

Differentiating the Effects of Androgenic and Anti-androgenic Oral Contraceptives on Rodent Behavior

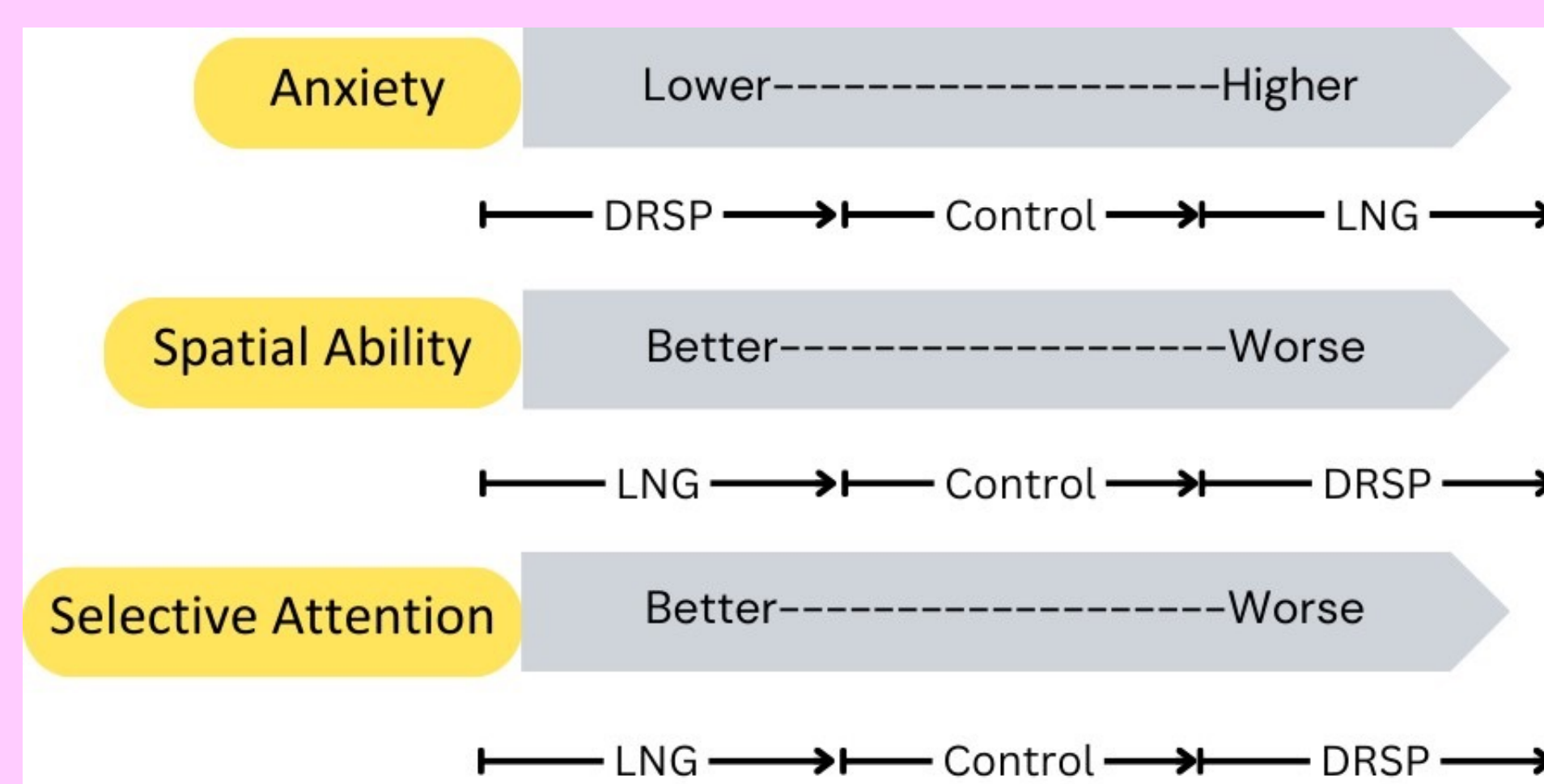
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Background

