Signalled and unsignalled delayed reinforcement

Effects of *d*-amphetamine, chlordiazepoxide, α-flupenthixol, and behavioural manipulations

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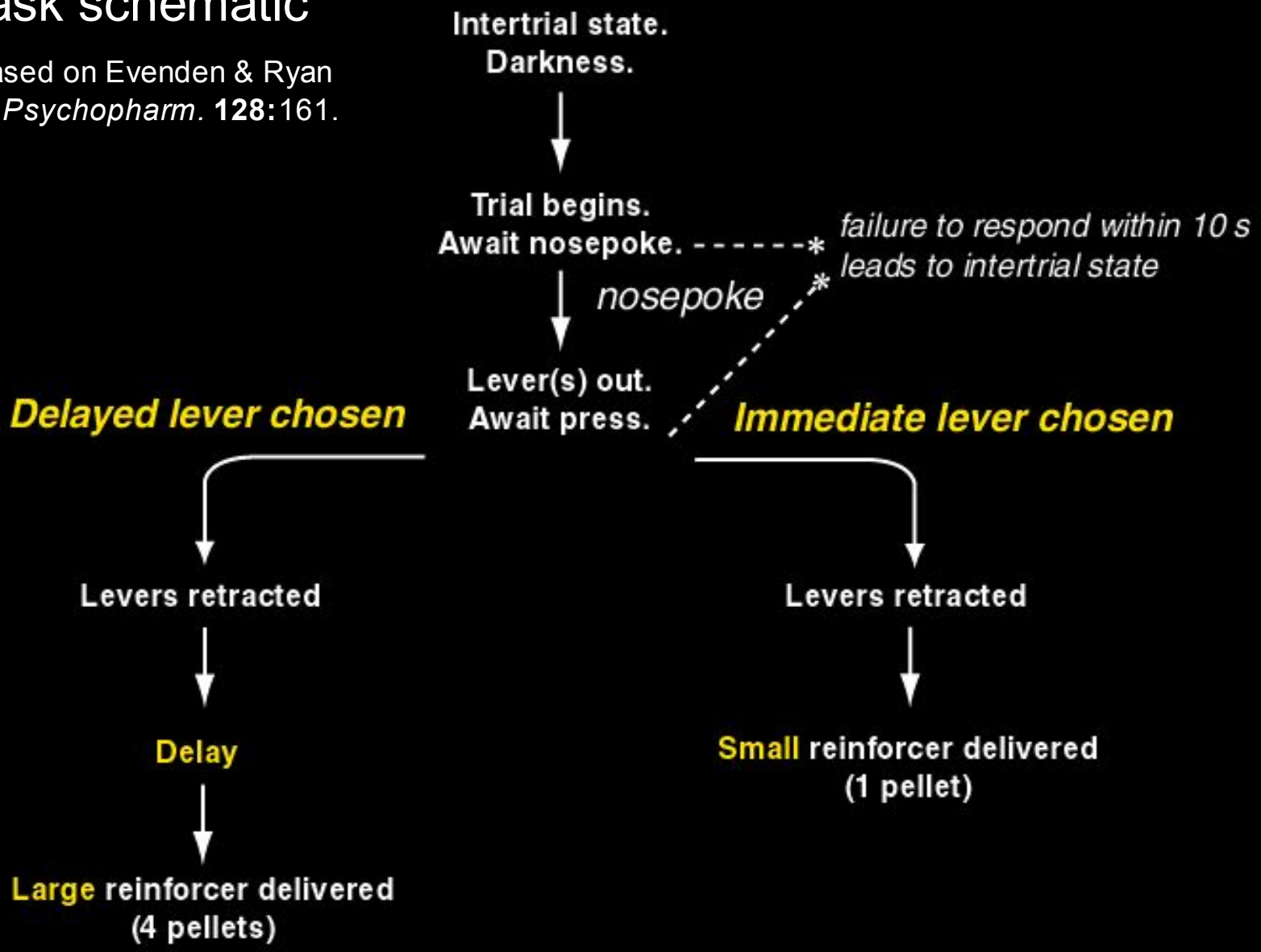
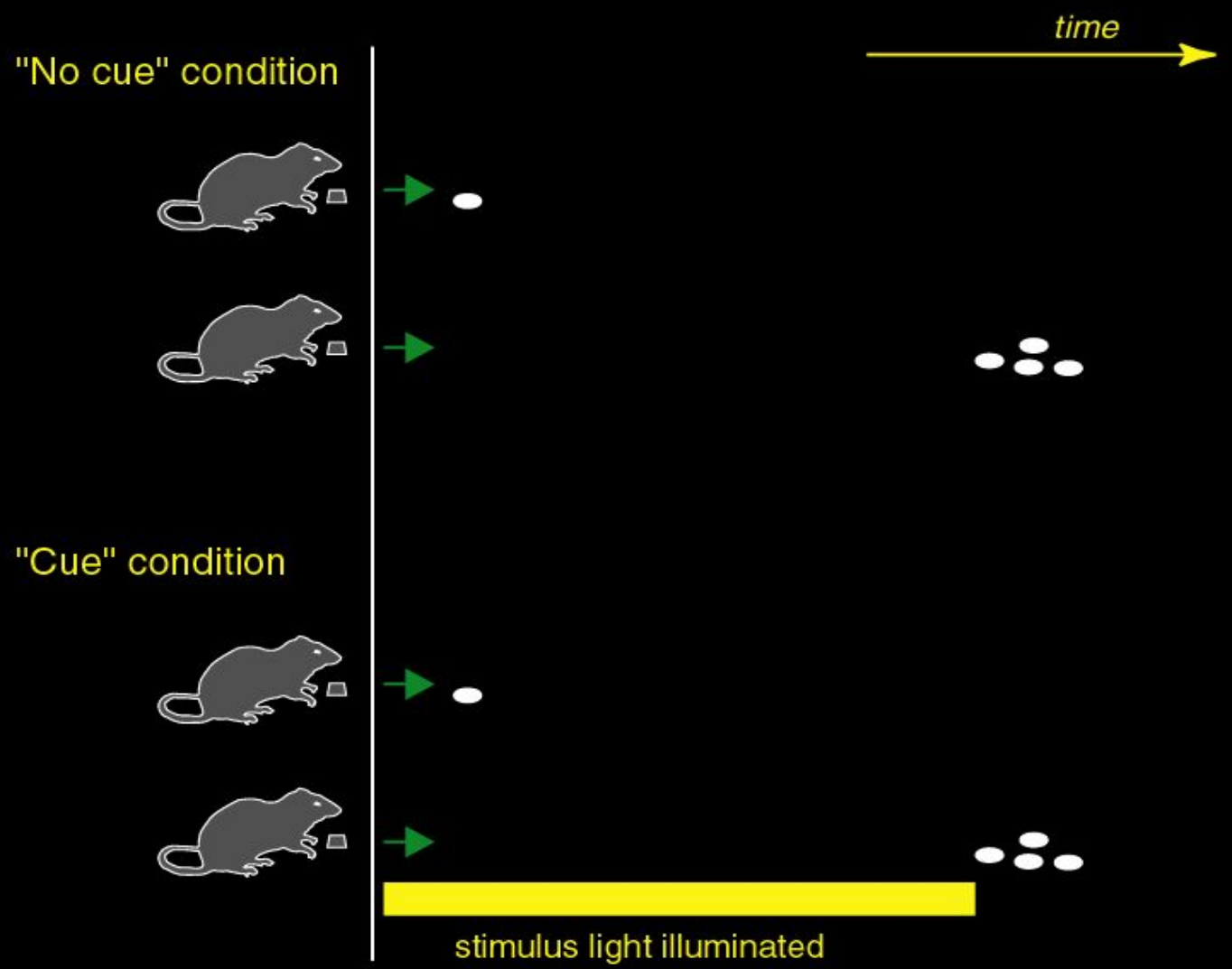
1. Task schematic

