

Introduction & Research Question

- Planaria flatworms swim away from both light and heat.
- They show the strongest responses to ultraviolet (UV) light (Paskin et al., 2014) and to temperatures above 30°C (Inoue et al., 2014).
- Conditioning is the process of accustoming a person or animal to behave in a certain way or to accept certain circumstances.
- Previous research suggests that planaria can learn through conditioning when they are exposed to different sweeteners in light and dark environments (Ouyang et al., 2017).
- This experiment seeks to test whether planaria can be conditioned to swim towards light when exposed to heat as a negative stimulus.
- Hypothesis: In response to thermal energy in a dark environment, planaria will swim towards the light when given the choice of both.
- Can planaria flatworms be conditioned to display a positive phototactic response to light due to heat as a negative stimulus?

Methods

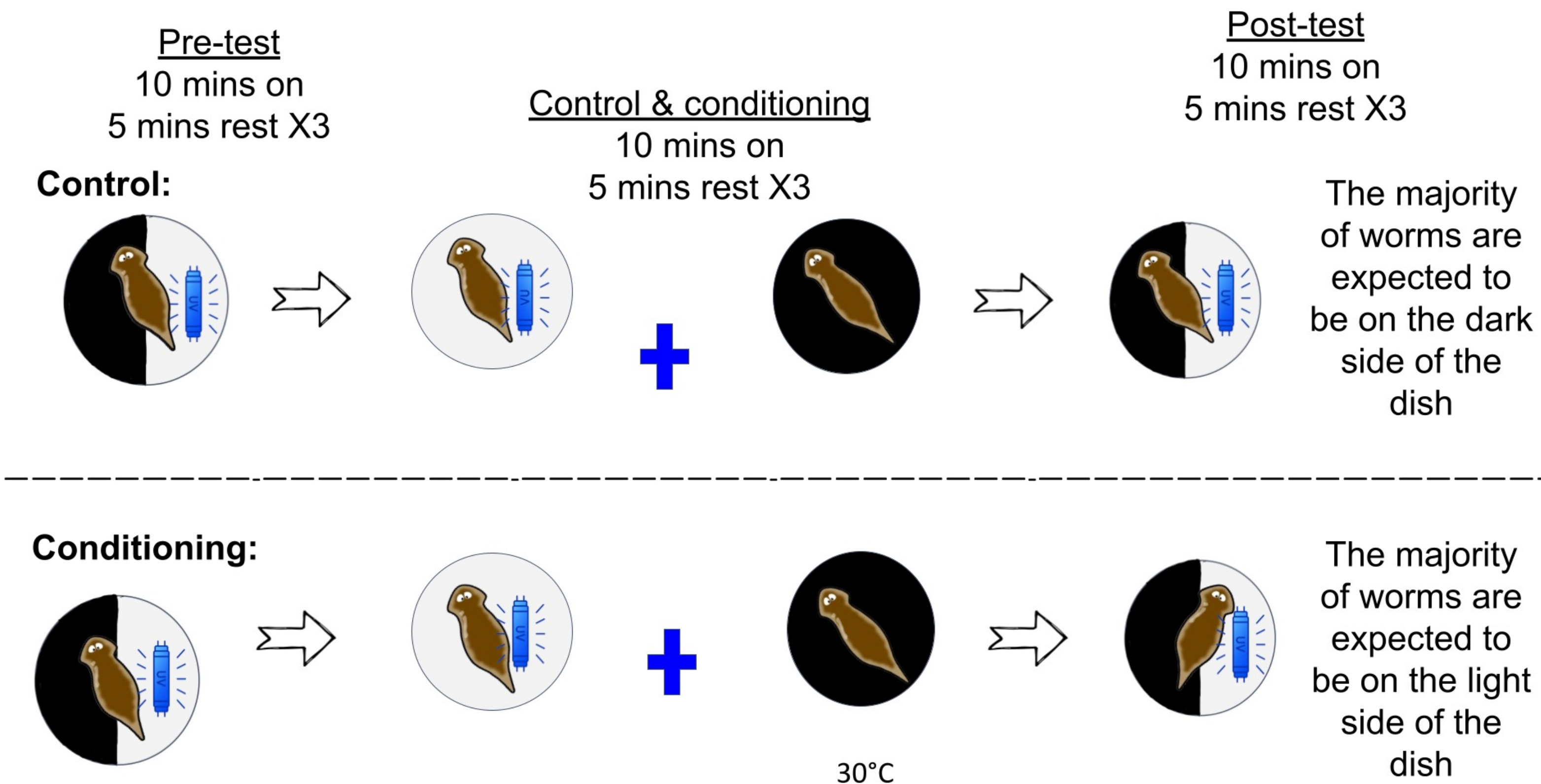


Figure 1. Experimental Design: Both a control group and conditioning group of worms endure the pre-test where half the dish is dark and half is lit with UV light for 10 mins on, 5 mins rest. During conditioning, both groups are held under the light for 10 mins and then the conditioning group water is changed to have 30 degrees C water and be placed under the dark with the control group for 10 mins. Rest for 5 mins. The post test mirrors the pre-test.