- 25.9 % of contraceptive users take the pill¹
- The pill can be categorized as androgenic or anti-androgenic, with relative masculinizing and feminizing effects on cognition and behavior
- BC is known for side effects on mood, and androgenicity may be linked to increased anxiety²
- Better spatial learning and memory performance seen among males, possible role of androgens³
- Improved attentional abilities associated with androgens and testosterone⁴

Hypothesis

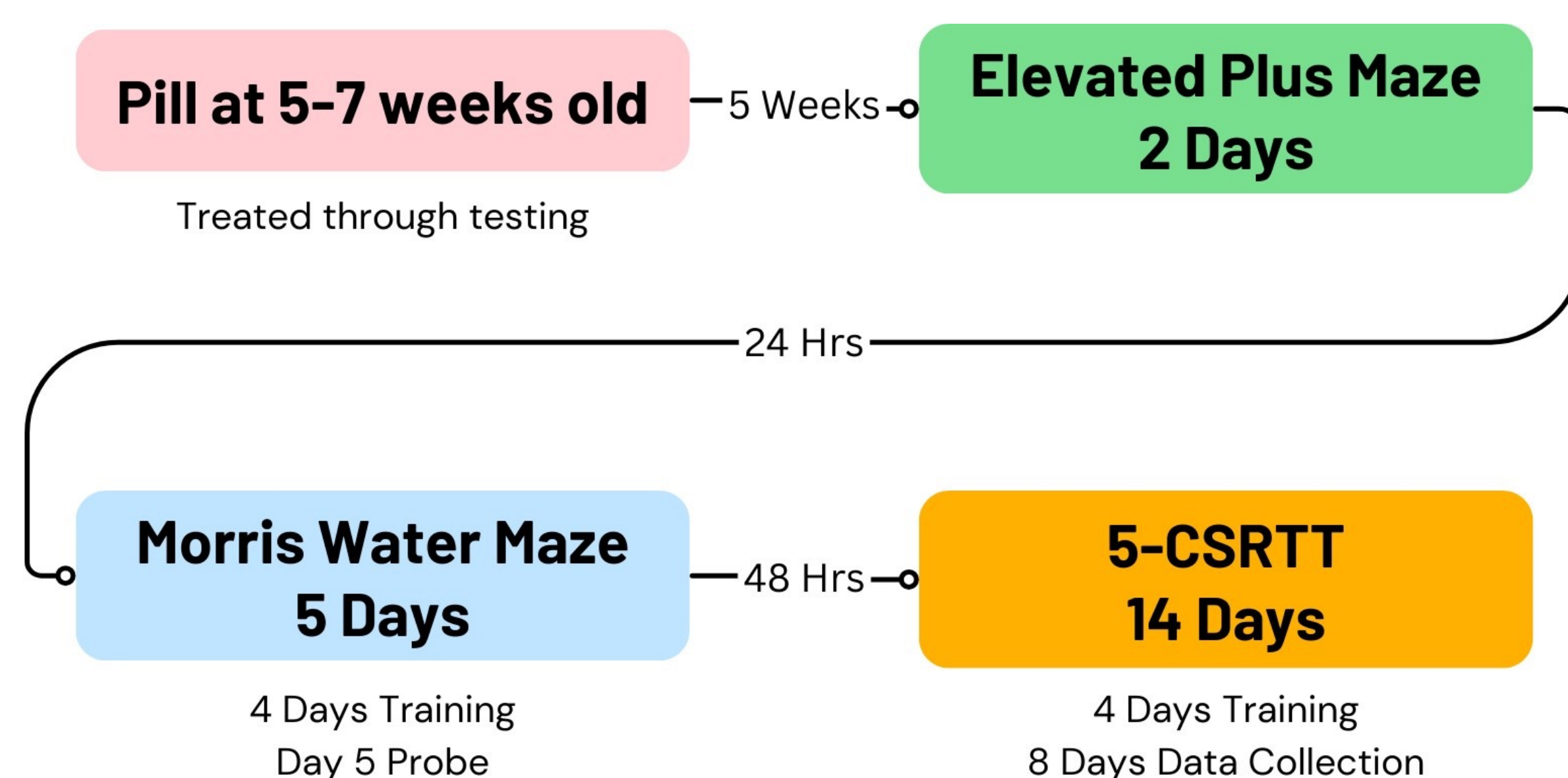


Method

Subjects



Timeline



Materials

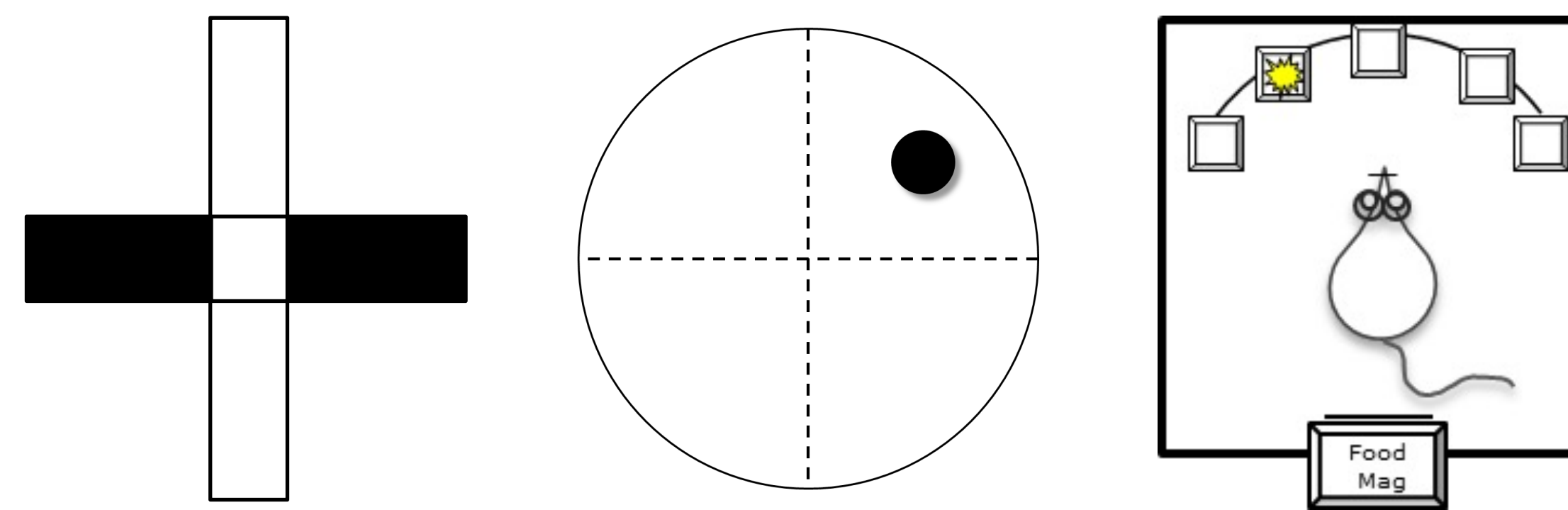


Figure 1. Behavioral Testing Apparatus'

- Left: Elevated plus maze: anxiety levels
- Middle: Morris water maze: spatial abilities
- Right: Five-Choice Serial Reaction Time Test: selective attention

