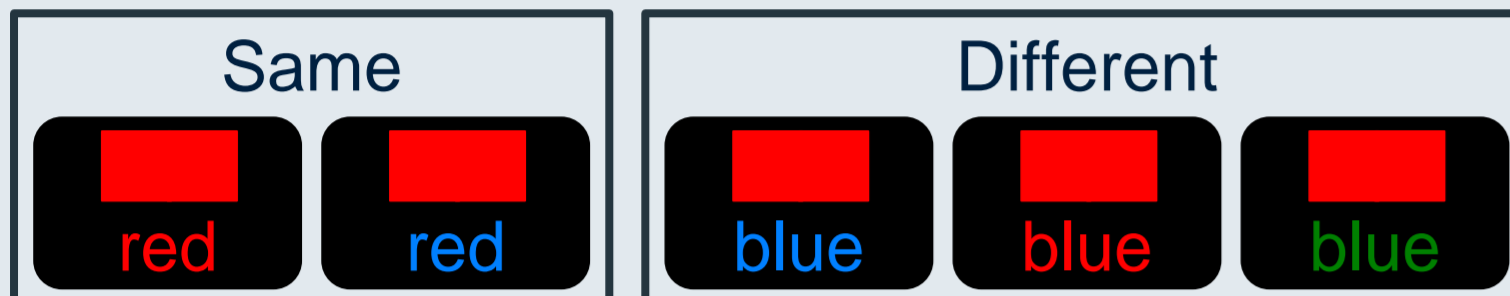# Audiovisual Colour-Word Stroop Matching Task:
Interference but not Facilitation from Written Word Meaning

Ido Bornstein and Anthony Herdman, University of British Columbia

Introduction

Visual matching Stroop[1] tasks require judging whether a colour-word's meaning is the same as or different from a reference colour bar[2,3]:

Same	Different
red red	blue blue blue

Previous audiovisual Stroop studies[4,5,6] used spoken words mainly as distractors in a colour-naming task, and thus did not require attending to and matching stimuli across modalities.
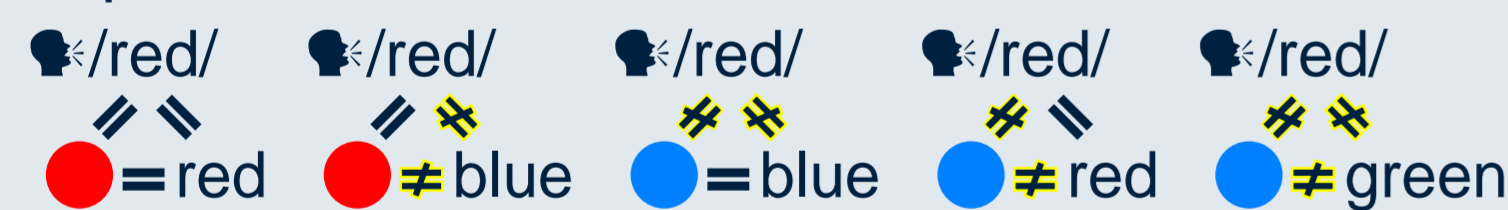
Objective
To explore how written word meaning affects audiovisual matching of a spoken colour-word and font colour.
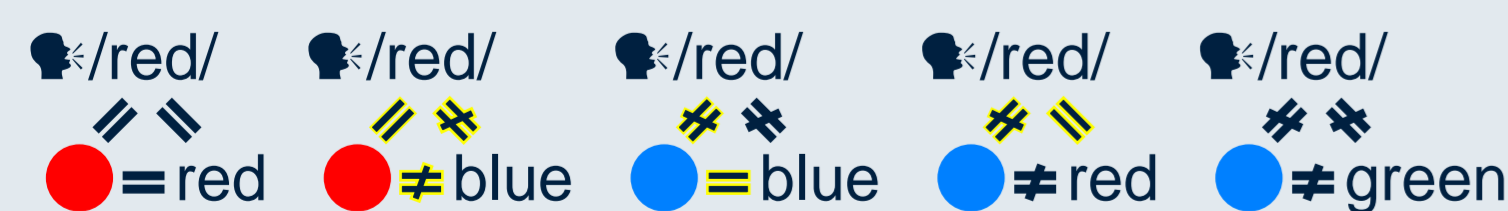
Hypothesis
Two hypotheses can account for interference to matching:

1. **Semantic-conflict** – between semantic representations of colour:

   /red/ = red, /red/ ≠ blue, /red/ = blue, /red/ ≠ red, /red/ ≠ green

2. **Response-conflict** – between responses ("same" vs. "different") to a task-relevant comparison (spoken word – font colour), and to two task-irrelevant comparisons (written word – font colour, and written word – spoken word):

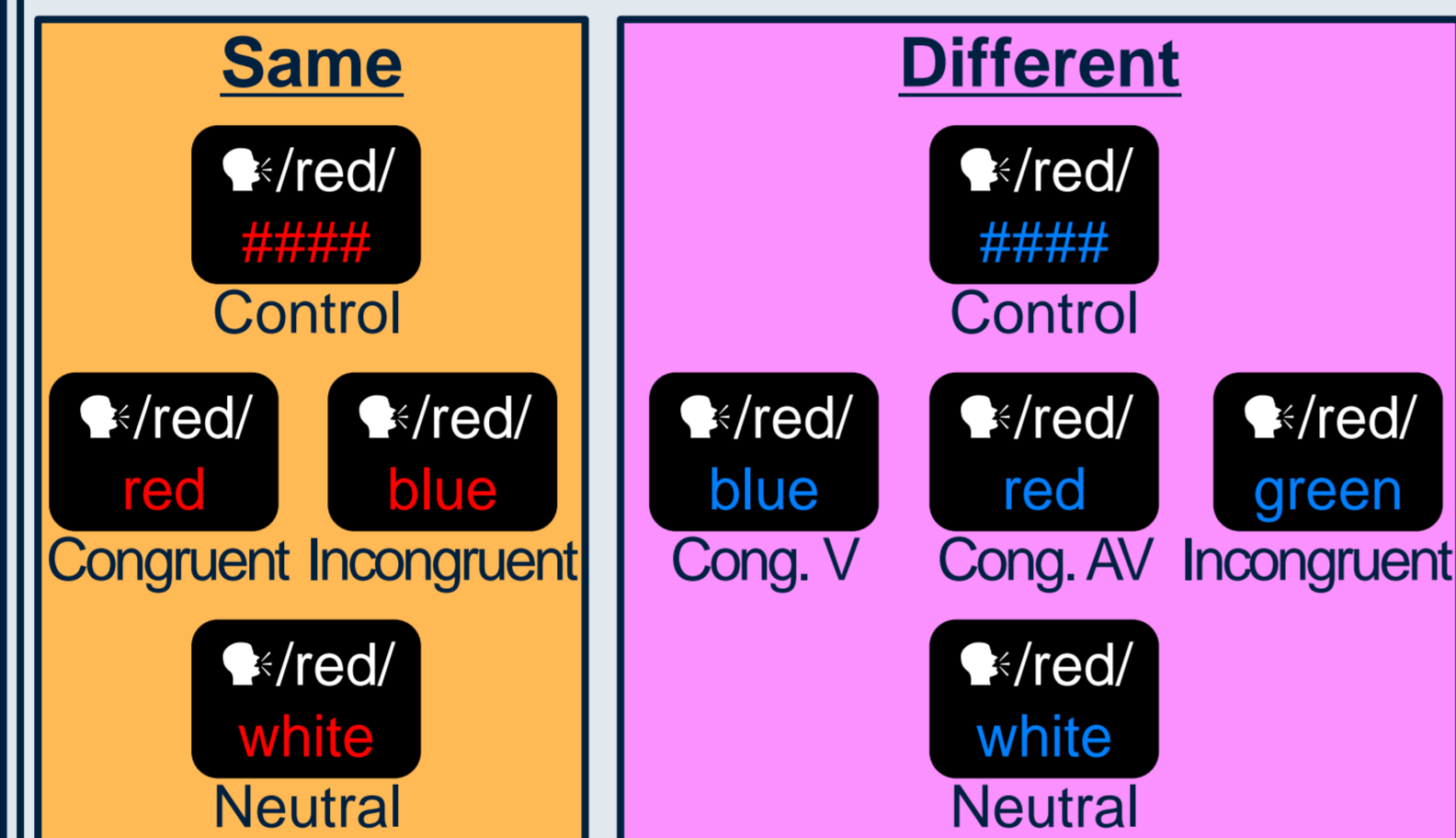   /red/ = red, /red/ ≠ blue, /red/ = blue, /red/ ≠ red, /red/ ≠ green

