

# Expression of *Pink1* is higher in female fruit flies relative to males by 1.8-fold

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## Summary

- Do females and males respond to oxidative stress differently?
- Male and female fruit fly brains were dissected, and RNA was extracted for qRT-PCR analysis of *Pink1*.
- Females have 1.8-fold higher expression of *Pink1* than males.

## Abstract

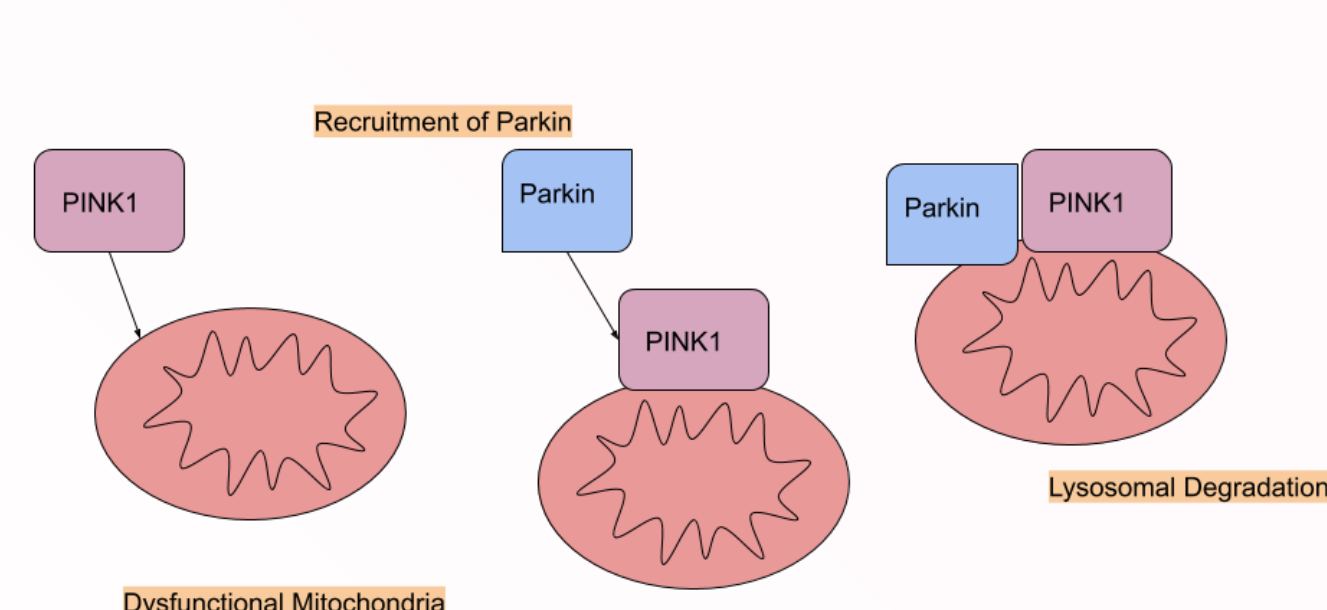
The *Pink1* gene protects cells from stress-induced mitochondrial dysfunction. This experiment established a baseline for the differences in *Pink1* mRNA expression between male and female *Drosophila melanogaster* (fruit fly) brains. The *Pink1* gene was targeted with qRT-PCR and data was analyzed based on CT values showing females had higher *Pink1* mRNA expression by 1.8-fold. This result highlights similar expression patterns between males and females.

## Introduction

**Hypothesis:** Since Parkinson's disease is more prevalent in males, and *Pink1* protects against oxidative stress, *Pink1* will be expressed more in female relative to male fruit flies.

### Target gene:

- *Pink1* contains instructions for the PTEN induced putative kinase 1 protein shown to protect cells from oxidative stress-induced mitochondrial dysfunction [1].
- *Pink1* is expressed in the brain and is linked to the neurological disorder Parkinson's disease [2].