Results

Spatial Memory

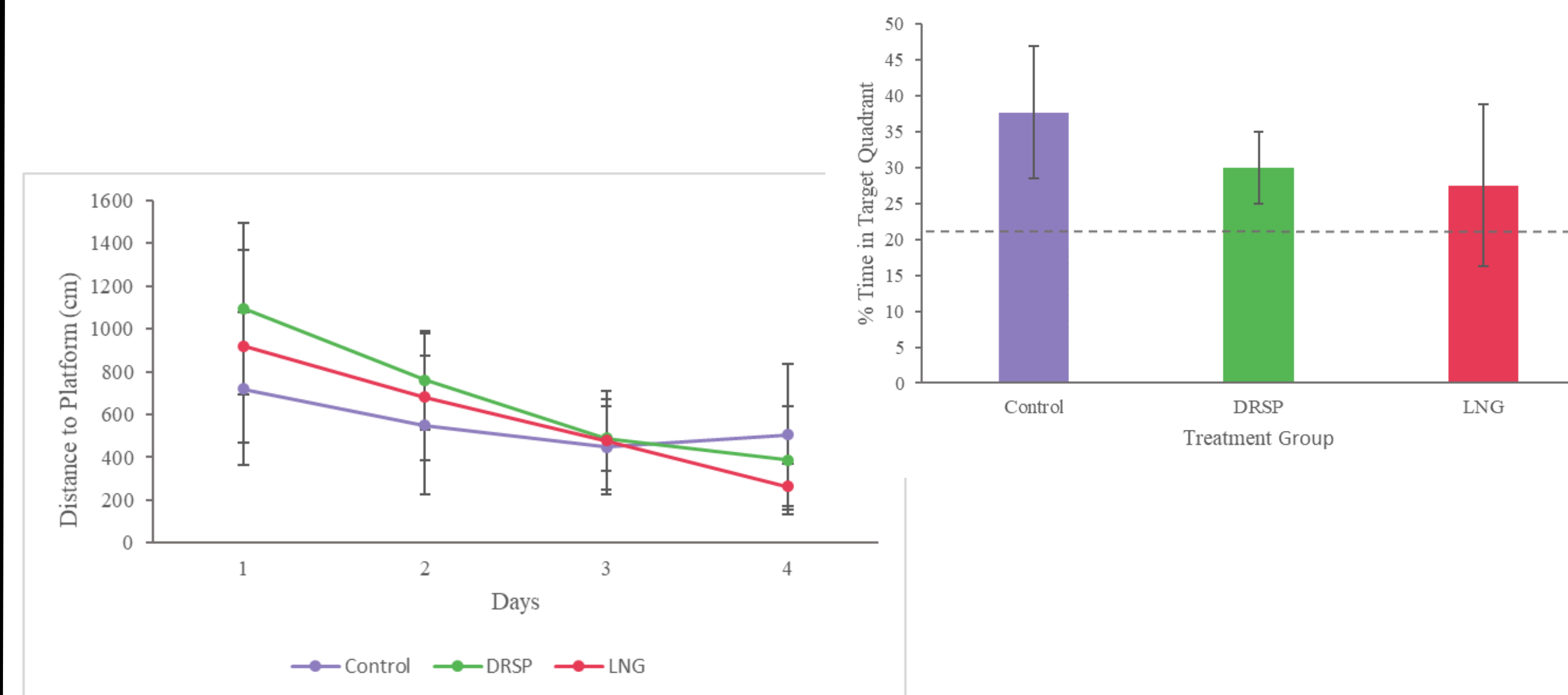
