

Effects of Methylphenidate on Risk Taking and Sociability in Adult Zebrafish (*Danio Rerio*)



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Introduction

Non-prescription use of methylphenidate (Ritalin®), a drug that treats Attention Deficit Hyperactive Disorder (ADHD), is increasing. Methylphenidate is becoming more widely used, especially among college students, because it increases concentration and promotes wakefulness. However, the acute effects on risk-taking and sociability in non-ADHD populations are not well characterized. Therefore, we studied the effects of Methylphenidate on risk taking and sociability in Zebrafish.



Zebrafish (*Danio Rerio*)

Advantages of the Model System

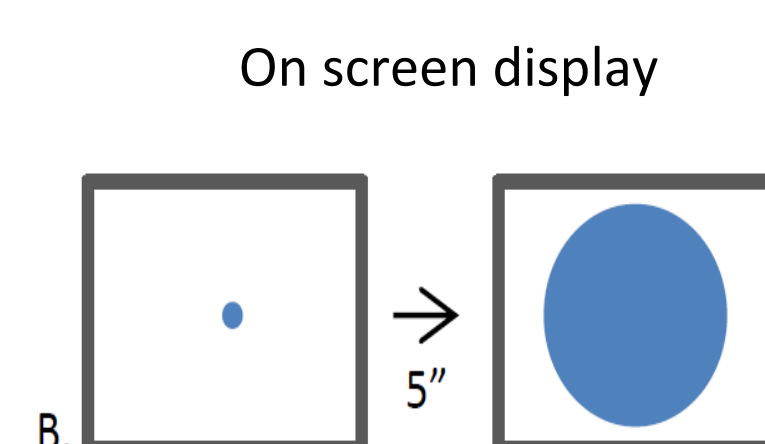
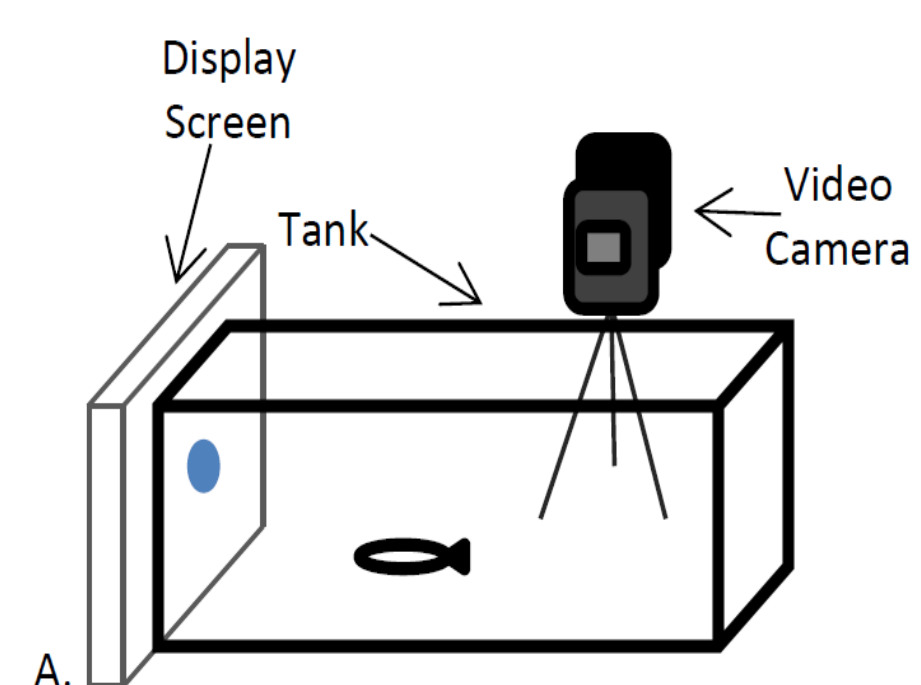
- Zebrafish are inherently social and find shoaling rewarding
- Zebrafish are evolutionarily programmed to avoid predators

Methods

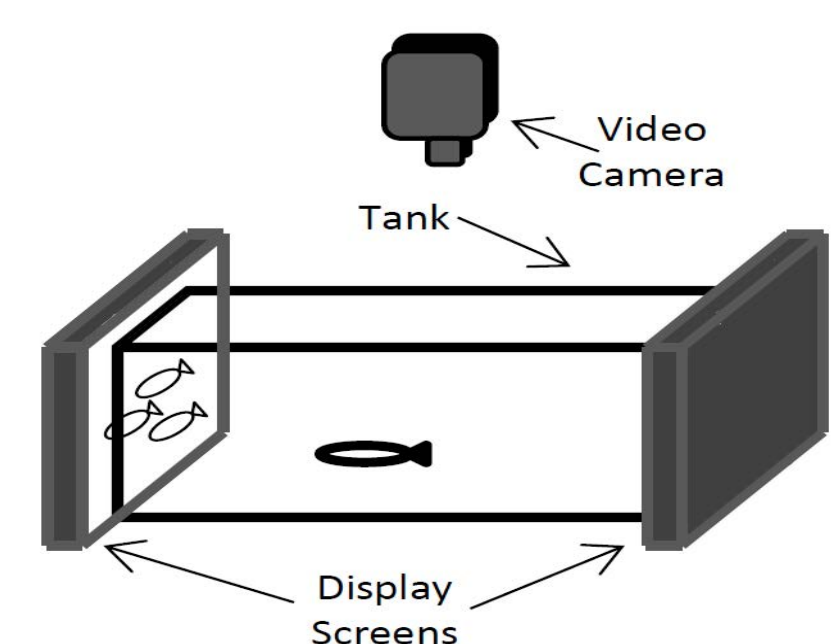
Animals: Mature AB Strain Zebrafish (*Danio Rerio*) were kept at approximately 28°C on a 10h dark and 14h light cycle. They were housed in 3-liter tanks in an Aquatic Habitats flow through a housing system and fed twice a day.

