials (4 control trials and 1 interference trial) and manipulated the presentation position of the interference trial within a block (i.e., positional frequency) according to 4 groups.

Group C (n = 53)

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Block 1	C	I	C	C	C
Block 2	C	C	C	C	I
Block 3	C	C	I	C	C

Blocks Continued

Group P2 (n = 67)

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Block 1	C	I	C	C	C
Block 2	C	I	C	C	C
Block 3	C	I	C	C	C

Blocks Continued

Group P3 (n = 54)

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Block 1	C	C	I	C	C
Block 2	C	C	I	C	C
Block 3	C	C	I	C	C

Blocks Continued

Group P4 (n = 68)

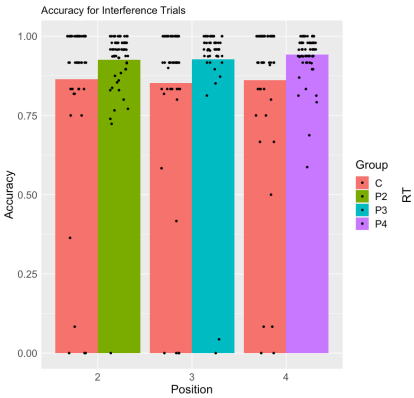
	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Block 1	C	C	C	I	C
Block 2	C	C	C	I	C
Block 3	C	C	C	I	C

Blocks Continued

Participants: Data of 242 participants were analyzed (113 female; mean age = 38.19; *sd* of age = 6.69).

Results

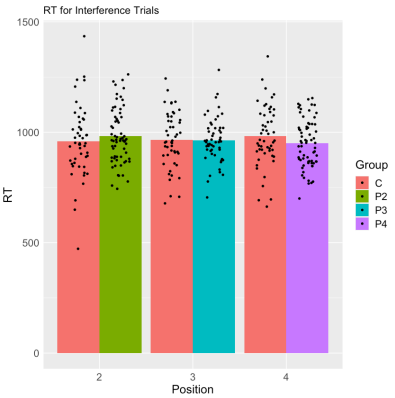
Accuracy



C < P2, P3, & P4

Note. The results of a mixed effects logistic model showed that the contrast between C vs. P2, P3, and P4 was significant (z = 2.41, p = .016).

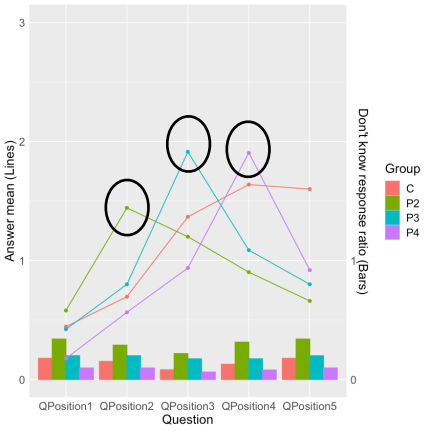
RT



C ≒ P2, P3, & P4

Note. The contrast was not significant (t = -0.30, p = .77).

Awareness of Temporal Regularity



Participants were asked about the subjective frequency of interference trials on completion of the task.

A subset of participants was accurately aware of the presentation position of interference trials.

Note. The subjective frequency was asked about on a 4-point Likert scale with a “Don’t know” response (e.g.,*“How often do you think difficult stimuli appeared at the first position?”*; 0 = not at all; 1 = sometimes; 2 = frequently; 3 = always). Lines represent means of answers at each position and bars proportions of “Don’t know” responses to all answers at each position.

Discussion

The facilitative effect of temporal regularity on accuracy suggests that control schedule learning supports executive function.

Methodologically, the current study’s manipulation would also offer a new window into adjustments of executive function that are modulated by temporal regularity.