Learning theories

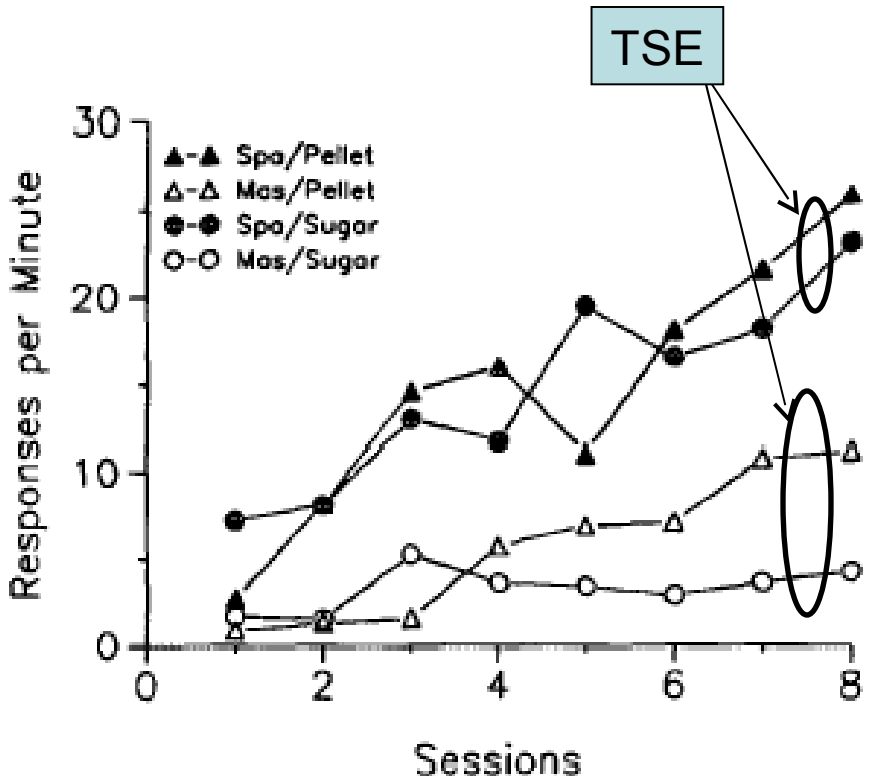
Acquisition failure

Example: Rescorla-Wagner (1972)

Retrieval failure

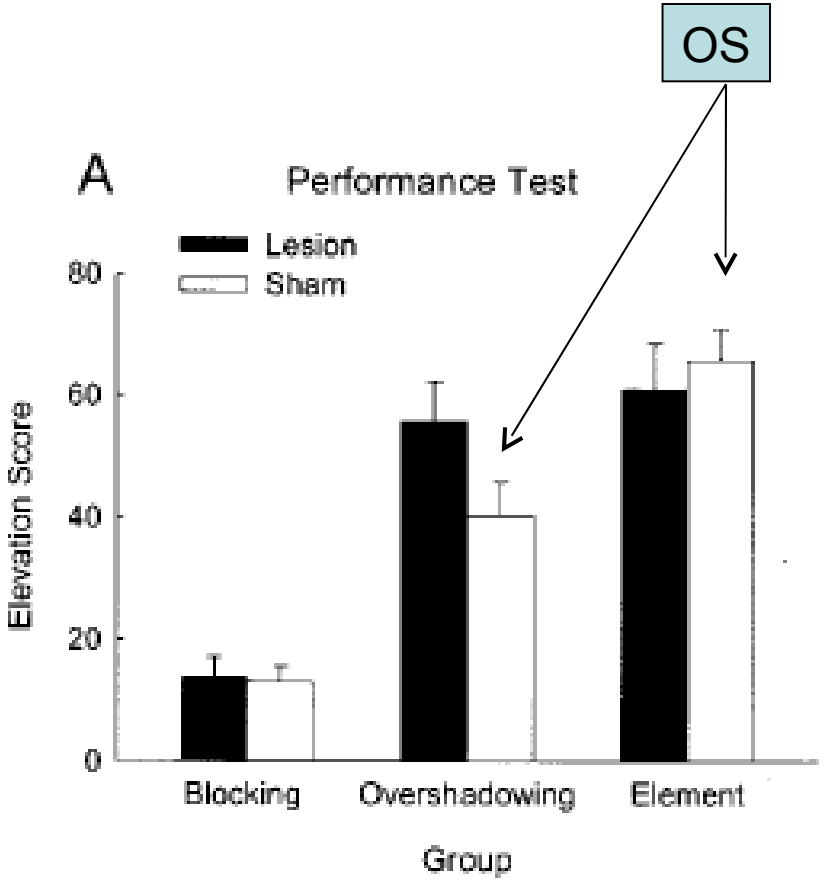
Example: Comparator hypothesis (1985)