Methods

Participants
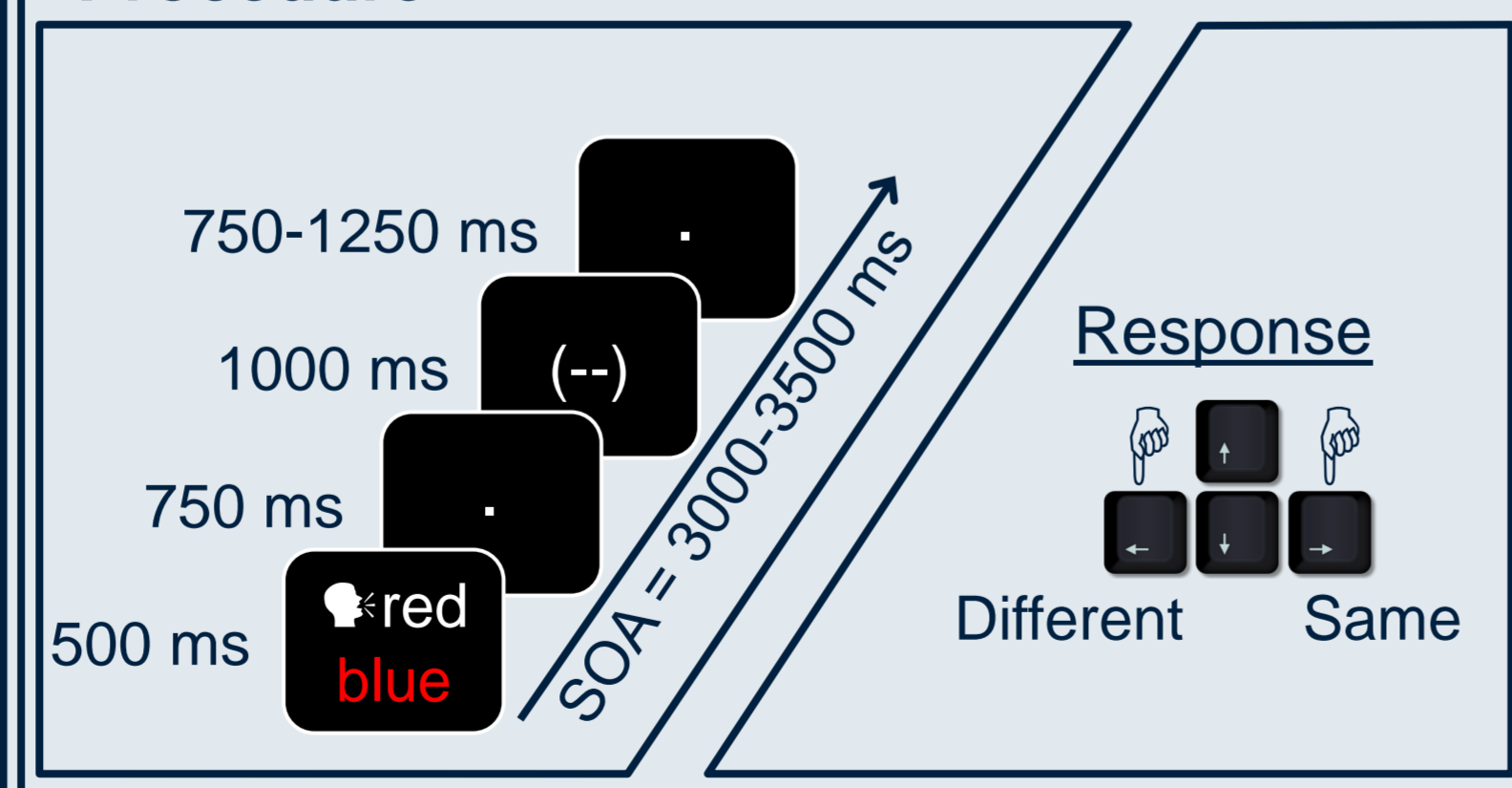- 28 young adults ($M = 24$ years, $SD = 3$)
- English first language