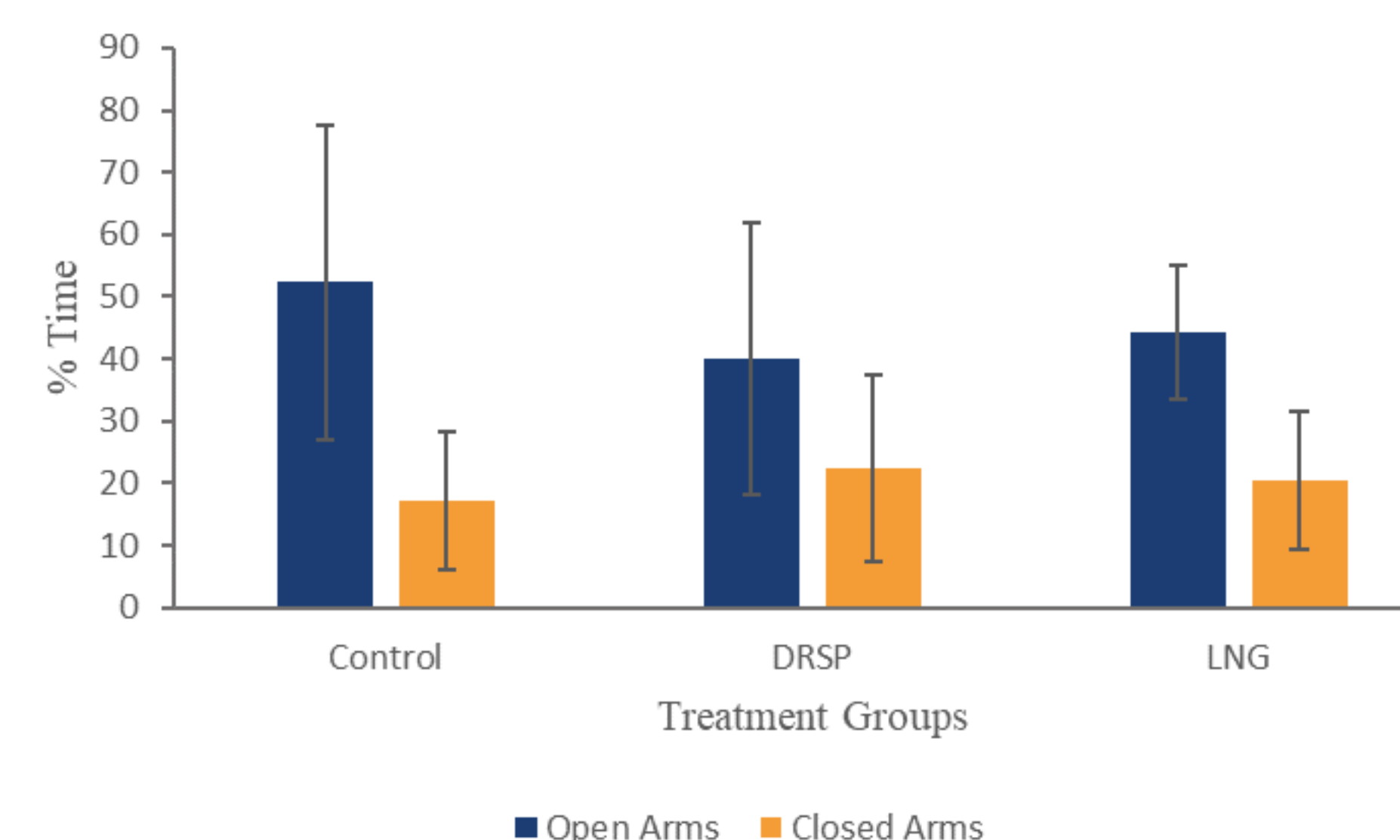


