

# An Increase in Post-Reinforcer ‘Preference Pulses’ Underlies an MDMA-Induced Increase in Reinforcer Sensitivity Following Acute but Not Chronic Exposure

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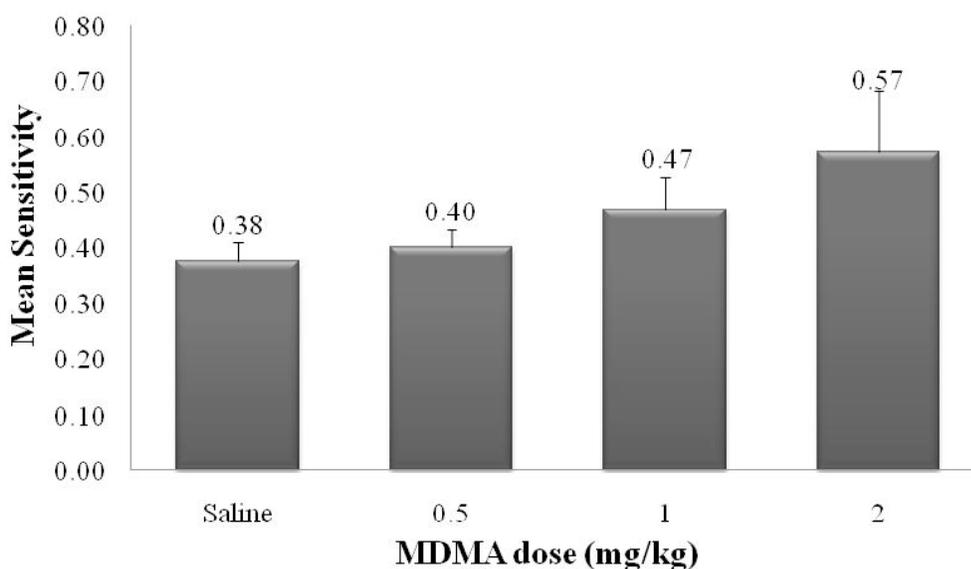
**Keywords:** MDMA, reinforcer sensitivity, concurrent schedules, preference pulses.

## INTRODUCTION

Both acute and chronic exposure to 3, 4-methylenedioxy-methamphetamine (MDMA) is associated with impairments in a range of conditional discrimination tasks that reflect memory function, decision making and self-control [1-3]. However, the mechanism by which MDMA decreases performance in these tasks is not clear. One interpretation of such findings has been that overall stimulus control is impaired (i.e., rats have trouble discriminating between response options and/or which reinforcers were associated with which stimulus-response option). This might underlie the observed overall drop in discrimination across all delays in DMTS tasks. Should this be the case then it would be expected that rats would also display a reduced molar sensitivity to overall reinforcer ratios arranged across concurrently available response alternatives.

Another interpretation is that poorer discrimination arises because there is a localized perseverative tendency in responding (e.g., after choosing LEFT on Trial ‘n-1’ there is a greater tendency to respond LEFT again on Trial ‘n’). If this was the case then a more molecular level analysis of responding across concurrent response alternatives might indicate that previous trial reinforcement has a carry-over effect to influence choice on subsequent trials (possibly then driving the ‘proactive interference’ effect seen previously).

The present experiments looked at the effects of ongoing chronic MDMA exposure and acute MDMA exposure on sensitivity to reinforcement at both a molar and molecular level using Davison & Baum’s (2000) concurrent choice procedure [4].



**Fig. (1).** Mean sensitivity for rats in the acute MDMA group as a function of dose. Sensitivity was calculated using the Generalised Matching Law [5].

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## METHODS

The relative rates of reinforcement for pressing two levers in an operant chamber were varied across five

conditions (15:1, 5:1, 1:1, 1:5, 1:15) within each session. In one study, following extensive pre-drug training, rats were exposed to a chronic MDMA exposure regime administered daily post-session (5.0mg/kg administered immediately after training for two blocks of testing lasting 2 weeks each). In a second study the same behavioral paradigm was used but we examined the impact of acute MDMA (0.5, 1.0 & 2.0mg/kg administered immediately prior to training with several days washout between testing).

## RESULTS

Results from the chronic study indicated that although ongoing MDMA exposure reduced overall response rates, there were no systematic changes in reinforcer sensitivity. In contrast, in the second acute study, sensitivity to reinforcement INCREASED when rats were acutely exposed to MDMA (see Fig. 1). This overall increase in reinforcer sensitivity was reflected at a more molecular level of behavior in that rats showed an increase in 'preference pulses' (responses to previously-responded to operanda immediately after reinforcer delivery). That is, the natural pattern to emit another response to the response option that just delivered a reinforcer was enhanced with increasing doses of MDMA, thus rats tended to make more responses to the lever currently associated with the richest reinforcement schedule.

## DISCUSSION & CONCLUSION

These results suggest that changes in reinforcer sensitivity across concurrently available response options may not underlie the performance impairments found in other behavioural tasks with long-term use of MDMA, but that acutely MDMA does impact on reinforcer sensitivity; a finding that may help in our understanding of the impact of acute MDMA exposure on a range of behavioural and cognitive tasks.

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Received: November 4, 2010

Revised: November 13, 2010

Accepted: November 13, 2010

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