Materials
- Written words: *red, green, blue, white, ####*
- Font colours: red green blue
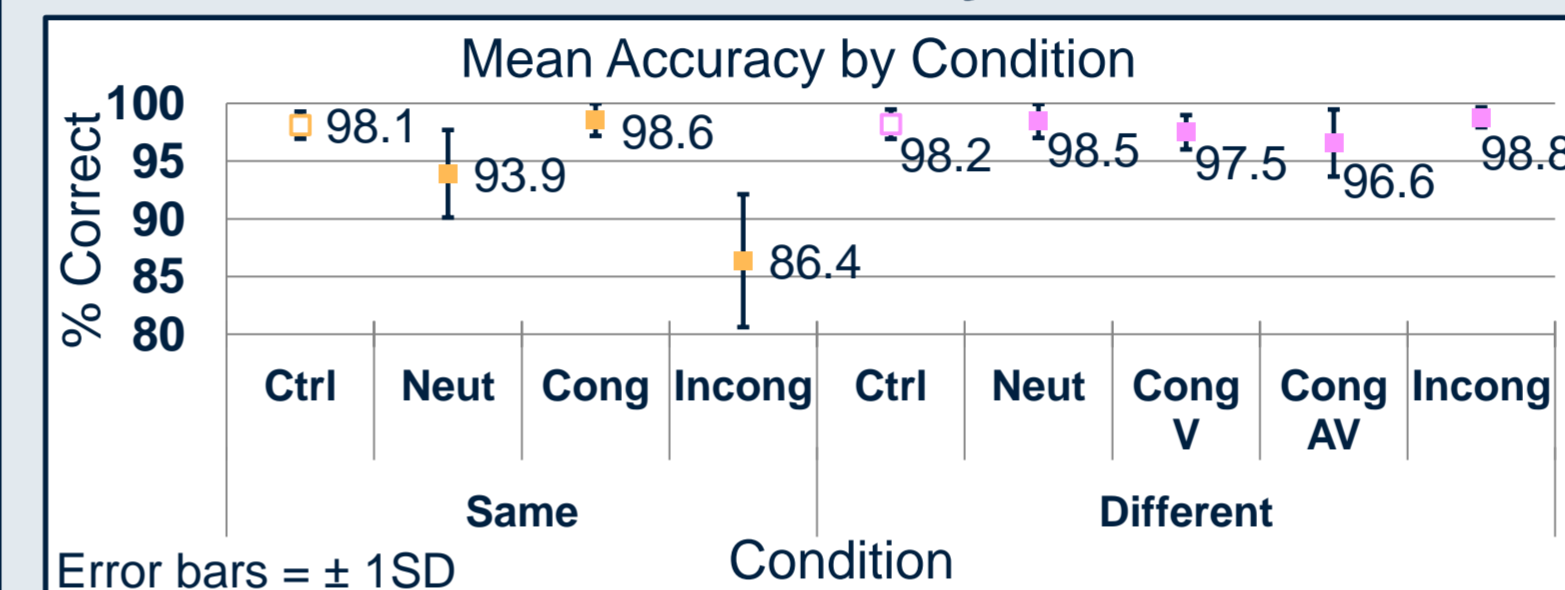- Spoken words: /red/, /green/, /blue/

Conditions

Same
- /red/ #### — Control
- /red/ red — Congruent
- /red/ blue — Incongruent
- /red/ white — Neutral

Different
- /red/ #### — Control
- /red/ blue — Cong. V
- /red/ red — Cong. AV
- /red/ green — Incongruent
- /red/ white — Neutral

Procedure

750-1250 ms
1000 ms (--)
750 ms
500 ms /red/ blue

SOA = 3000-3500 ms

Response
Different ← → Same

Results

Response-conflict hypothesis ✓
Semantic-conflict hypothesis ✗

Accuracy

Mean Accuracy by Condition

	Same				Different				
	Ctrl	Neut	Cong	Incong	Ctrl	Neut	Cong V	Cong AV	Incong
% Correct	98.1	93.9	98.6	86.4	98.2	98.5	97.5	96.6	98.8

Error bars = ± 1SD

Experimental-Control Accuracy Differences

	Same			Different			
	Neut	Cong	Incong	Neut	Cong V	Cong AV	Incong
Δ % correct	-4.2	0.5	-11.8**	0.3	-0.7	-1.6*	0.6

* $p < .05$; ** $p < .001$

Response Time

Mean RT by Condition

	Same				Different				
	Ctrl	Neut	Cong	Incong	Ctrl	Neut	Cong V	Cong AV	Incong
RT (ms)	612	665	618	706	695	698	729	745	706