Figure 2. Morris Water Maze Performance.

- Left: Mean distances over four days for each group
- Rodents became faster over the 4 days, displaying learning
- Right: Probe Trial Results of time spent in target quadrant
- Control group spent significantly more time in target quadrant ($p= 0.042$) than both treatment groups, and time spent was significantly above chance.

Anxiety

Figure 3. EPM Time Spent in Open vs Closed Arms per Group. Groups did not differ in time spent in open or closed arms.



Selective Attention

Figure 4. 5CSRTT Days to Criteria 1. (Right)

- Groups did not differ in average days taken to reach TR3

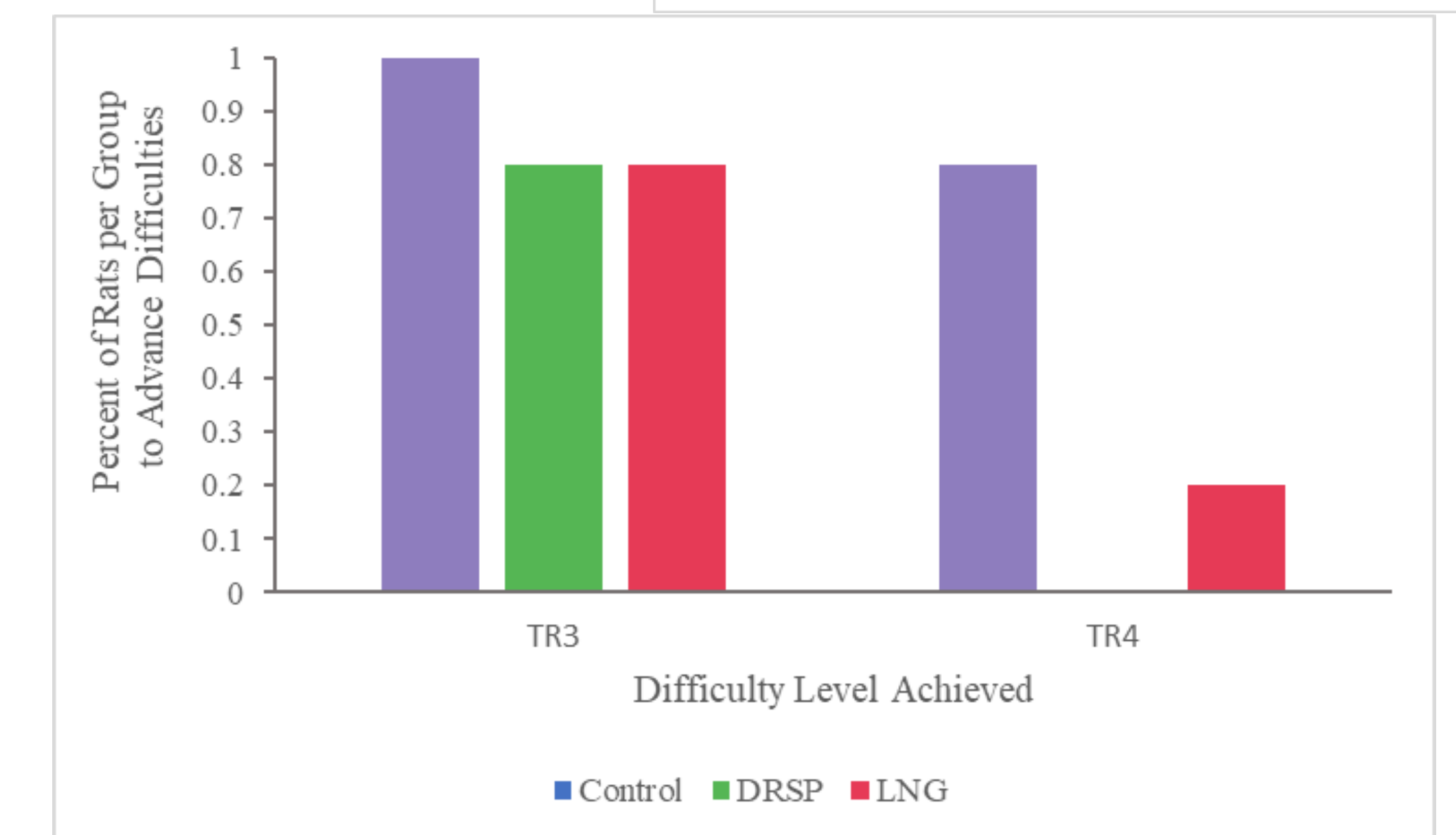
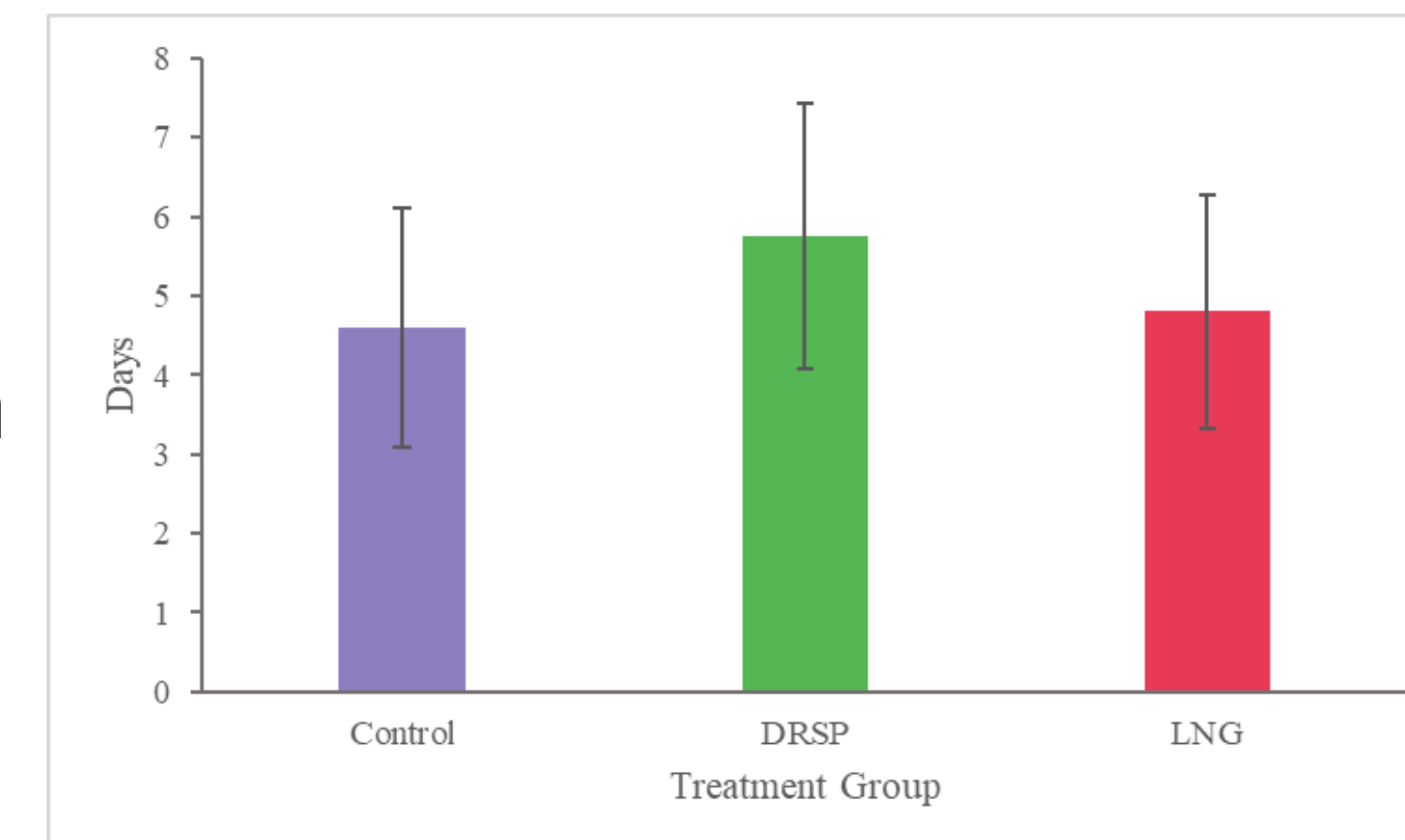


