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The Effects of Prenatal Methadone Exposure on Learning and Memory in Sprague Dawley Offspring

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Background

- The opioid epidemic has escalated in recent years due to the increased prescription of opiate drugs for chronic pain treatment
- A significant component of this epidemic that is understudied is opiate use in pregnant women
- The fetal brain and placenta are permeable to opiates and thus usage during pregnancy may have effects on offspring¹
- Previous studies have reported that children prenatally exposed to opiates exhibit deficits in memory and learning, however neither the onset nor the duration of these effects are known^{2,3}
- As methadone is an opiate that is prescribed to pregnant women to treat narcotic addiction, we chose this drug for our experimentation⁴

Objective: Assess the effects of Prenatal Methadone Exposure (PME) on learning and memory across ontogeny

Methods

Prenatal Methadone Exposure:

- Pregnant female Sprague Dawley rats were injected with methadone subcutaneously twice daily from gestational days 3 through 20
- The dosage administered on day 3 was 5mg/kg and 7mg/kg on days 4-20

Novel Object Recognition (NOR)

1. Habituation: animals were placed in the center of a plexiglass arena and allowed to explore for 10 min
 2. Familiarization: animals were placed in the same plexiglass arena, exposed to two identical objects and allowed to explore them for 10 min
 3. NOR: one of the objects from the familiarization trial was replaced with a new object and the animal was allowed to explore both objects for 5 minutes
- This behavioral test was performed in offspring
 - at postnatal (P)27 (juvenile), P45 (adolescence) and P70 (adulthood)

Figure 1. Prenatal and Postnatal Measures

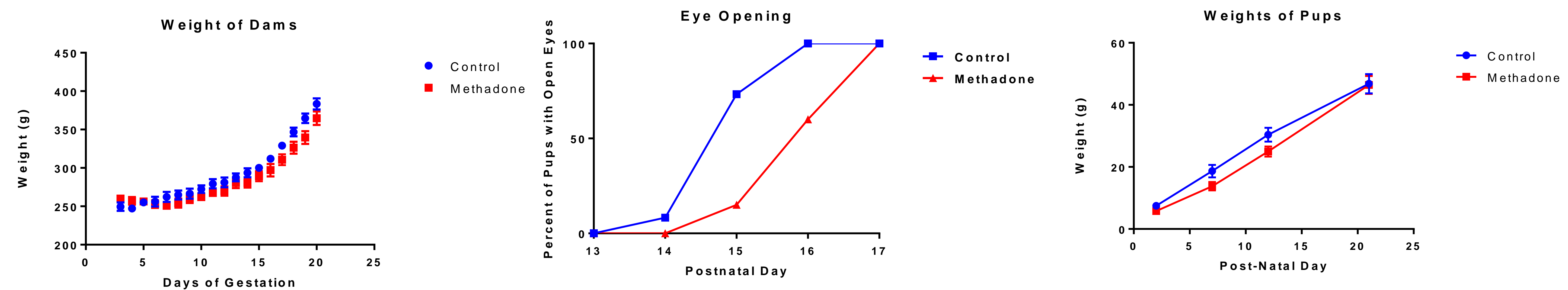


Figure 2. Familiarization

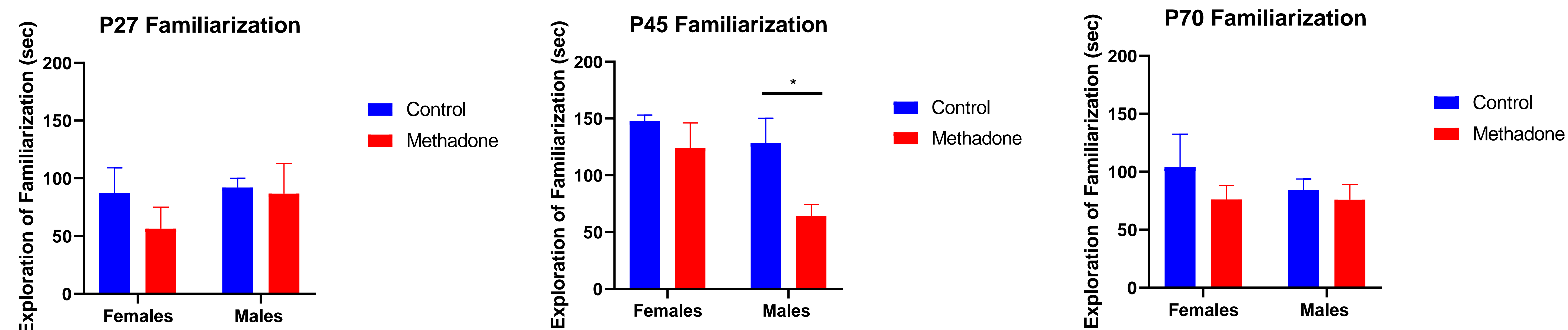
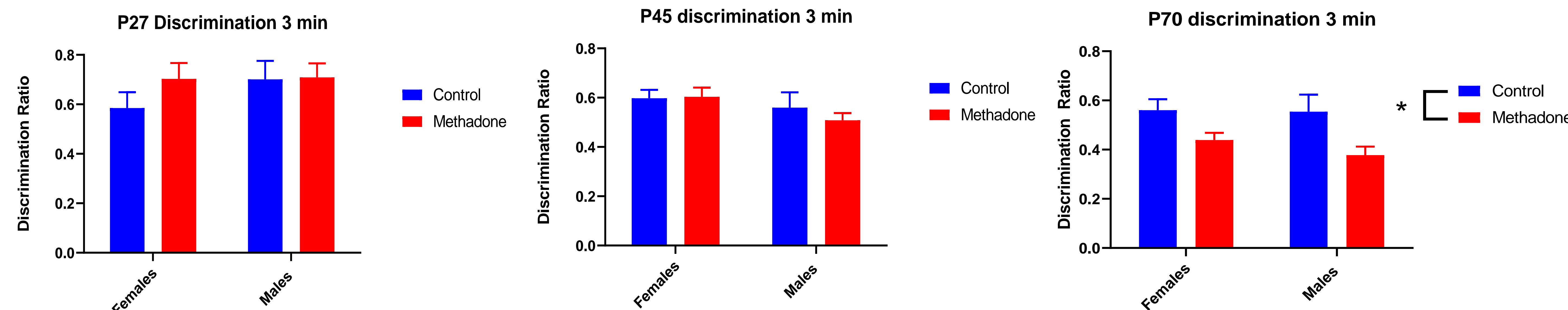


Figure 3. Discrimination Ratios



Conclusions

- At P45, it was found that the methadone exposed males exhibited decreased exploratory behavior towards the objects during their familiarization period.
- At P70 methadone exposed animals displayed preference to the known object relative to the novel object however this effect was not observed at P27 or P45
- These data suggest that prenatal exposure to methadone may have long-lasting effects on learning and memory

References and Acknowledgements

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