Trial-spacing effect (TSE)



Papini & Brewer, 1994, Learn Motiv, 25, 201-15.

Overshadowing (OS)



Holland & Fox, 2003, Behav Neurosci, 117, 650-6.

Rescorla-Wagner (1972) model

- RW is designed to account for conditioning in situations involving compound stimuli.
- RW assumes that the presentation of even a single CS is a compound conditioning trial involving that CS and the context in which it is presented.
- If the CS is called "A," the context is called "X," and the presentation of the US is called "+," then a CS-US pairing is represented as an AX+ trial.
- The basic RW equation, $\Delta V = \alpha \beta (\lambda - V)$, is then computed for each stimulus present in a given trial.
- Thus, for an AX+ trial, we have:
  - $\Delta V_A = \alpha_A \beta (\lambda - V_{AX})$
  - $\Delta V_X = \alpha_X \beta (\lambda - V_{AX})$
  - $V_{AX} = V_A + V_X$
- The discrepancy is now a difference score between the asymptotic strength supported by the US in the training situation minus the sum of the associative strength of all the stimuli present in that trial.
- This is called the **shared associative strength rule**.

Examples of compound conditioning effects

Overshadowing (AB+ / B?): A target CS acquires less strength when conditioned with an accompanying CS than when conditioned alone.

Trial-spacing effect : Long ITIs lead to faster acquisition than short it is.

Some additional effects:

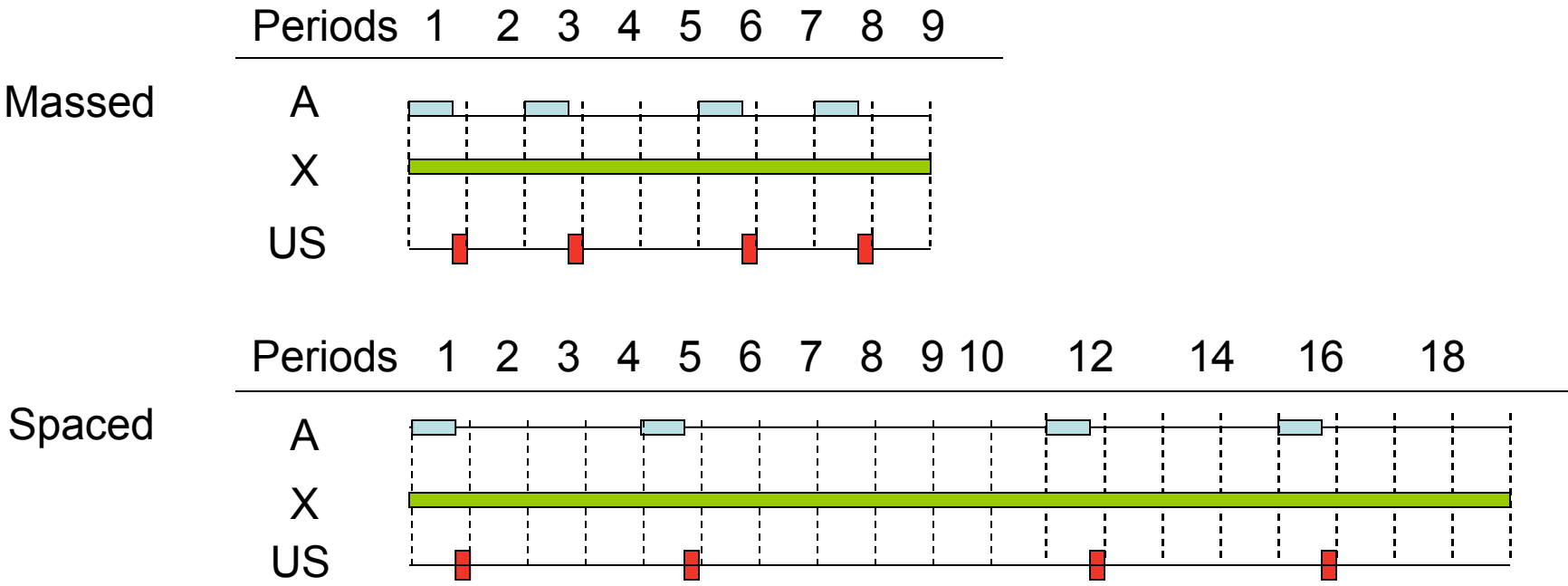
Blocking (A+ / AB+ / B?): Prior conditioning with one CS impairs subsequent conditioning to a second CS presented in compound with the first CS.