Error bars = ± 1SD
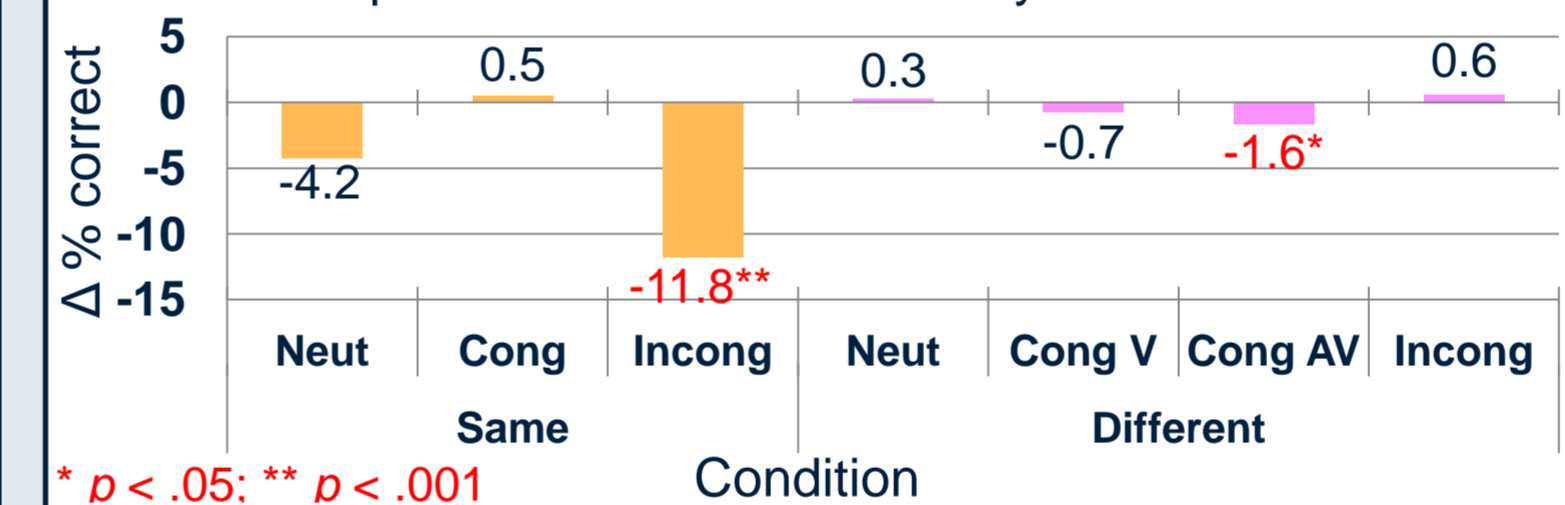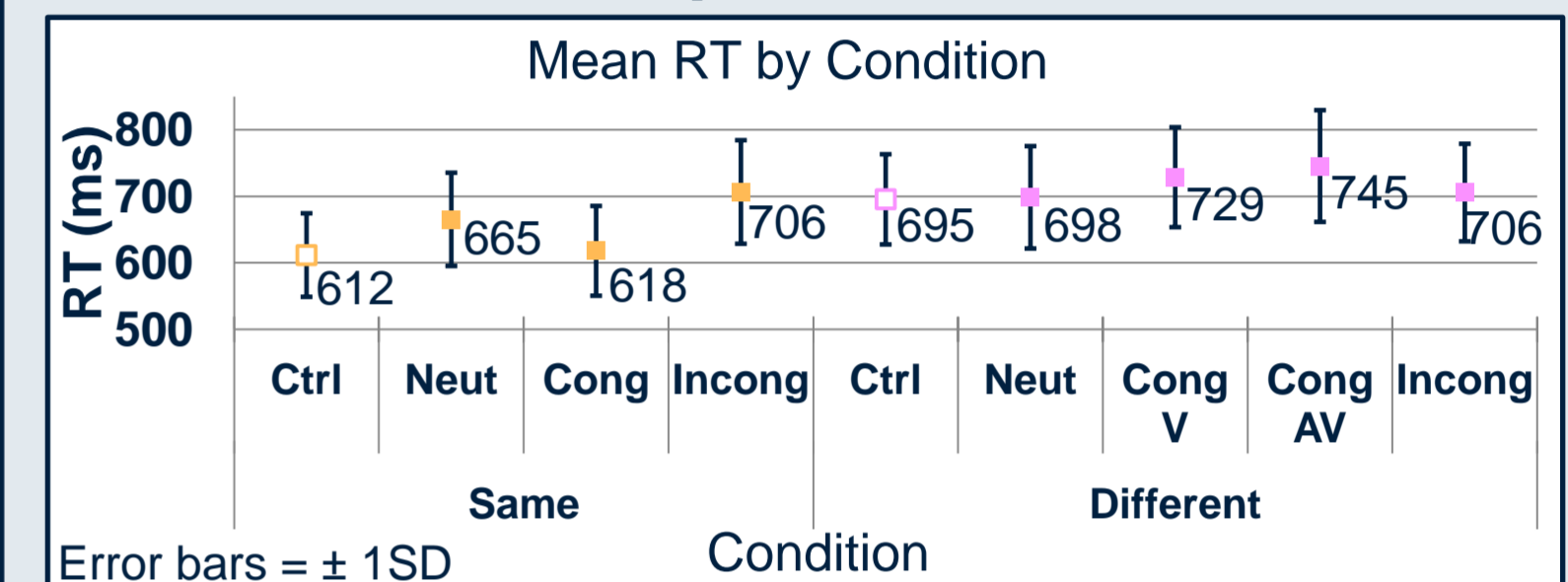
Experimental-Control RT Differences