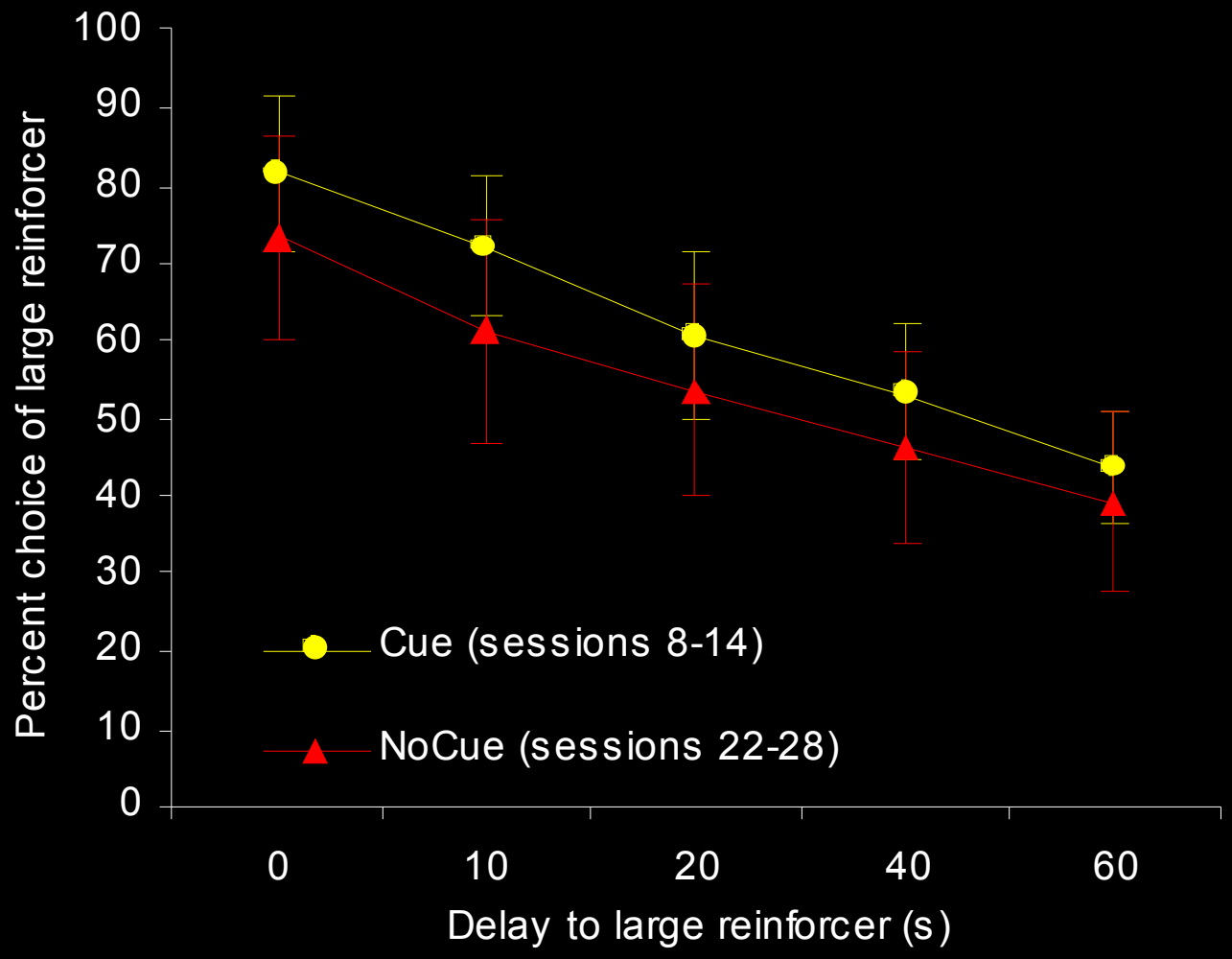
Task based on Evenden & Ryan (1996), *Psychopharm.* **128:**161.