Dosing: Each group had a 30 minute immersion in low, medium, or high dose of methylphenidate (0-mg/L, 2-mg/L, 4-mg/L, 8-mg/L).

Predator Avoidance Test:



Social Shoaling Test:



Control Image

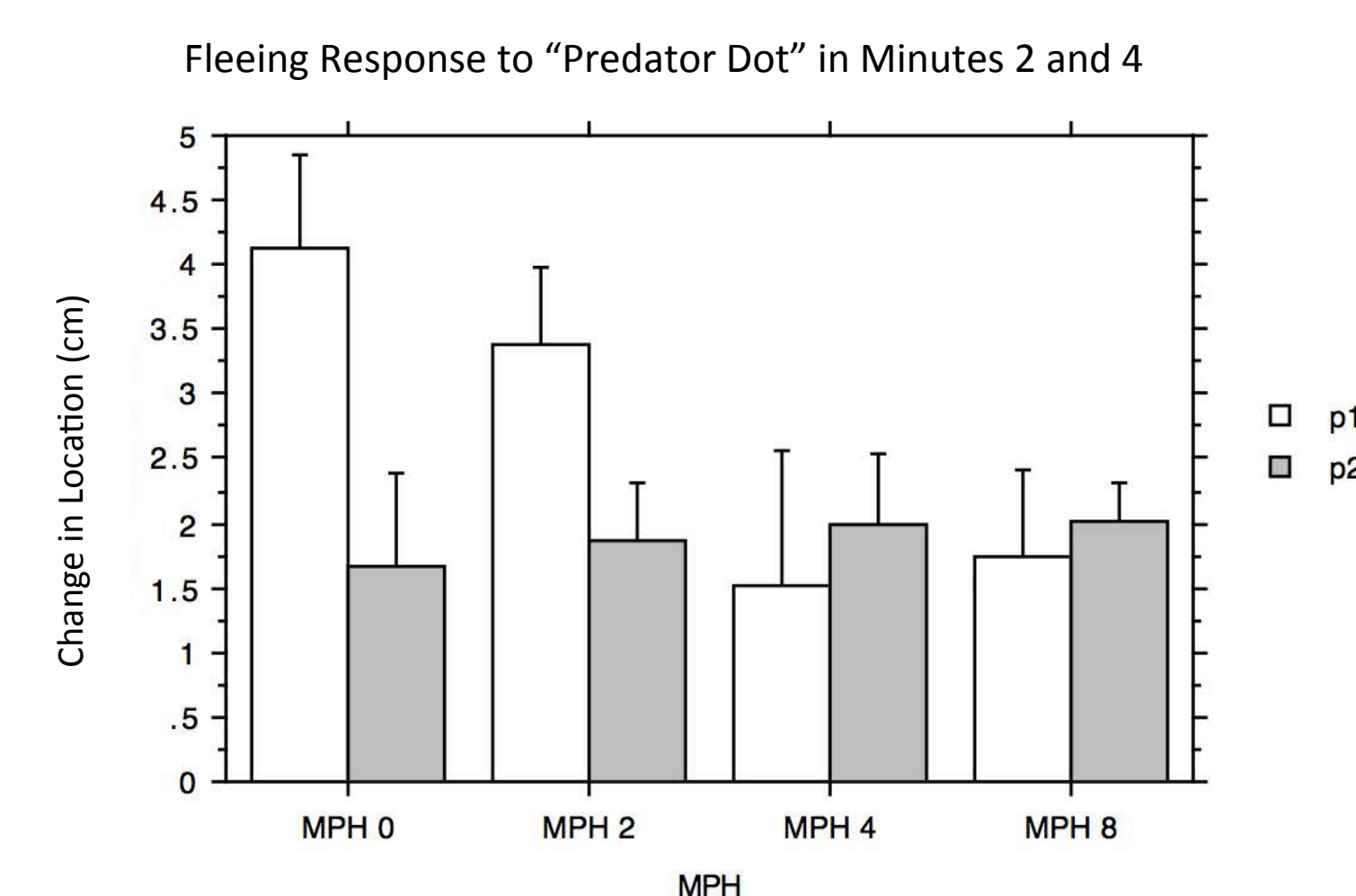


Shoaling Fish Image

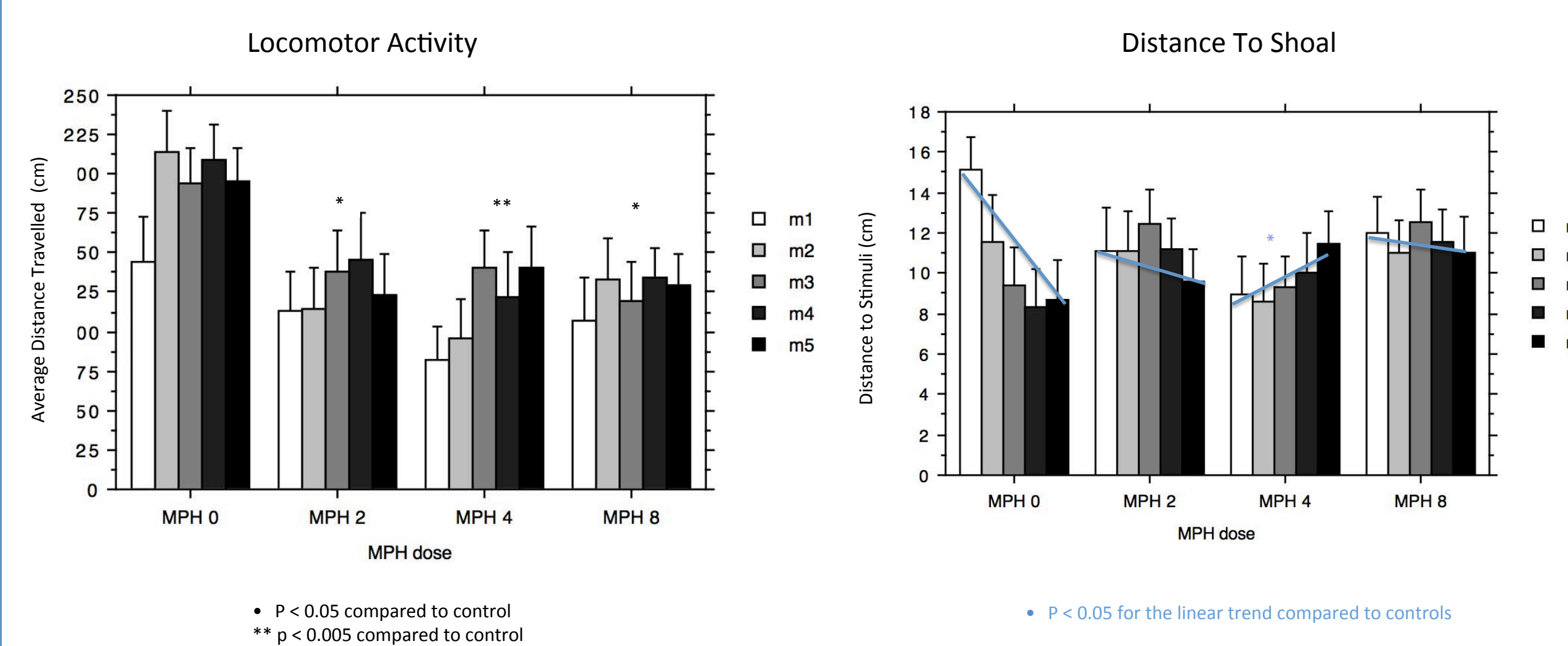


Results

Predator Avoidance Test:



Social Shoaling Test:



Conclusions

Predator Avoidance Test:

- Controls show fleeing during their 1st exposure to the predator and habituate during the 2nd encounter
- The fish with higher doses of Methylphenidate do not react during their 1st exposure to the predator
- The fish on Methylphenidate would likely be eaten in the wild since they do not respond to predators
- If adults on methylphenidate have higher levels of risk taking, they could also experience negative health or social consequences

Social Shoaling Test:

- Control fish increase their locomotor activity in response to the shoaling stimulus
- Fish with Methylphenidate exposure have significantly decreased locomotor activity compared to controls
- The distance from the screen does not decrease when the shoal is playing, which means the fish are less affected by social rewards.

Overall, diminished response to environmental cues

Future Directions

- My next step is to study developmental affects of chronic exposure to Methylphenidate using time points that correspond to childhood and adolescence in human patients.
- Zebrafish have cellular reporter systems, continuous visual access and molecular interventions that we want to use to determine critical mechanisms underlying this behavior.
- A survey that correlates personality traits including risk taking and sociability, moral decision making, and prescription & non-prescription use of Methylphenidate is currently in the data collection phase.
- I plan to look at the ethical implications of this work. Specifically, I am going to study medical decision making in light of personality changing drugs.

Acknowledgements

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