

# Evolutionary Constraints Associated with Color and Aggression in *Drosophila melanogaster*

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## Introduction

- Pleiotropy (one gene affects multiple unrelated traits) can limit adaptive evolution. This can affect our ability to predict adaptive change.
- This may be seen in the relationship between melanin-based coloration and aggression behaviors in *Drosophila melanogaster*. Differences in melanin-based coloration have been correlated with various differences in behaviors in several species (1-2).
- Dopamine is a precursor in the melanin biosynthesis pathway in *D. melanogaster*, so increased melanin utilization for coloration may result in less available free dopamine, which may cause more aggressive behaviors (3).

**Hypothesis:** We hypothesized that selecting for darker pigmentation would result in more aggressive behaviors while selecting for lighter pigmentation would result in less aggressive behaviors.

## Methods

- Light and dark color flies were selected with aggression tests being run every five generations up to generation 15.
- ImageJ was utilized to analyze the color of the trident section of the flies' thoraxes.
- Images were made grayscale and calibrated for black and white values (0 and 255) utilizing the black and white background of the images.
- The freeform selection tool was utilized to analyze the color of the trident after color calibration. The values were recorded in a spreadsheet.

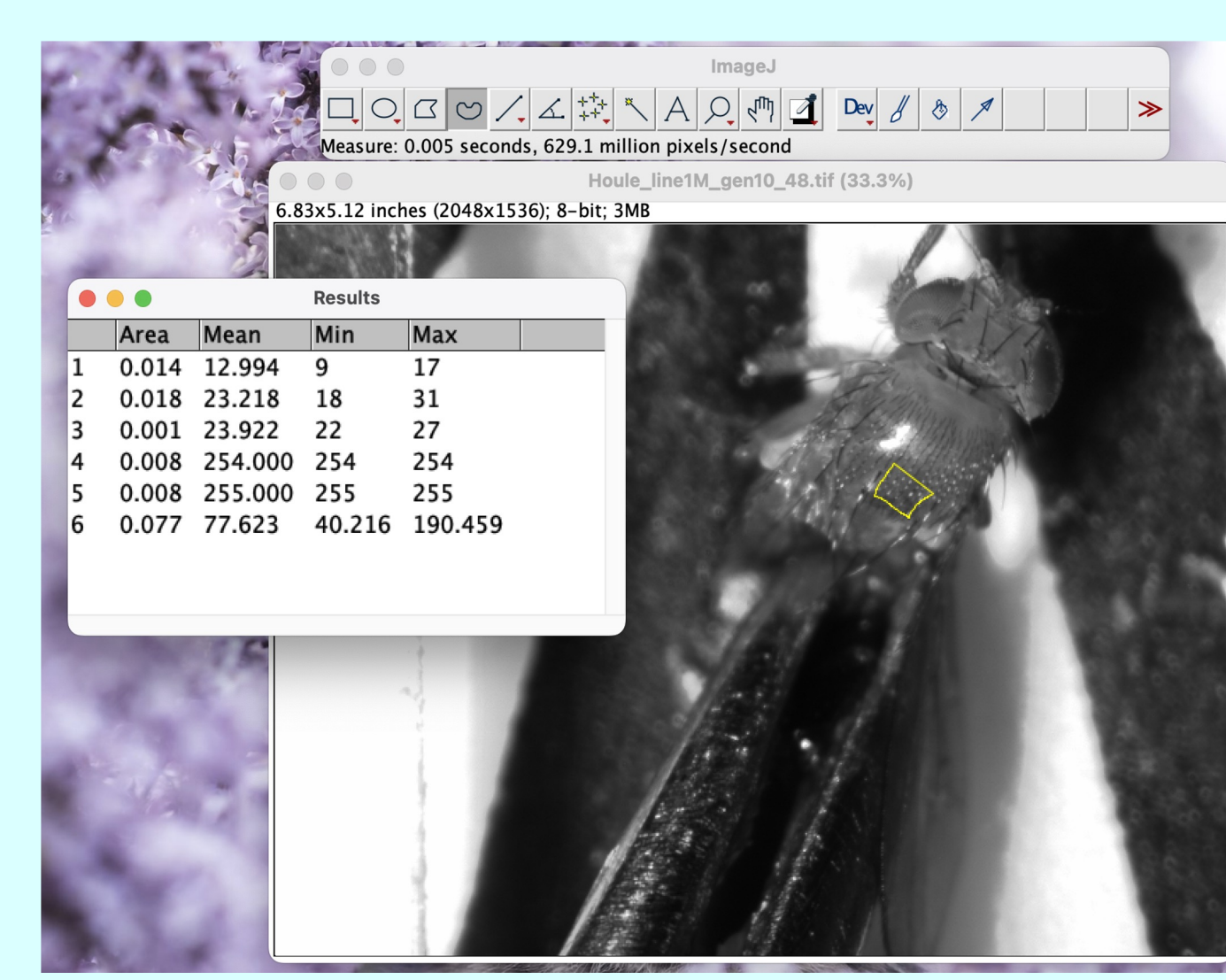
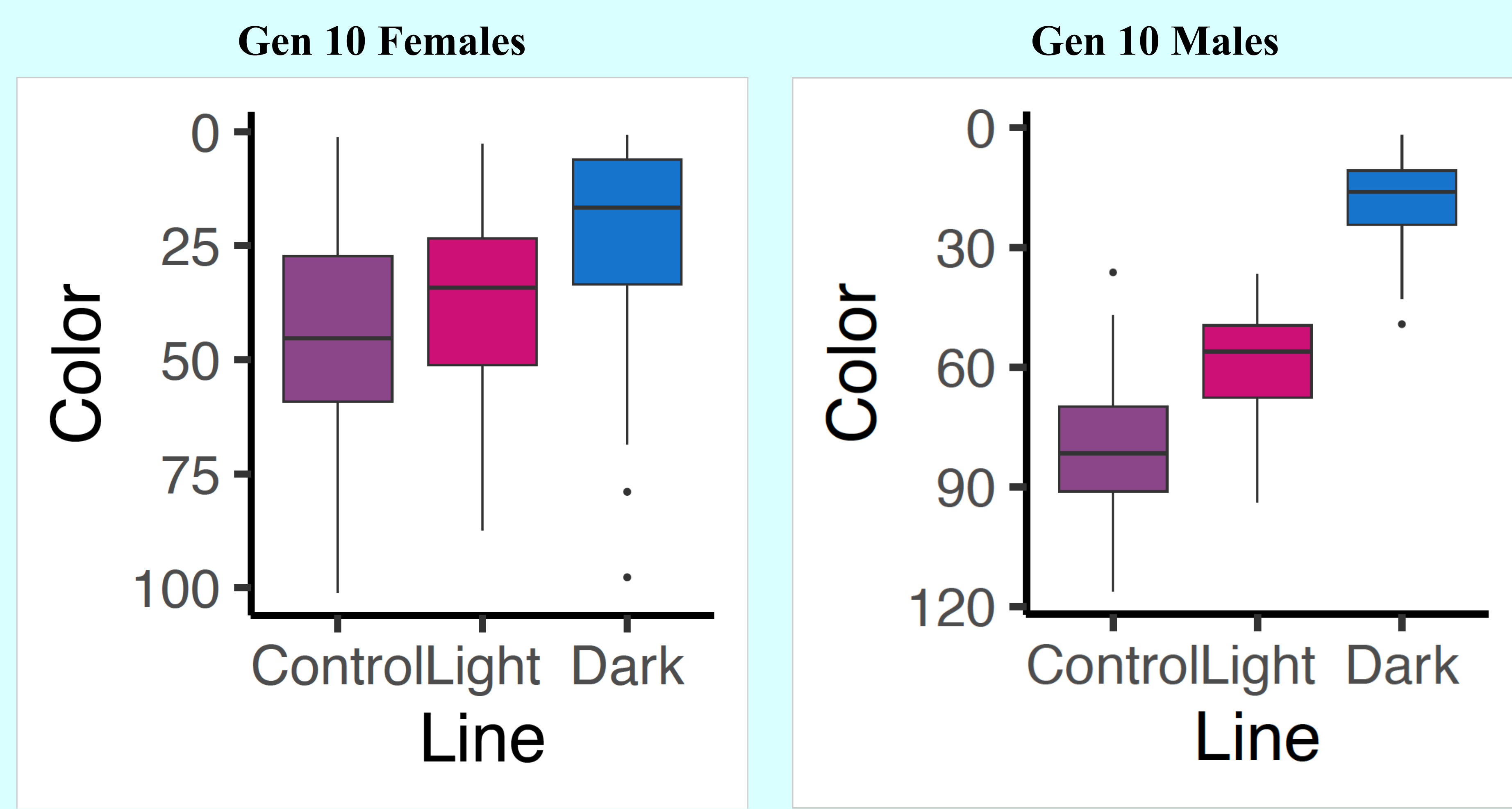


Figure 1: ImageJ software interface with black and white calibration values in the table and the trident area of the fly selected with the freeform tool.