Discussion & Conclusion

- In the control group pre test, and post test, we would expect the majority of worms to move to the dark quadrant. Results reflect that.
- Planaria exhibit photophobic behavior when exposed to UV light. Not all worms moved to the dark because this is a general behavior.
- In the treated group, there is a 0.07 trend toward the light. This would support our thesis.
- However, more trials would need to be conducted to formulate accurate conclusions.
- The experimental design can be improved by having two UV light set ups and more researchers to quicker aid in the changing of water.
- Final conclusions can not be made from the data collected. However, there is a trend toward the light suggesting that planaria may be conditioned to exhibit positive phototaxis when using heat as a stimulant.

Results

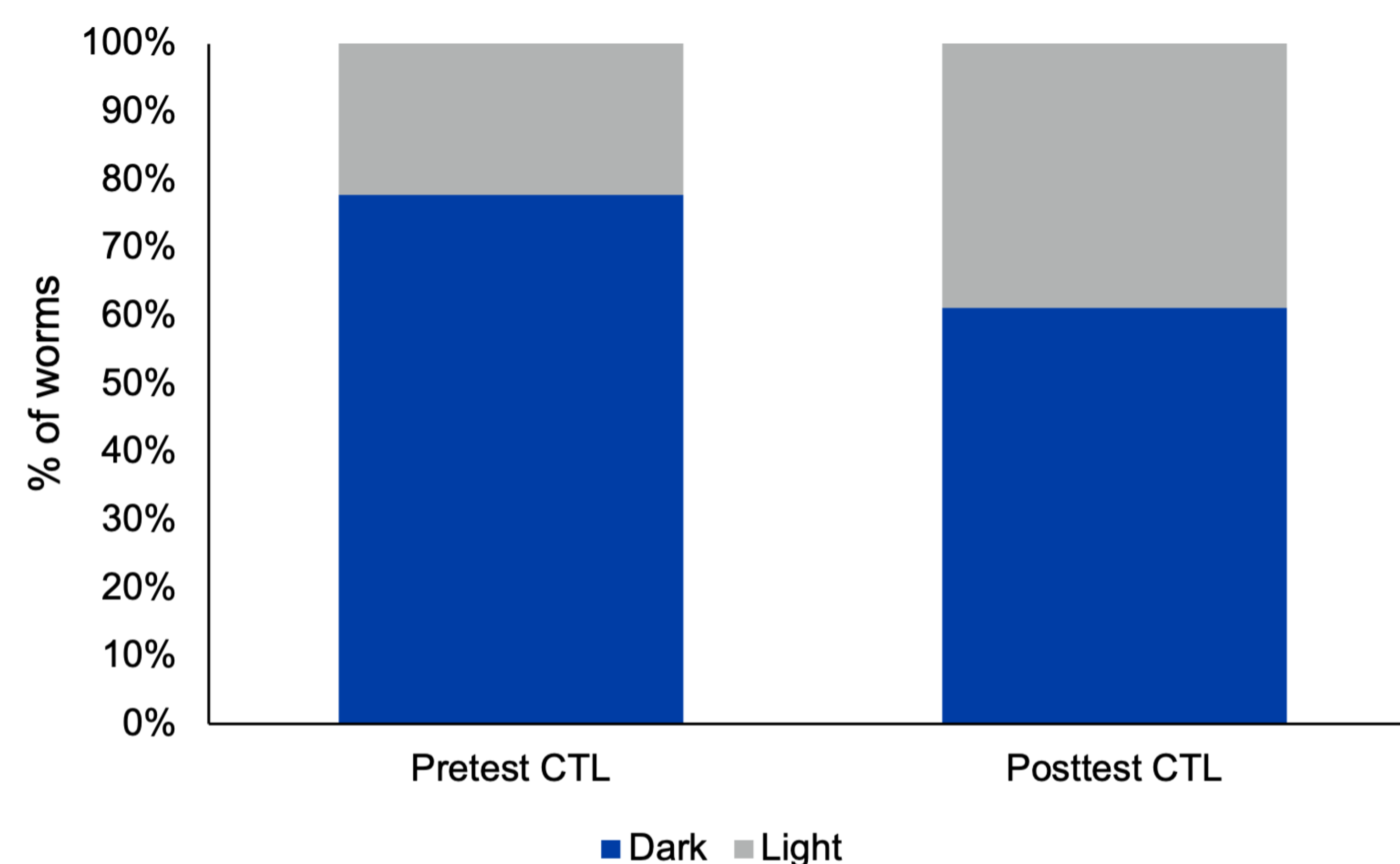


Figure 2. Control Group Pretest and Posttest Results: During the pretest control, an average of 4 worms were in the light side of the dish and 14 were in the dark side. During the posttest, an average of 7 worms were in the light and 11 worms were in the dark. This is an average over three trials each containing 12 worms total. Worm location supports negative phototaxis.

