



DIFFERENTIAL REARING ENVIRONMENT EFFECTS ON IMPULSIVE ACTION AND IMPULSIVE CHOICE IN RATS

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INTRODUCTION

• Rearing in an enriched environment (EC) has been shown to reduce responding for self-administered drugs, visual novelty, and sucrose reinforcers (Bardo & Dwoskin, 2004; Wood, Siegel, & Rebec, 2006). This reduction in behavior, relative to rats reared in an impoverished environment (IC), has been interpreted in terms of a reduction in impulsivity (Wood et al., 2006) and a reduction in reward incentive (Cain, Green, & Bardo, 2006).

• The direction of the effects of enrichment on impulsivity is inconsistent (Hellemans, Nobrega, & Olmstead, 2005; Perry, Stairs, & Bardo, 2008; Wood et al., 2006). The goal of the present experiment was to further investigate the effects of different rearing environments on impulsive action and impulsive choice behavior.

METHODS

Animals

- 18 male Sprague-Dawley rats
- 30-day rearing period beginning at 23 days of age

Impoverished (n = 9)

- Minimal handling
- Individual housing with no novel objects



Enriched (n = 9)

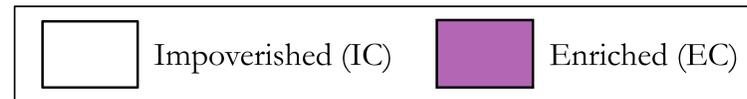
- Daily handling
- Group housing with daily toy changes



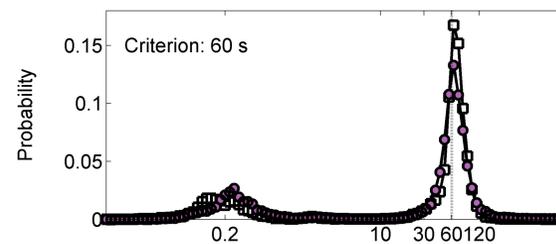
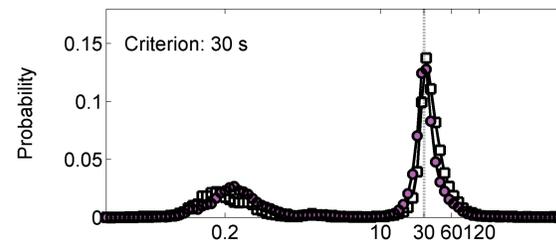
Procedure

- Impulsive action
 - Differential reinforcement of low rate (DRL)
- Impulsive choice:
 - Smaller-sooner (SS) vs. Larger-later (LL)
 - Free-choice trials, forced-choice trials, and peak trials
- All rats were tested in both tasks (task order was counterbalanced within groups)

Phase		
1	2	3
Delay discounting SS: 10 s, 1 pellet LL 30 s, 2 pellets	Reward sensitivity SS: 30 s, 1 pellet LL 30 s, 2 pellets	Reward sensitivity (LS) SS: 30 s, 1 pellet LL 30 s, 2 pellets (Lever swap)
DRL 30	DRL 60	DRL 60



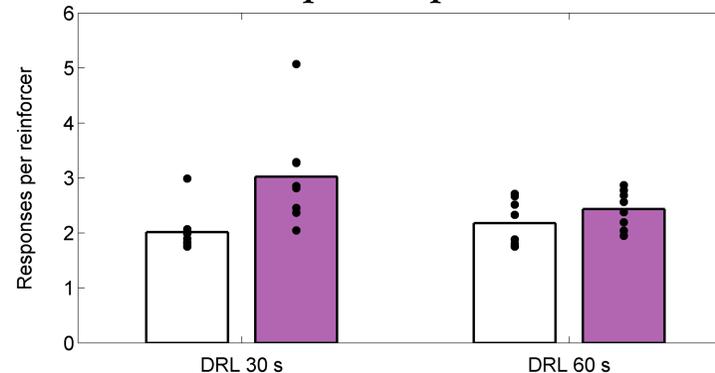
Differential reinforcement of low rate (DRL)



Interresponse time (log s)

- Impoverished group had a greater percentage of IRTs that exceeded criterion when the DRL criterion was 30 s (considering 10-200-s IRTs).