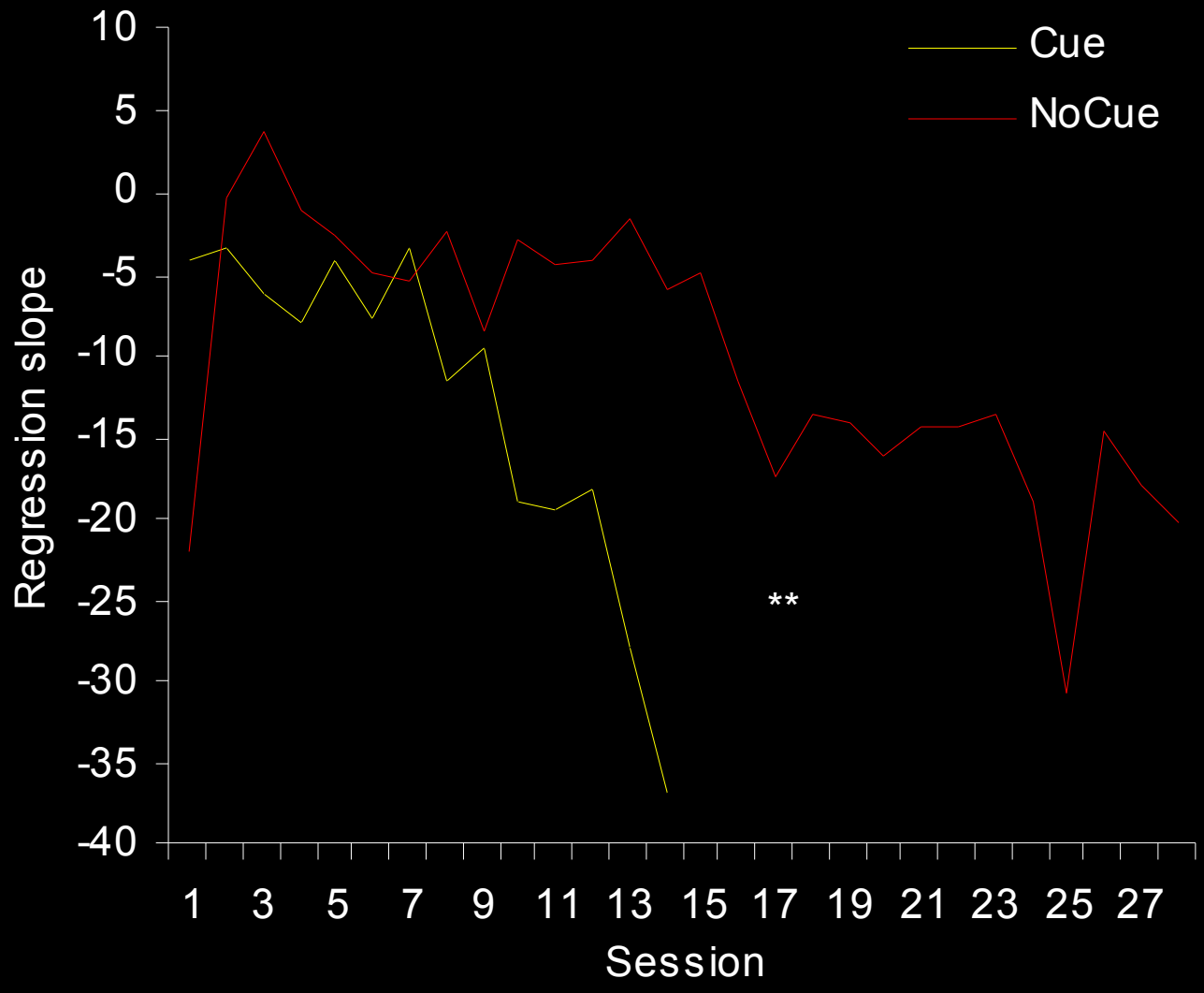
2. Signalled or unsignalled delayed reinforcement