	Same			Different			
	Neut	Cong	Incong	Neut	Cong V	Cong AV	Incong
Δ RT (ms)	53.7**	6.4*	94.9**	3.0	33.2**	50.1**	10.2
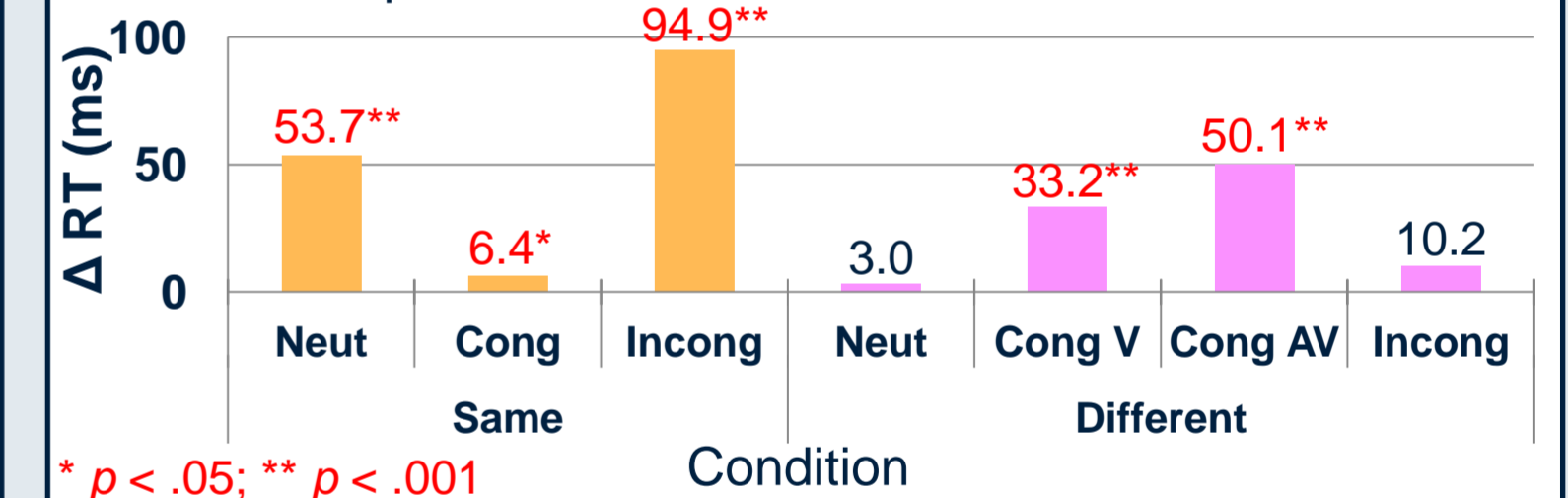
* $p < .05$; ** $p < .001$

Summary

- Written word meaning interfered with but did not facilitate audiovisual judgments.
- Interference seemed to result from a conflict between the outcomes[7] ("same" vs. "different" judgment) of task-relevant and task-irrelevant comparisons.
- Incongruent semantic representations that elicited concurring outcomes (i.e., all "different") did not produce interference.
- Outcome-conflicts seemed to produce delays by imposing serial processing of comparisons while non-conflicting outcomes allowed for parallel processing.

References
1. Stroop. *J. Exp. Psychol.* **1935**, *18*, 643.
2. Luo. *Psychol. Sci.* **1999**, *10*, 35.
3. Goldfarb & Henik. *Psychol. Sci.* **2006**, *17*, 96.
4. Appelbaum et al. *Front Psychol.* **2013**, 4, 799.
5. Cowan & Barron. Atten. Percept. Psycho.**1987**,41, 393.
6. Elliott et al. Eur. J. Cogn. Psychol. **2014**, 26, 15.
7. Navon & Miller. J. Exp. Psychol. Human. **1987**,13, 435.

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