

PI3K/Akt signaling influences dopamine function in *C. elegans*

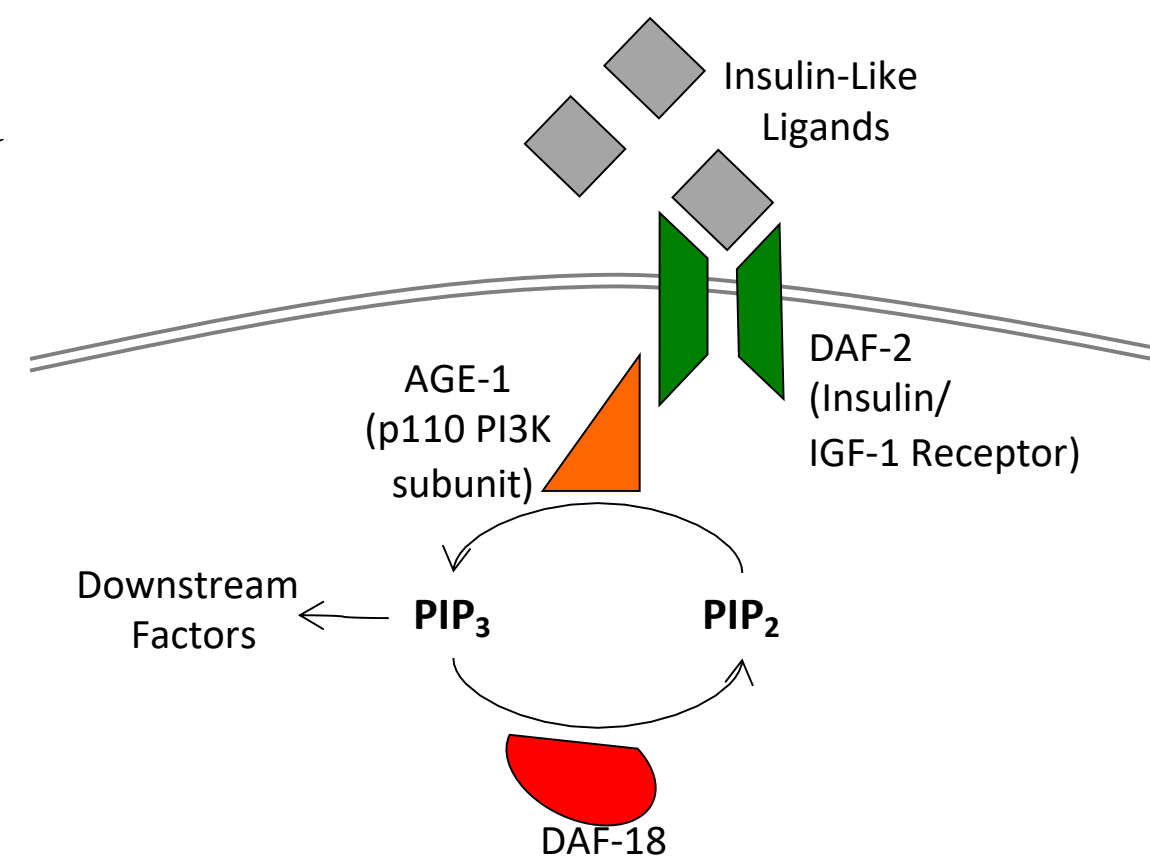
Meretta Hanson & Stephanie Fretham, Ph.D.

Department of Biology, Luther College, Decorah, IA 52101

LUTHER COLLEGE
BIOLOGY

INTRODUCTION

- PI3K/Akt signaling dysfunction has been linked to many disorders, including neurodegenerative disorders involving dopamine.
- C. elegans* mutations in PI3K/Akt signaling (*daf-18* and *age-1*) and dopamine production (*cat-2*) can be used to examine dopamine function in overactive and underactive PI3K/Akt signaling conditions.
- Hypothesis:** PI3K/Akt signaling influences dopamine function in *C. elegans*.
- Approach:** We examined dopamine in *C. elegans* using tap habituation and glyoxylic acid induced fluorescence.