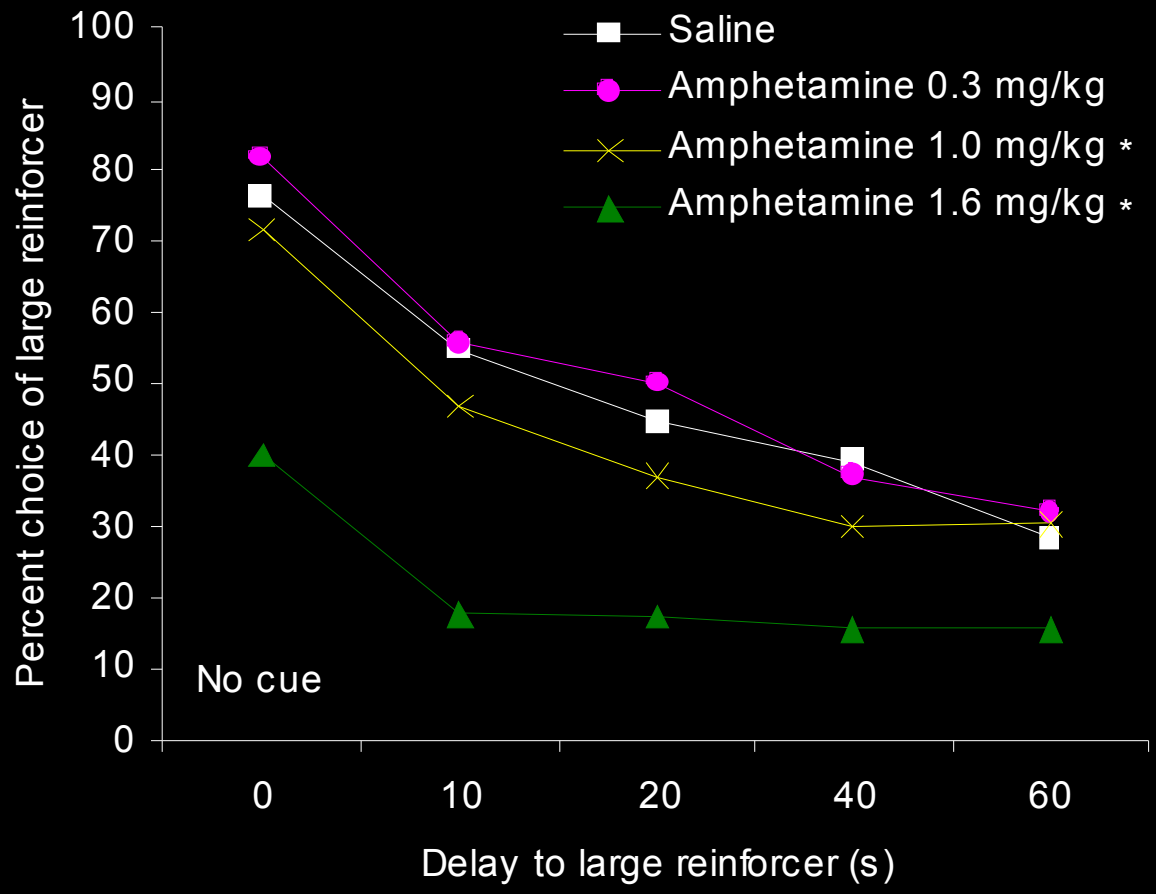
3. Cues do not affect baseline choice



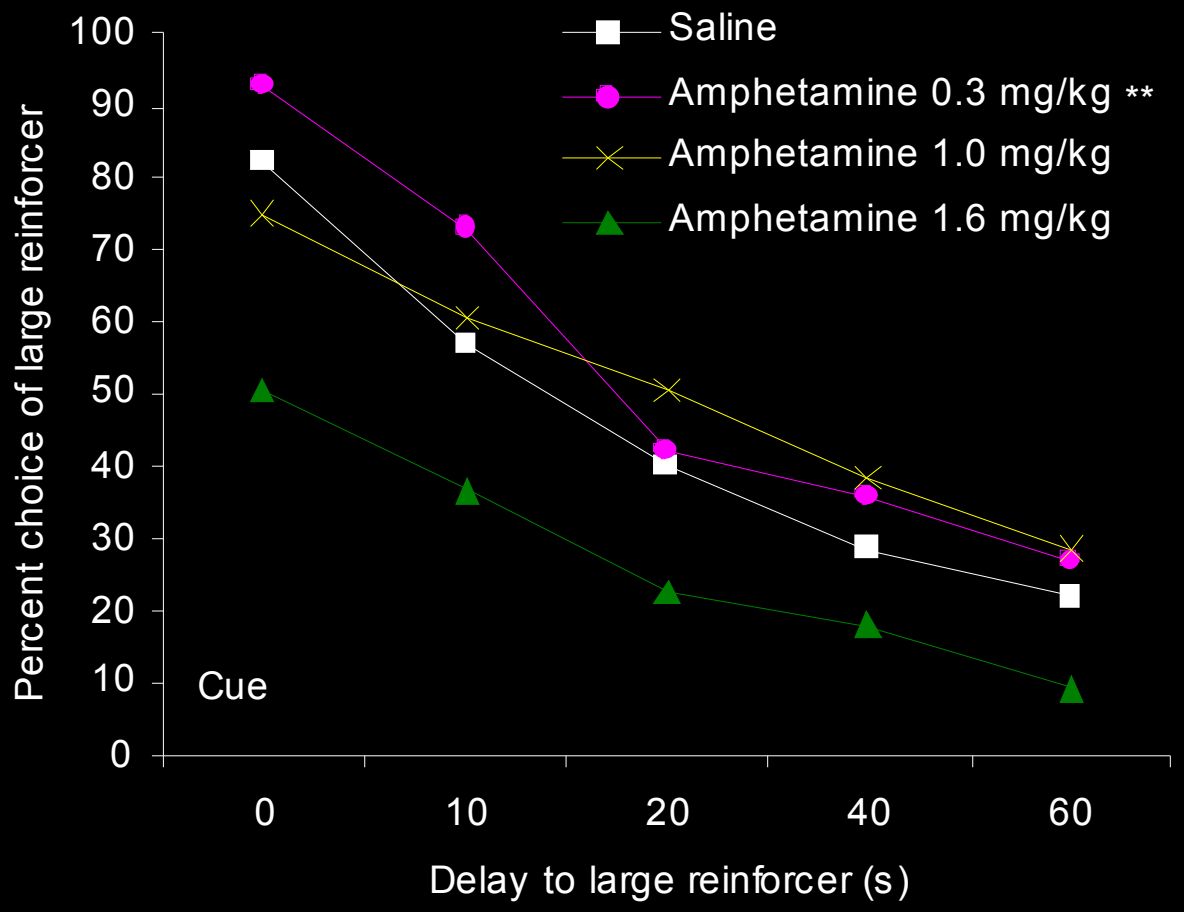
4. Cues speed acquisition of delay sensitivity



