# Cognitive Control and Narrative Memory

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## Introduction

- According to the Dual Mechanisms of Control (DMC) framework (e.g. Braver, 2012) two different modes of control can be used during the AX-CPT.
- *Proactive* mode: The cue is represented and actively maintained in working memory so that a cue-based response can be prepared for the probe.
- *Reactive* mode: Minimal attention is given to the cue. When the probe is presented, goal information contained within the cue must be reactivated.
- The present study explored whether there are differences in surface form, textbase, and event model representations in people who have adopted a more vs. less proactive mode of control during the AX-CPT.

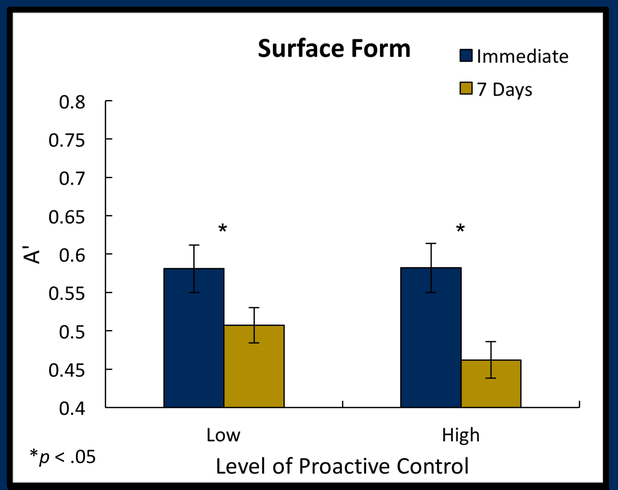
## Method

**Participants**

- 35 undergraduate students at California State University, San Bernardino

**Stimuli and Procedure**

- Participants first completed 212 trials of the AX-CPT. Approximately 77.5% were AX trials, and 7.5% were AY, BX, and BY trials.
- Participants read four narratives ranging from 516 to 703 words long ($M$ = 621, $SE$ = 79). Each narrative contained roughly 40 sentences presented one at a time on a computer screen. Reading was self-paced.
- Participants took the first recognition memory test.
- A week later, they took the second test online. Each recognition test included four different types of probe sentences to assess level of memory representation.



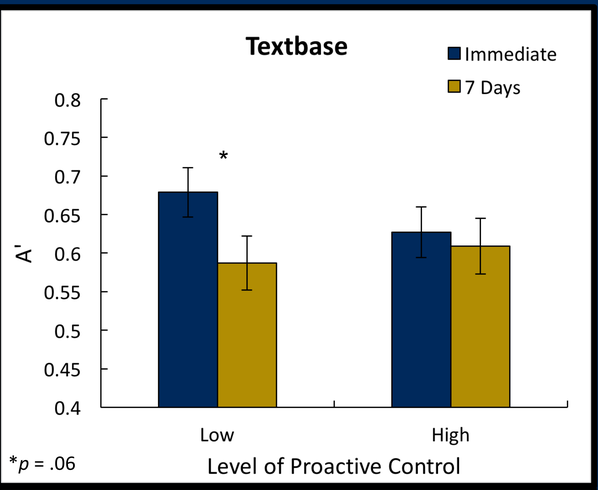

- Main effect of test time, $F(1, 33)=12.76$, $MSE=.01$, $p<.01$
- $M_{Immediate}=.58$, $M_{7\ Day}=.48$

## Design

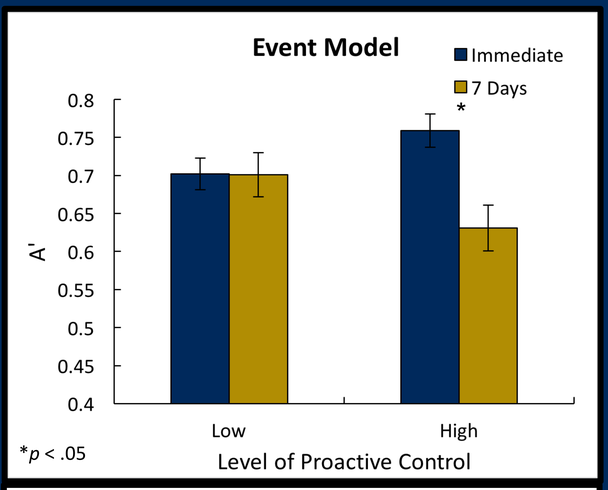
- A 3 (Test Sentence Type: Surface Form vs. Textbase vs. Event Model) x 2 (Test Time: Immediate vs. 7 Days) x 2 (Level of Proactive Control: Low vs. High) mixed-design was used. Test sentence type and test time were varied within-subjects, while level of proactive control varied between-subjects.

## Level of Proactive Control

- A Proactive Behavioral Index (PBI) score was calculated for each participant using RTs from AY and BX trials of the AX-CPT, PBI = (AY-BX)/(AY+BX)
- A median split on PBI scores was used to create the Low and High Proactive Control conditions
- People in the low proactive control condition had a significantly lower PBI ($M$ = .10) than people in the high proactive control condition ($M$ = .26), $t(33)=-9.40$, $p<.001$.
- The Sentence Type x Test Time x Proactive Control Level interaction was marginally significant, $F(2, 66) = 3.05$, $MSE$ = .015, $p$ = .054




- Marginally significant main effect of Test Time, $F(1, 33)=3.81$, $MSE=.014$, $p=.06$
- Marginally significant test time effect for people with a low level of proactive control, $t(17)=2.02$, $p=.06$, but not for people with high proactive control, $|t|<1$




- Significant Test Time x Proactive Control Level interaction, $F(1, 33)=10.92$, $MSE=.007$, $p<.01$
- Effect of test time was significant for people with a high level of proactive control, $t(16)=3.60$, $p<.01$, but not for people with a low level of proactive control, $|t|<1$

## Levels of Representation

- Representation was assessed using the Schmalhofer and Glavanov (1986) procedure and the signal detection measure, A'.

**Study Sentence**

*A prominent member of the Board was Phil Marks.*

**Recognition Probes**

Verbatim (Surface Form)
*A prominent member of the Board was Phil Marks.*

Paraphrase (Textbase)
*Phil Marks was a notable member of the Board.*

Inference (Event Model)
*Phil Marks was an administrator at the CIA.*

Wrong
*Marks himself was an amateur engineer.*

## Summary and Conclusions

- Memory for information from surface form, textbase, and event model representations appears to depend on the level of proactive control that people use.
- Textbase representation was forgotten to a greater degree for lower levels of proactive control. In contrast, event model representation was forgotten to a greater degree for higher levels of proactive control.
- The way target information is processed in working memory may affect the nature and retention of long-term representations.

## References

Braver, T. S. (2012). The variable nature of cognitive control: a dual mechanisms framework. *Trends in Cognitive Sciences, 16*, 106-113.

Schmalhofer, F., & Glavanov, D. (1986). Three components of understanding a programmer's manual: Verbatim, propositional, and situational representations. *Journal of Memory and Language*, 25(3), 279-294.

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