Figure 5. Percentage of Rats to Advance to Difficulty Levels Tr3 and TR4 per Group (Left)

- Control rodents were significantly more likely to reach TR4 than LNG and DRSP rodents ($p= 0.020$)

Conclusion

- OC's had little impact on anxiety but impaired spatial and attention abilities regardless of androgenicity

Future Research

- Replicate findings
- Different mazes/paradigms
- Isolate progesterone without estrogen
- Blood samples to confirm dosages

Implications

- Effects on cognition
 - Individuals with memory impairments or attentional deficits
- Little effect on anxiety
 - Individuals with mental health struggles

References

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2. Braverman, P. & Lesley L. Breech, Md. (2009). Safety, efficacy, actions, and patient acceptability of drospirenone/ethinyl estradiol contraceptive pills in the treatment of premenstrual dysphoric disorder. *International Journal of Women's Health*, 85.
3. Hampson, E., & Rovet, J. F. (2015a). Spatial function in adolescents and young adults with congenital adrenal hyperplasia: Clinical phenotype and implications for the androgen hypothesis. *Psychoneuroendocrinology*, 54, 60-70
4. Agrawal, J., & Dwivedi, Y. (2020). GABAA receptor subunit transcriptional regulation, expression organization, and mediated calmodulin signaling in prefrontal cortex of rats showing testosterone-mediated impulsive behavior. *Frontiers in Neuroscience*, 14, 600099.