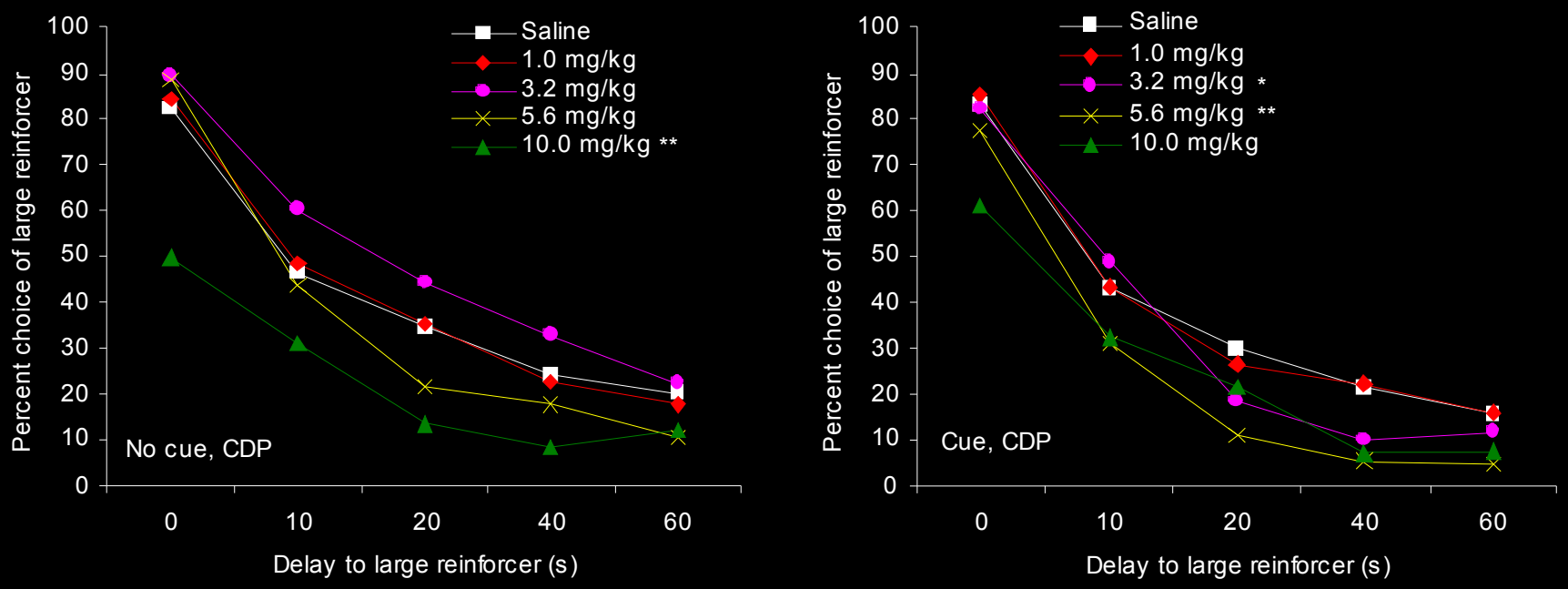
5. In the absence of cues, amphetamine *decreases* preference for the larger, delayed reward (increases “impulsivity”)