Overexpectation effect (A+,B+ / AB+ / B?): Compound CSs lose value when previously reinforced in isolation.

Conditioned inhibition training (A+,AB- / B?): A CS becomes inhibitory if nonreinforced in compound with an excitatory CS.

Superconditioning (A+,AC- / CB+ / B?): A CS acquires abnormally high strength if reinforced in compound with an inhibitory CS.

Simulating the TSE



How does RW explain the TSE?

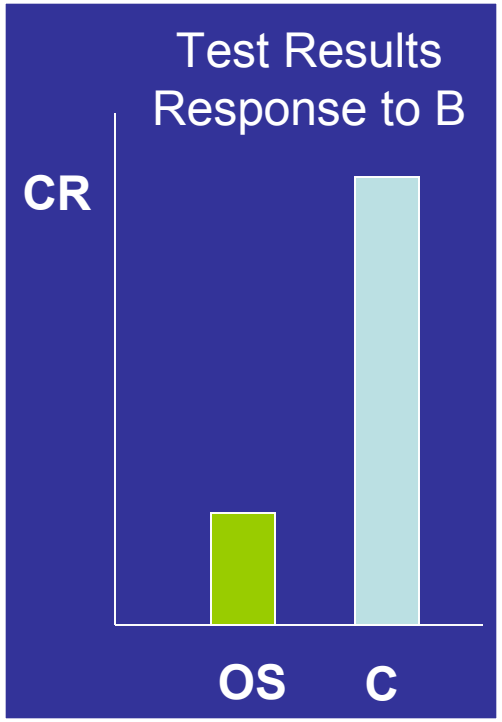
(3) X acquires strength in both groups.

(5) However, X extinguishes more in the spaced condition due to long ITIs.

(7) Therefore, A has less competition for strength in the spaced condition.

Overshadowing

Group	Training	Test
Overshadowing	AB+	B?
Control	B+	B?



How does RW explain overshadowing?

(3) Assume AB+ training reaches a near asymptotic value.

(5) Acquisition by A detracts from B's ability to gain strength in (Gr. Overshadowing).

(7) In contrast, B is free to gain relatively more strength (Gr. Control).