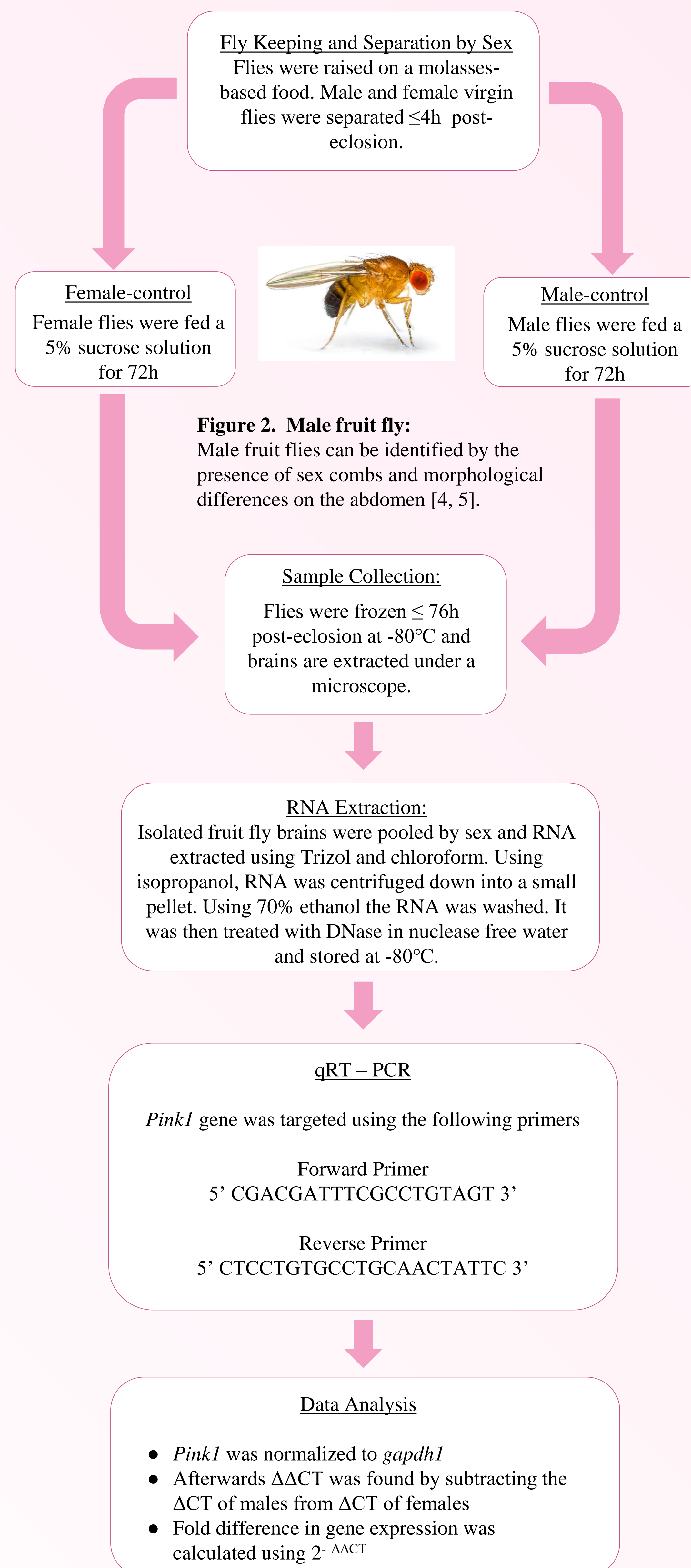


**Figure 1. *Pink1* Pathway:** The protein coded by *Pink1* recognizes and attaches to the dysfunctional mitochondria. It then recruits the Parkin protein to attach to the mitochondria. This causes the dysfunctional mitochondria to undergo cell lysis [1].