6. In the presence of the cue, amphetamine *increases* preference for the larger, delayed reward

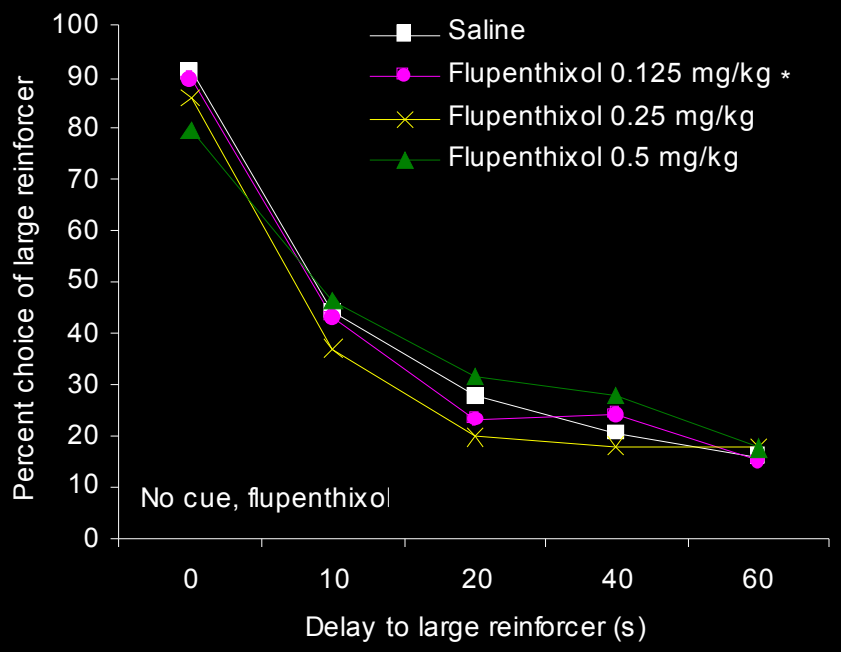


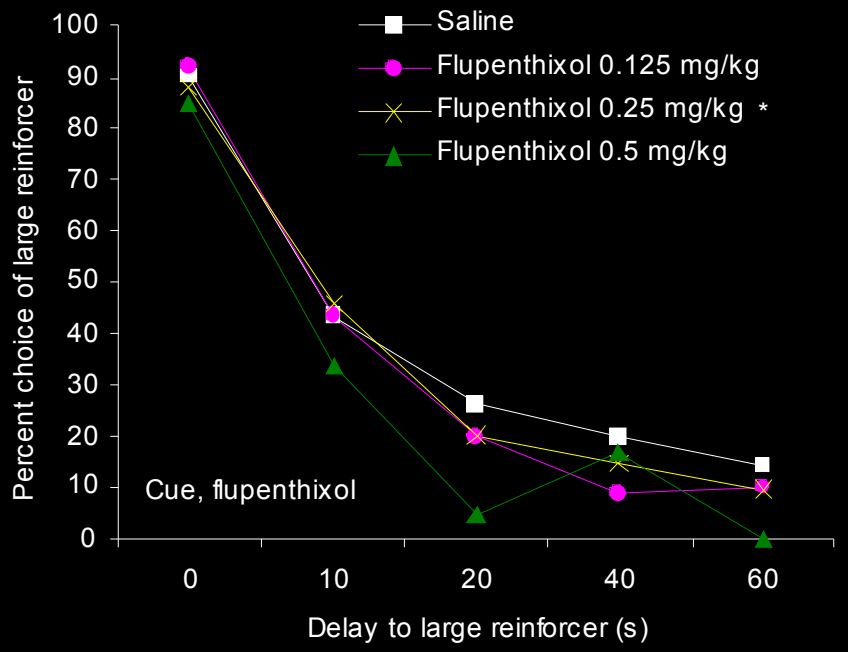
7. Chlordiazepoxide



The effects of chlordiazepoxide were not altered by the cue. Its most consistent effect was to *decrease* preference for the large, delayed reward.

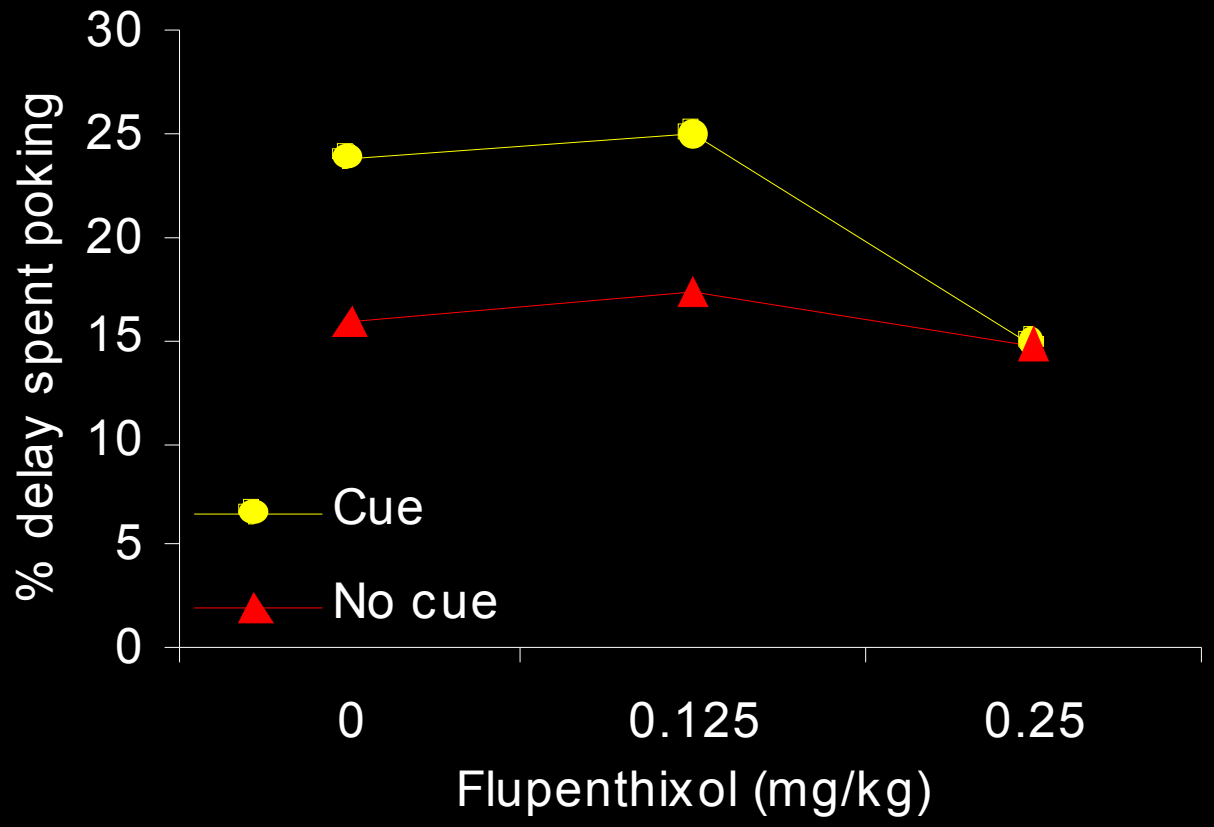
8. α-Flupenthixol





Flupenthixol *decreased* preference for the large, delayed reward, irrespective of the cue. Thus its effects in the Cue condition were opposite to those of amphetamine.