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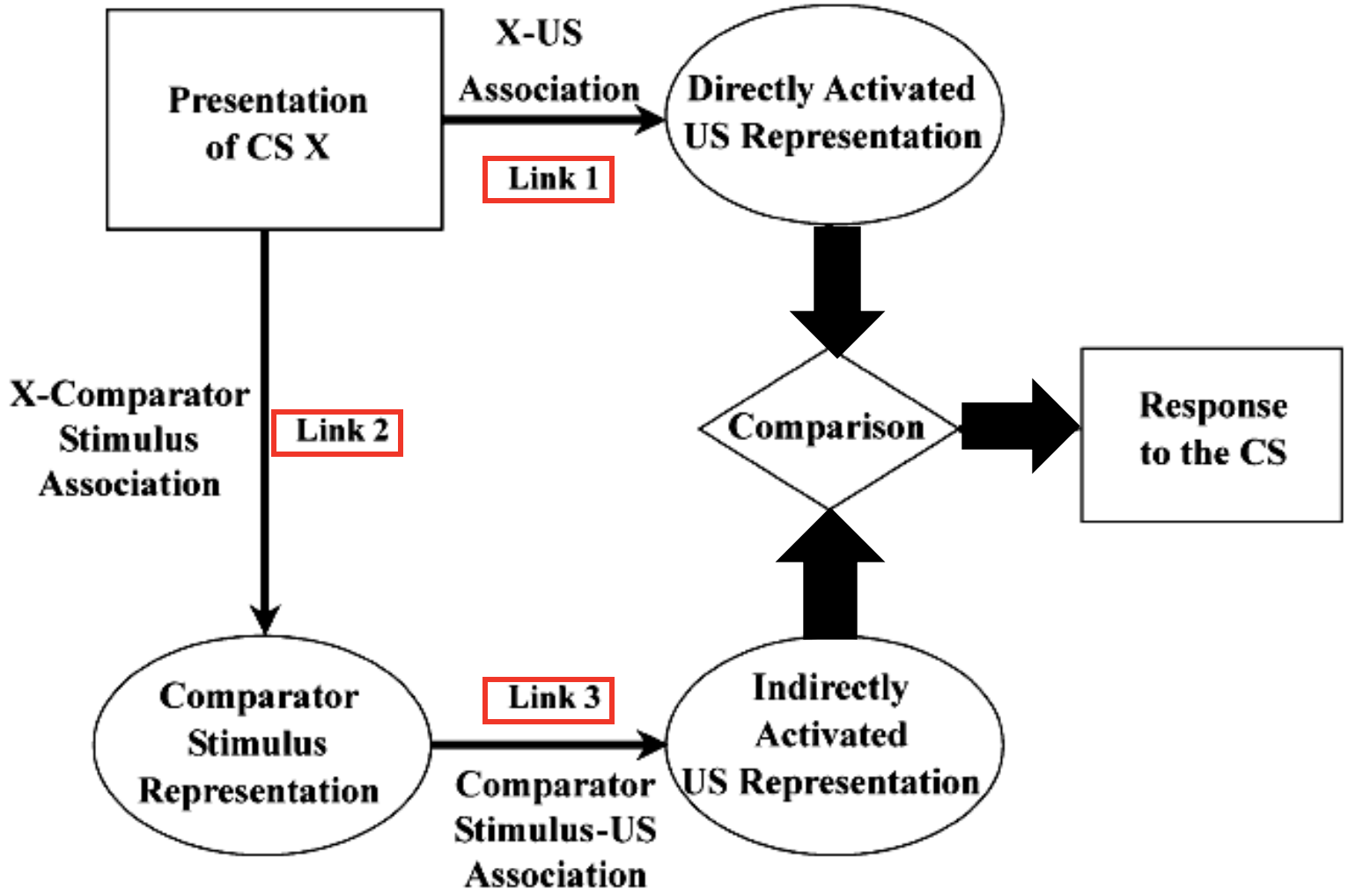
The comparator hypothesis



How does the comparator hypothesis explain the TSE?