### Model organism:

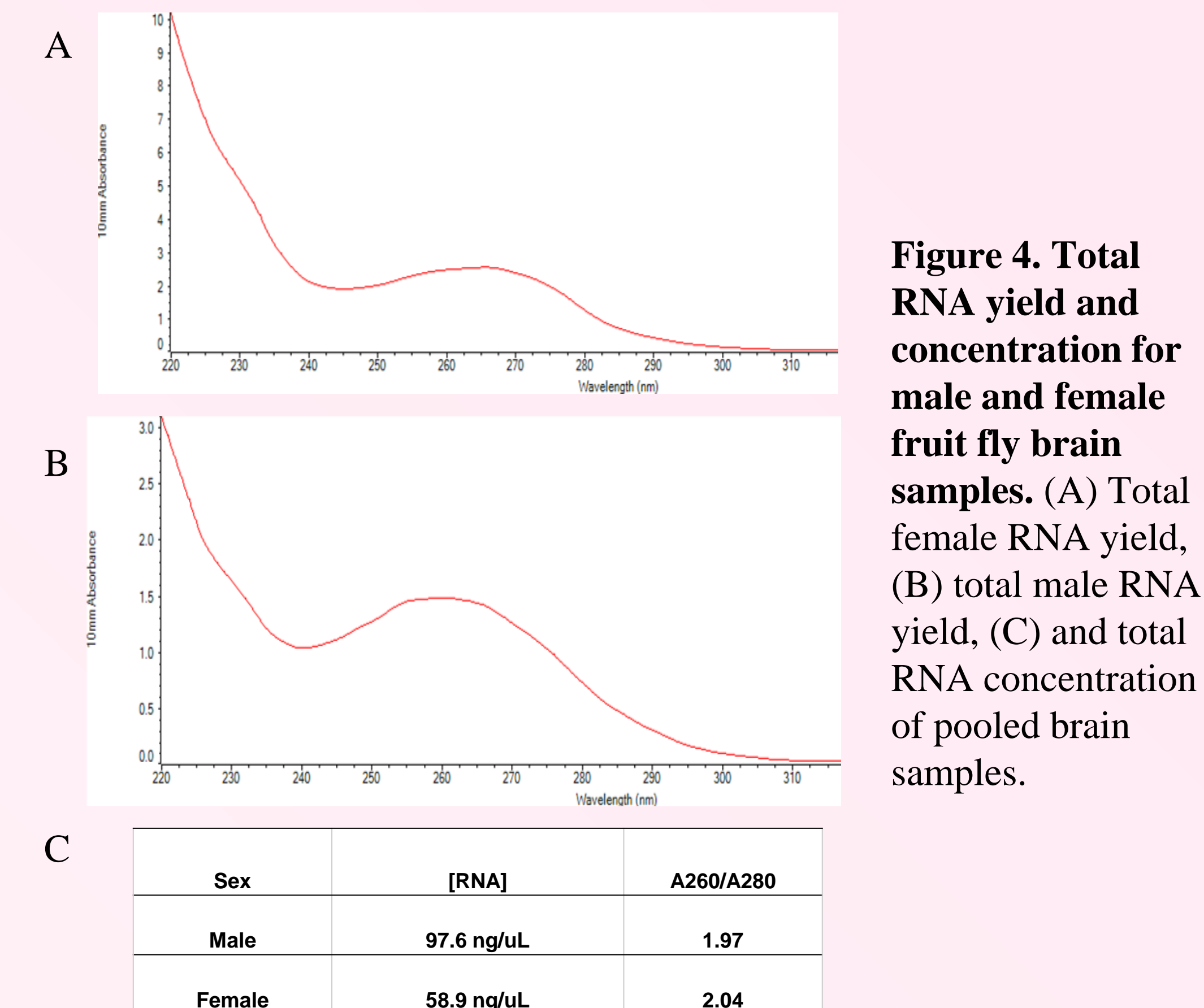
- *Drosophila melanogaster* (fruit flies) share about 75% of disease-related genes with humans, are inexpensive to maintain, have many offspring, and reproduce quickly [3].