9. Flupenthixol abolishes the ability of the cue to sustain nosepoking during the delay



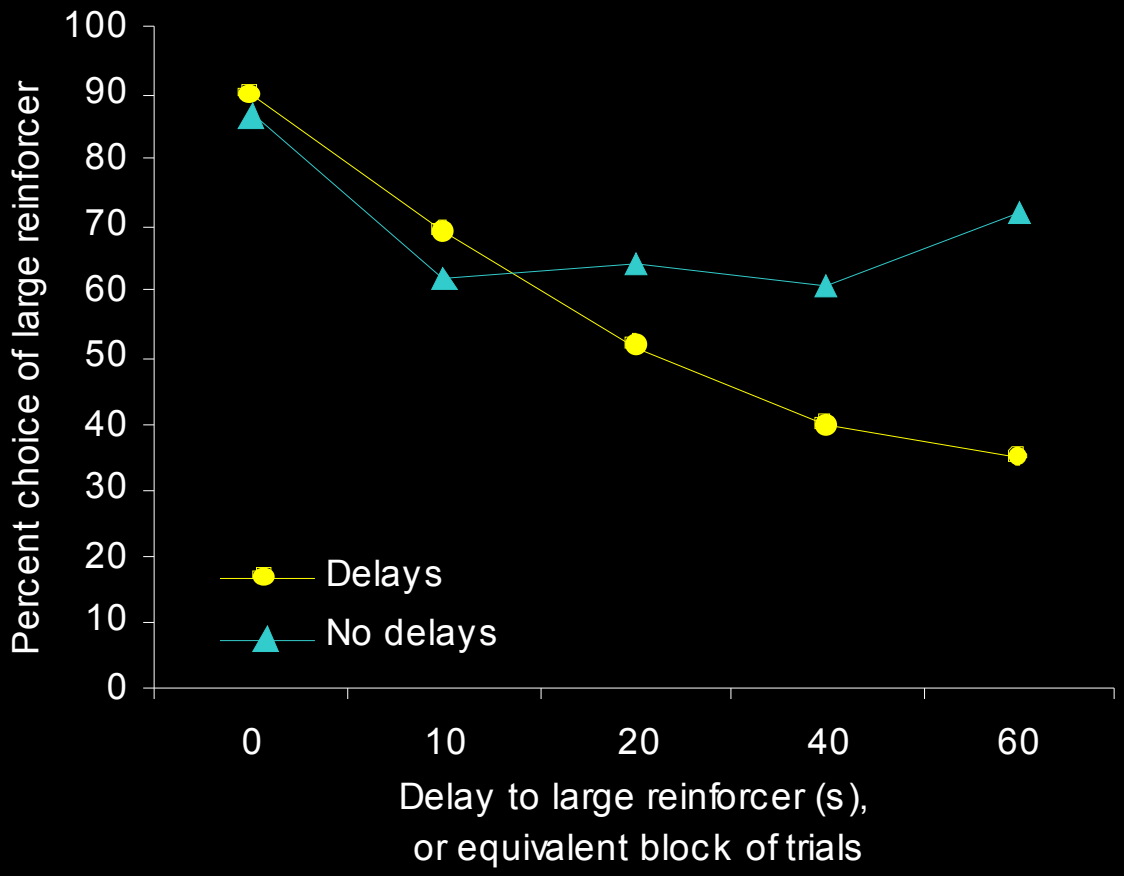
10. Conclusions

- Signalling a delay to reinforcement can have important effects on choice behaviour.
- Cues present during the delay have the potential to become conditioned reinforcers.
- Dopaminergic agonists are known to potentiate the effects of conditioned reinforcement.
- Amphetamine interacts with the presence of a cue in this task. There is a cue-dependent effect to *increase* preference for the larger, delayed reward, and a cue-independent effect to *decrease* that preference.
- Chlordiazepoxide does not interact with the cue, and generally *decreases* choice of the delayed reward.

∀ α-Flupenthixol *decreases* choice of the delayed reward. It also impairs the cue's control over approach behaviour.

- These results are consistent with the conditioned reinforcement hypothesis.

Supplement 1. Rats remain sensitive to delay: effect of setting all delays to zero



Supplement 2. Rats remain sensitive to delay: preference alters when the delay sequence is reversed