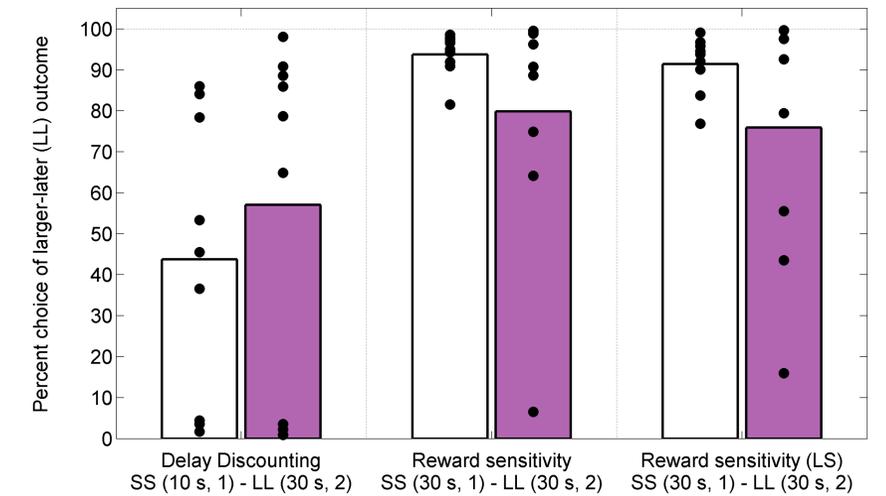
DRL: Responses per reinforcer



- Enrichment produced deficits in responding on the DRL 30-s schedule but not on the DRL 60-s schedule.

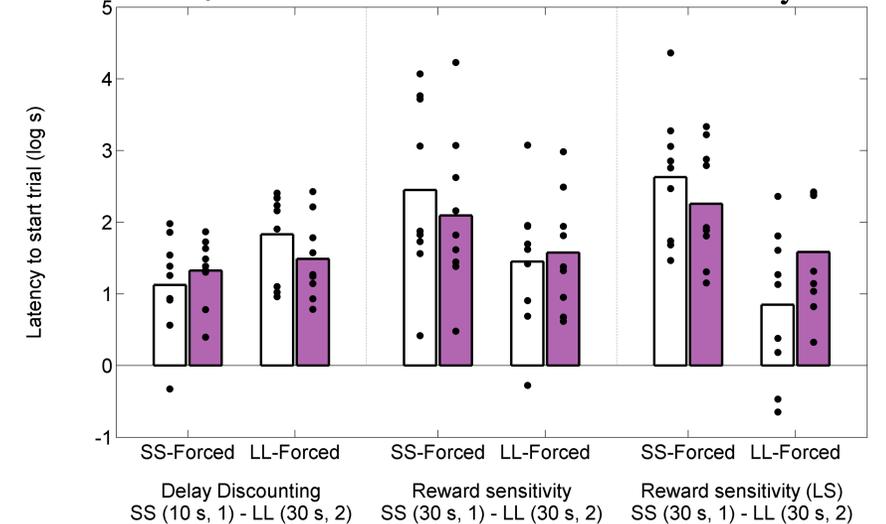
RESULTS

SS/LL Choice



- Percent LL choice significantly increased between Phases 1 and 2. There was a trend for the EC rats to choose the LL less often in Phases 2 and 3.

SS/LL Choice: Forced-choice latency



- In the final reward sensitivity phase, the EC rats showed faster latencies to choose the SS reward, but slower latencies to choose the LL reward on forced choice trials.

DISCUSSION

- The EC rats were impaired in their DRL efficiency on the DRL 30 task, suggesting an increase in impulsive action. This stands in contrast with previous results (Ough, Beatty, & Khalili, 1972).
- In the impulsive choice task, the pattern of behavior in the EC rats was consistent with reduced discrimination between the small and large reward in the reward sensitivity phase.
- Enrichment has been shown to reduce responding for various reinforcers (Bardo & Dwoskin, 2004). The current results could be interpreted as a reduced incentive to earn food rewards in the EC rearing condition compared to the IC rearing environment (see Cain et al., 2006). This could result in poorer DRL performance and weaker reward discrimination.