## Methodology



**Figure 3. Flowchart of experimental design.**

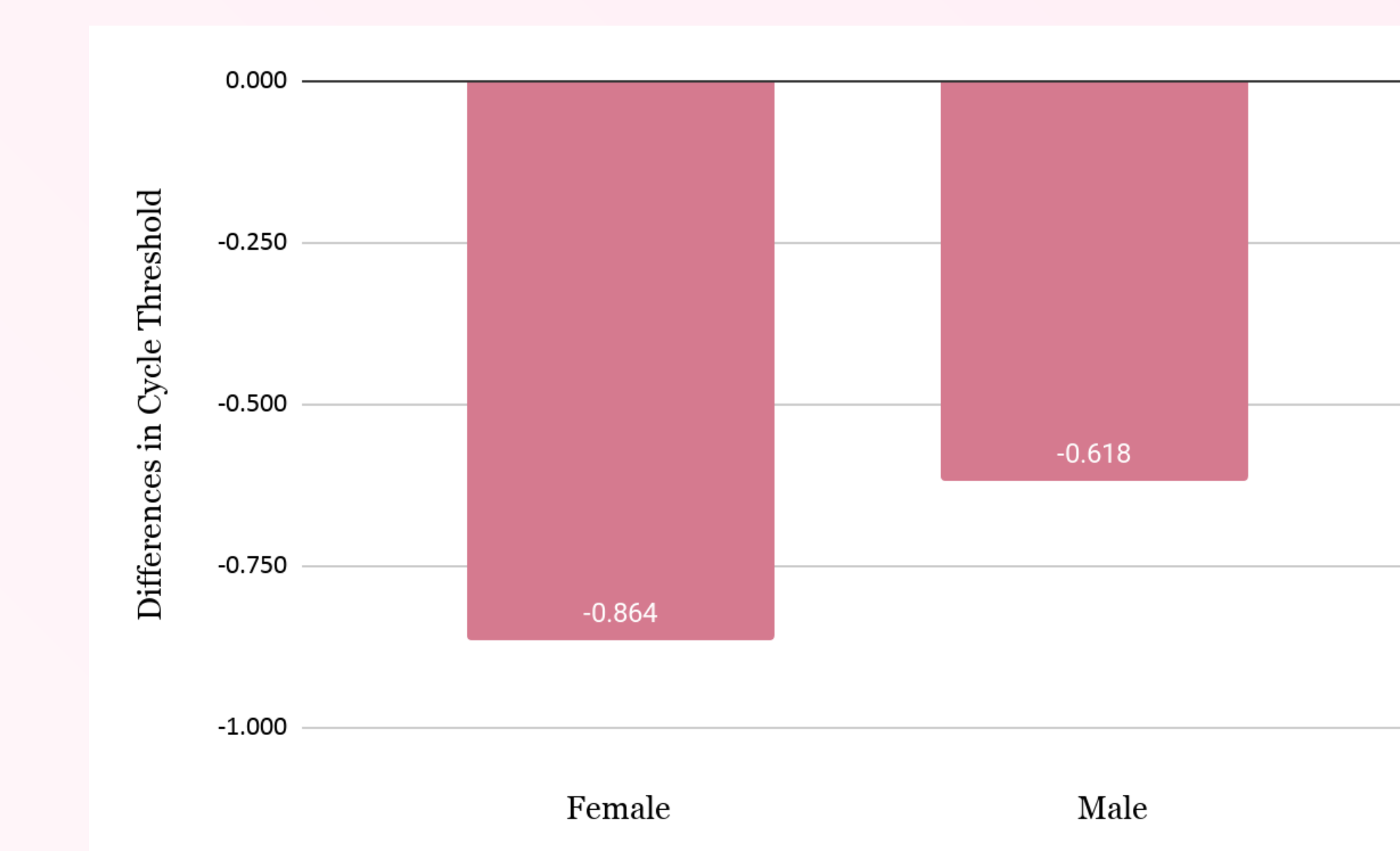
## Results



**Figure 4. Total RNA yield and concentration for male and female fruit fly brain samples.** (A) Total female RNA yield, (B) total male RNA yield, (C) and total RNA concentration of pooled brain samples.



**Figure 5. *Pink1* mRNA expression is 1.8-fold higher in females relative to males.** Red indicates higher gene expression; green indicates lower gene expression. All genes normalized to *gapdh1*



**Figure 6.  $\Delta\text{CT}$  values are lower for female fruit flies relative to males.** The difference in cycle threshold, after being normalized with *gapdh1*, is greater in male fruit flies with  $-0.618$  than female fruit flies with  $-0.864$ , resulting in a 1.8-fold higher *Pink1* mRNA expression in female fruit flies.

## Discussion/Conclusion

*Pink1* does not exhibit sexually dimorphic mRNA expression in fruit flies.

- In control conditions, female *Drosophila melanogaster* have 1.8-fold higher gene expression of the *Pink1* gene.
- Although these results agree with the hypothesis, the slight 1.8-fold upregulation of *Pink1* is not significant enough to indicate sexual dimorphism in *Pink1*.
- Males are affected by Parkinson's more often than females [6]. Non-sex-specific expression of *Pink1* could indicate the protective effects are not sexually dimorphic.

This study showing differences in *Pink1* in fruit flies establishes baselines for future studies of *Pink1* expression under stressors.

## Study Limitations

- Flies were studied only post-eclosion.
- Brains were pooled - no distinction between individuals.
- Study lacks statistical analysis.
- Study was only performed on mRNA level.

## Future Directions

- The experiment could be performed in higher order organisms.
- Analyze individual genetic expression within the sexes.
- In future experiments, gene expression data could be collected from flies at other life stages.
- Protein expression of *Pink1* could be analyzed.

## Bibliography