METHODS

Strains and Preparation:

- N2
- CB1112 – *cat-2(e1112)*
- Day 1 adults were picked for both experiments.
- RB712 – *daf-18(ok480)*
- TJ1052 – *age-1(hx546)*

Tap Habituation:

- Robot arm delivered 30 taps with 10 second inter-stimulus interval [1]
- Measured reversal frequency (n > 48 per strain) [2]
 - Reversal recorded if more than 30% of body length

Glyoxylic Acid Induced Fluorescence:

- Qualitative study of dopamine-like induced fluorescence using glyoxylic acid [3]
- 4-7 animals were observed across three separate days.
- Dopaminergic neurons fluoresce in response to glyoxylic acid

HPLC:

- Dopamine was quantified in homogenized L1 animals using HPLC and normalized to total protein as determined by BCA.

RESULTS

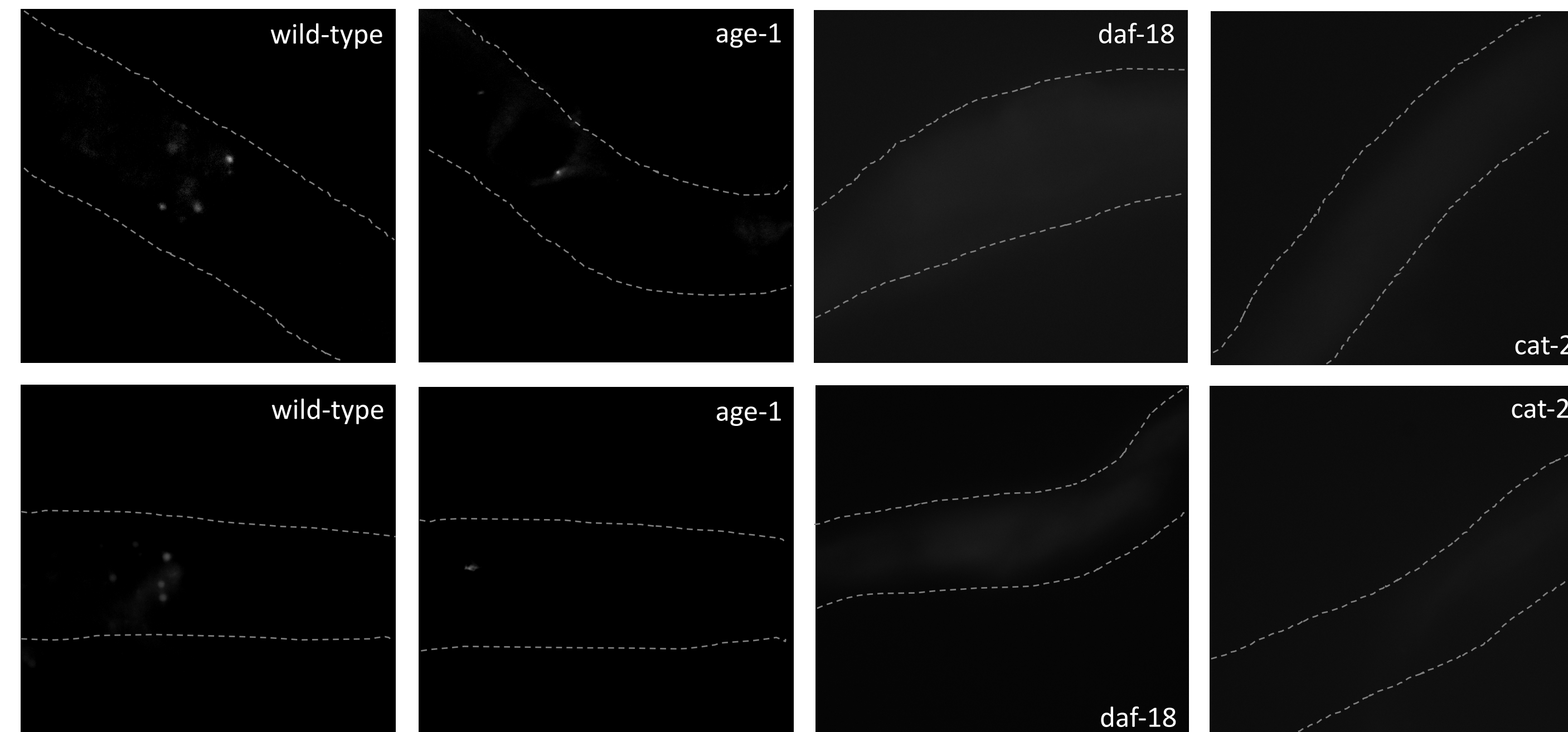


Figure 3 (Left). Glyoxylic acid-induced fluorescence of dopaminergic neurons. All animals are organized posterior to anterior.