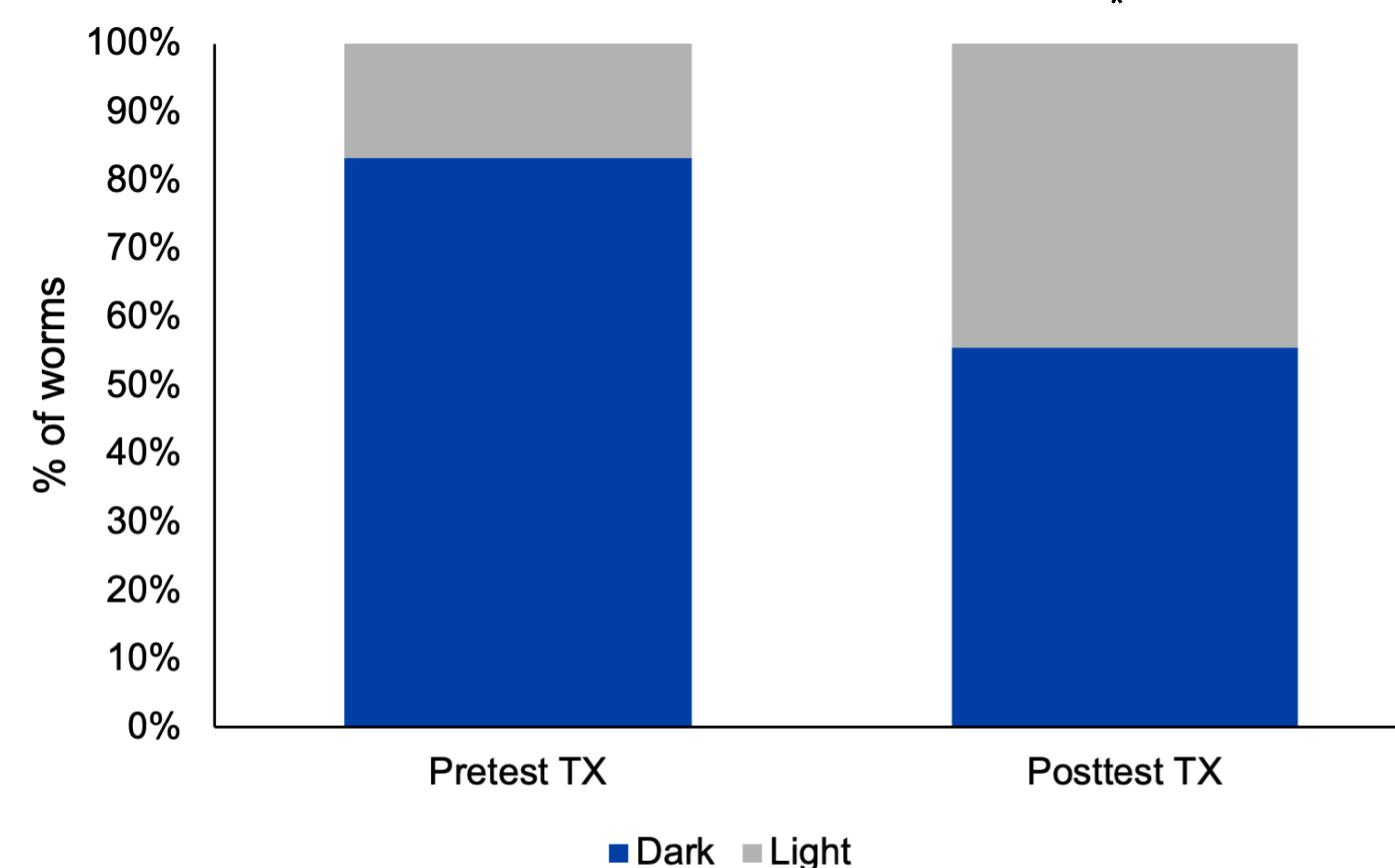


Figure 3. Treated Group Pretest and Posttest Results: During the treated pretest, an average of 3 worms were in the light side of the dish and 15 on the dark side. During the posttest, 8 worms were in the light side of the dish and 10 on the dark side. Tendency to preference of the light after conditioning. *, significantly different from pretest; $\chi^2 (1, N=36) = 3.2727, p=0.07044$

Future Direction

Future research questions may focus on environmental toxicant effects on positive phototactic responses in planaria.

Increasing temperatures used during conditioning to evoke stronger reactions.

References

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- Paskin, T. R., Jellies, J., Bacher, J., & Beane, W. S. (2014). Planarian phototactic assay reveals differential behavioral responses based on wavelength. *PLoS one*, 9(12), e114708. <https://doi.org/10.1371/journal.pone.0114708>
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Acknowledgements

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