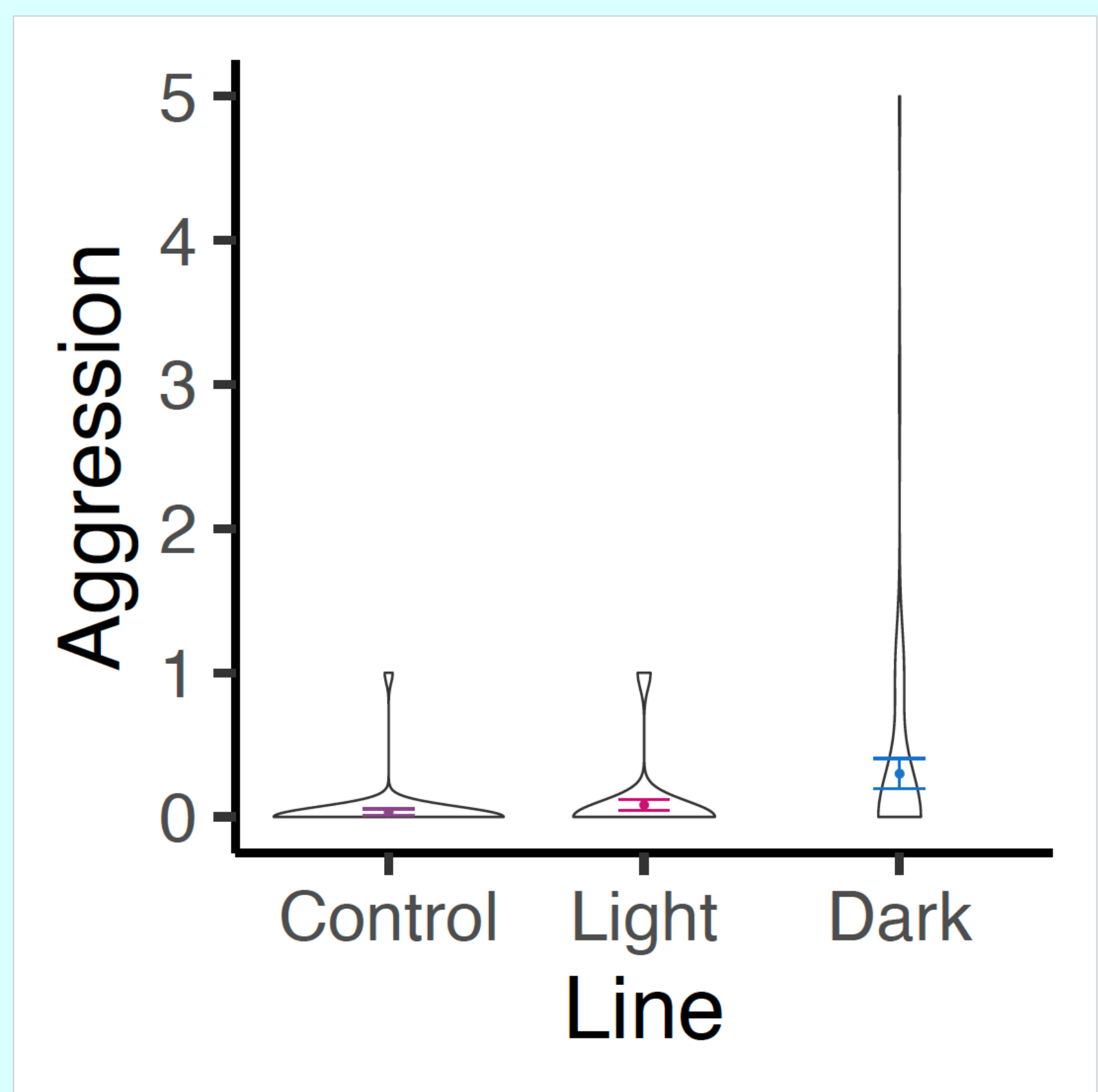
## Results



	Control vs. Light	Control vs. Dark	Light vs. Dark
Females	p-value = 0.5568	p-value < 0.0001	p-value < 0.0001
Males	p-value < 0.0001	p-value < 0.0001	p-value < 0.0001

Table 1: All color data analyzed via beta regression model.

## Gen 15 Males and Females



Control vs. Light	Control vs. Dark	Light vs. Dark
p-value = 0.5568	p-value < 0.0001	p-value < 0.0001

Table 2: All aggression data analyzed via hurdle model.

## Conclusions and Future Directions

- Darker flies are significantly more aggressive than light selected and control flies
- This supports our hypothesis that dark *D. melanogaster* individuals are more aggressive than their lighter counterparts.
- This provides more evidence for a possible pleiotropic effect between color and aggression in *D. melanogaster*.
- The next step in this research will be to determine the exact genes which are causing this pleiotropic effect.

## References

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