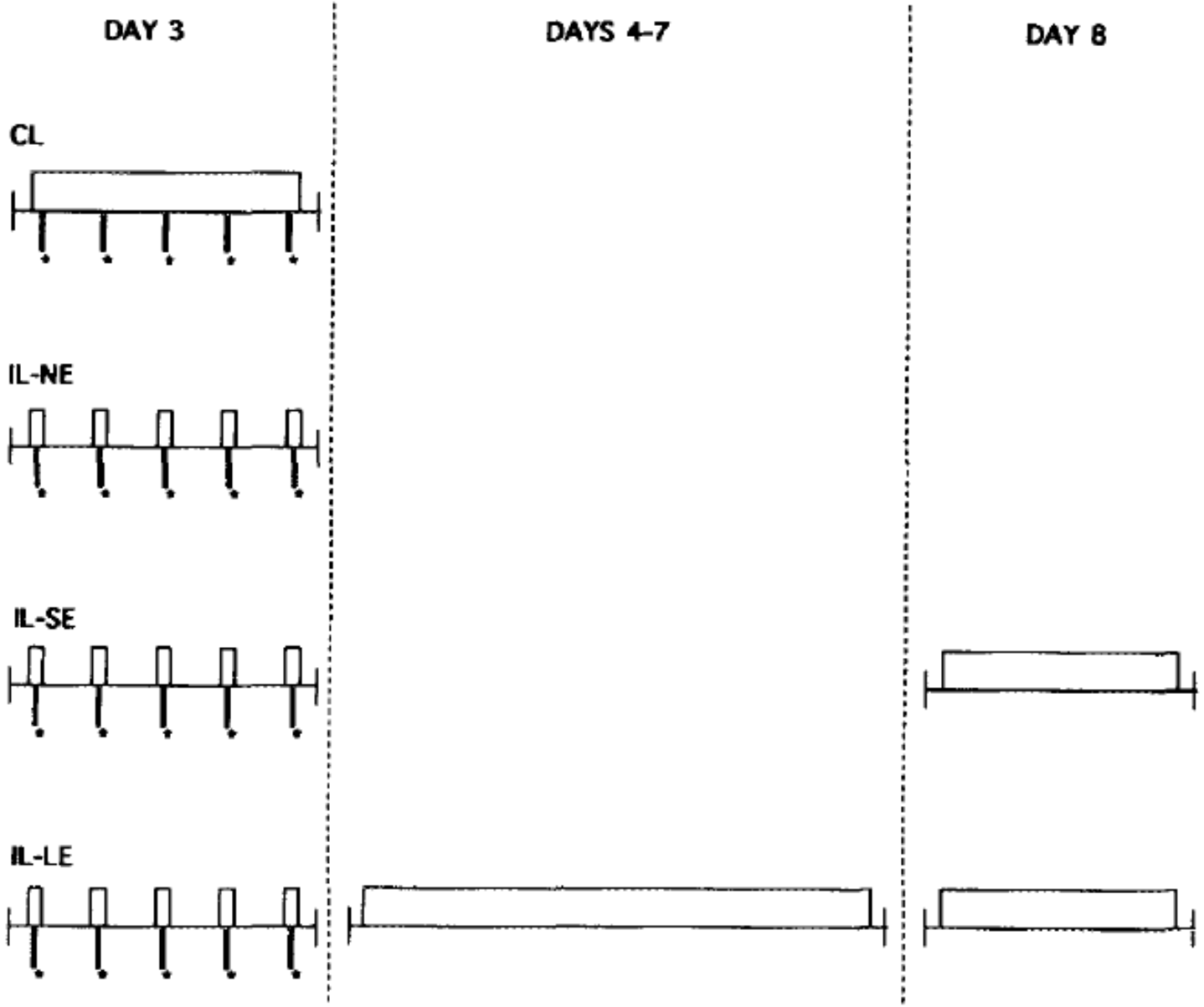
(3) Both A and X acquire strength in both groups.

