Between-Task Competition and the Occurrence of Task Inhibition

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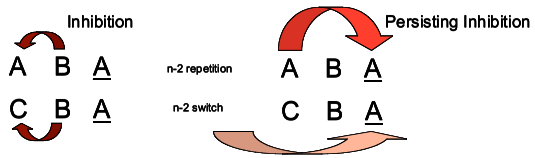
Introduction

The performance of task sequences requires the activation of the relevant task set as well as inhibition of recently performed, but currently irrelevant task sets (Mayr & Keele, 2000; Schuch & Koch, 2003). Empirical marker of inhibitory processes during the performance of task sequences are so called n-2 repetition cost.



We assume that inhibition in the performance of task sequences arises when tasks compete with each other. Inhibition then solves this between-task competition. In two studies, we tested this assumption more specifically. In the first study, we examined the influence of residual task activation on task inhibition. In the second study, we manipulated the overlap in the response sets of different task and addressed its impact on task inhibition.

Study I: Residual task activation and task inhibition

Typical Observation:

N-2 repetition cost decreases with increasing time between tasks (i.e. response cue interval RCI, see Mayr, 2002)

Accounts:

1. The decrease in n-2 repetition cost is due to decay of task inhibition.
2. The decrease in n-2 repetition cost is due to decay of task activation of the preceding, competing task.
3. Both decay of task inhibition and decay of task activation account for the decrease in n-2 repetition cost.

Experimental approach:

Trial-by-trial randomization of RCI to decide among the different accounts.

Predictions:

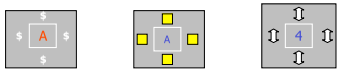
Conditions for decreased n-2 repetition cost

Hypothesis	n-2 RCI	n-1 RCI
Decay of Task Inhibition	short/long	long
Decay of Task Activation	long	short/long
Decay of Task Inhibition & Activation	long	long

Method:

32 subjects
two RCI conditions:
100ms vs. 1400ms & 100ms vs. 1900ms

Tasks:

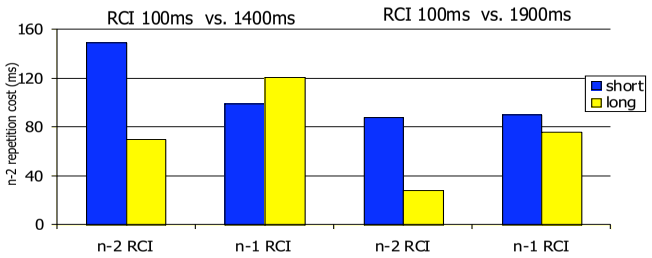


Form A vs. 4 **Color** red vs. blue **Size** large vs. small

References

Gade, M., & Koch, I. (2005). Linking inhibition to activation in the control of task sequences. Psychonomic Bulletin & Review, 12, 530-534.
Mayr U. & Keele, S.W. (2000). Changing internal constraints on actions. The Role of Backward Inhibition. Journal of Experimental Psychology: General, 129, 4-26.
Mayr, U. (2002). Inhibition of action rules. Psychonomic Bulletin & Review, 9, 93-99.
Schuch S., & Koch, I. (2003). The role of response selection for inhibition of task sets in task shifting. Journal of Experimental Psychology: Human Perception and Performance, 29, 92-105.

N-2 repetition cost as a function of n-2 RCI and n-1 RCI



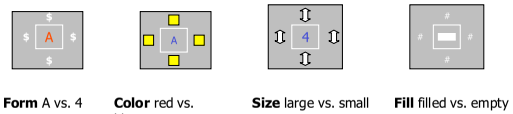
Discussion

Both experiments support the decay of activation hypothesis. N-2 repetition cost decreases as task activation decreases between trial n-2 and trial n-1. Therefore we conclude that residual task activation leads to competition between tasks and thus influences the amount of task inhibition (Gade & Koch, 2005).

Study II: Response-set overlap and task inhibition

In three experiments, we varied the overlap in response set for one out of four tasks and tested whether competition between tasks due to feature overlap also modulates task inhibition. We predicted no n-2 repetition cost when there is no feature overlap in response set.

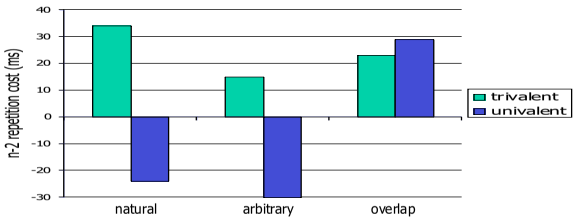
Tasks



Form A vs. 4 left vs. right
Color red vs. blue left vs. right
Size large vs. small left vs. right
Fill filled vs. empty

Fill Task responses, three different groups
Natural: fill vs. empty
Arbitrary: up vs. down
Overlap: left vs. right

N-2 repetition cost as a function of task in trial n-1



Discussion

N-2 repetition cost were no longer present when subjects performed an univalent task in trial n-1 with non-overlapping response sets. Overlap in responses lead to the re-occurrence of n-2 repetition cost. Thus, competition during response selection seems to be critical for the occurrence of task inhibition (Schuch & Koch, 2003).

CONCLUSIONS

Task inhibition arises under conditions of competition between tasks. Competition between tasks can either be due to residual activation of currently irrelevant tasks and/or to feature overlap during response selection. Thus, task inhibition is a means to solve competition between tasks during the performance of task sequences.