(5) However, X extinguishes more in the spaced condition due to long ITIs.

(7) Therefore, A has a less favorable control of behavior in the massed condition than in the spaced condition, even though A is an equally good signal in both conditions.

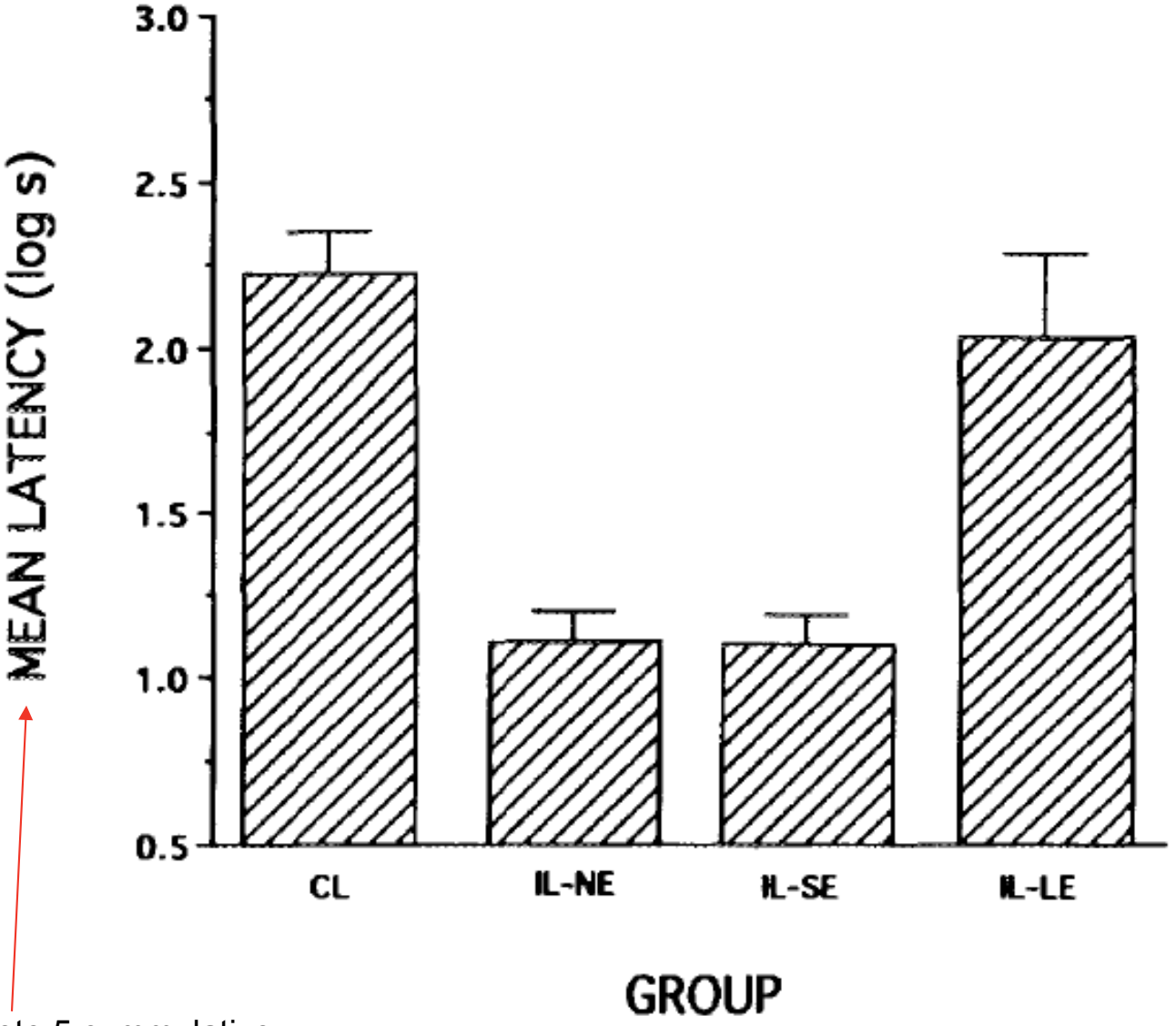
(9) Prediction: extinction of X after conditioning should uncover control of behavior by A (i.e., not an acquisition failure, but a performance failure).

Testing the comparator hypothesis



Yin et al., 1993, Learning & Motivation, 24, 219-241.

Testing the comparator hypothesis



Latency to complete 5 cummulative seconds of drinking in the presence of the target CS.

Yin et al., 1993, Learning & Motivation, 24, 219-241.

Explaining overshadowing

Group	Training	Test
Overshadowing	AB+	B?
Control	B+	B?

How does the comparator hypothesis explain overshadowing?

(3) B acquires strength in both groups.

(5) However, B is compared against a stronger comparator in Gr. Overshadowing (A) than in Gr. Control (X).

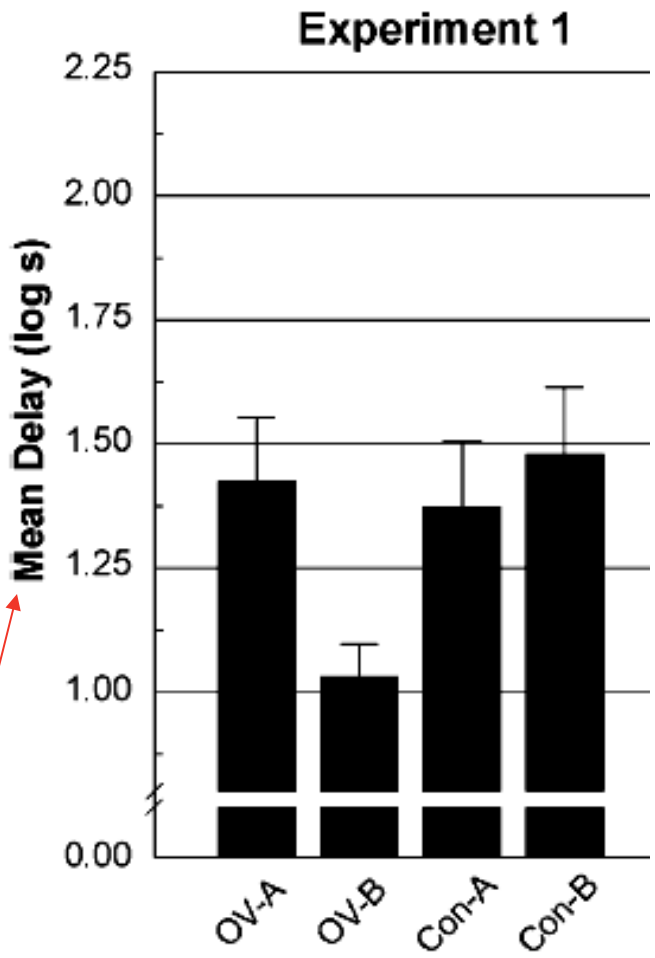
(7) Therefore, B has a less favorable control of behavior in the overshadowing condition than in the control condition, even though B is an equally good signal in both conditions.

(9) Prediction: extinction of A after conditioning should uncover control of behavior by B (i.e., not an acquisition failure, but a performance failure).

Overshadowing: Acquisition or retrieval failure?

Group	Phase 1	Phase 2	Test
OV-A	AX+, BY+	A-	X?
OV-B	AX+, BY+	B-	X?
Con-A	X+, BY+	A-	X?
Con-B	X+, BY+	B-	X?

A & B: Tone and Light, counterbalanced.
X & Y: Click and Noise, counterbalanced.
+: foot shock, 1-s long, 0.7 mA.



Latency to complete 5 cummulative seconds of drinking in the presence of the target CS.

Denniston et al., 2003, Learning & Motivation, 34, 1-31.