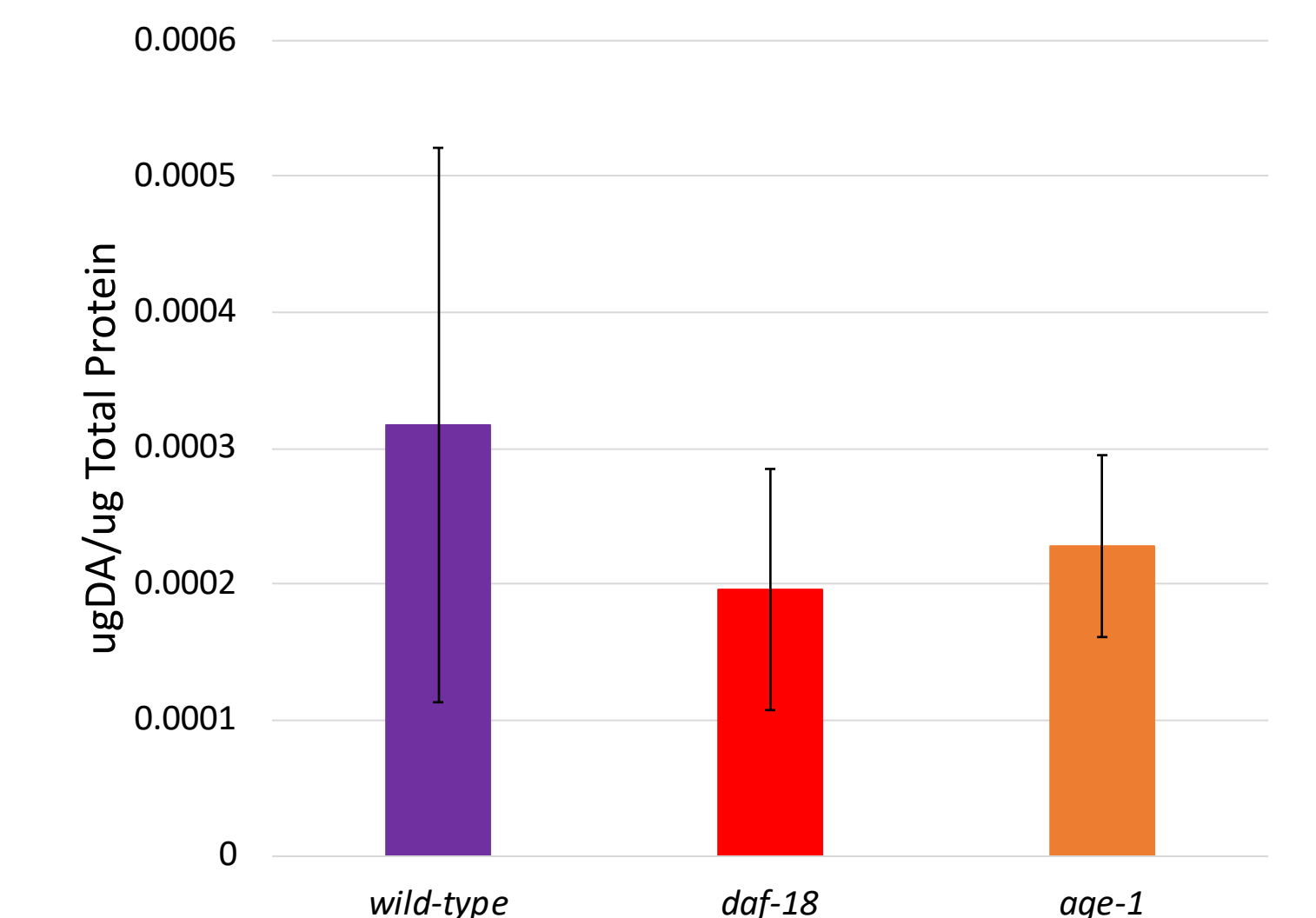


Figure 4. Dopamine quantification results from HPLC. Sample size was too small for statistical analysis. Data is mean +/- SD, n=4-5

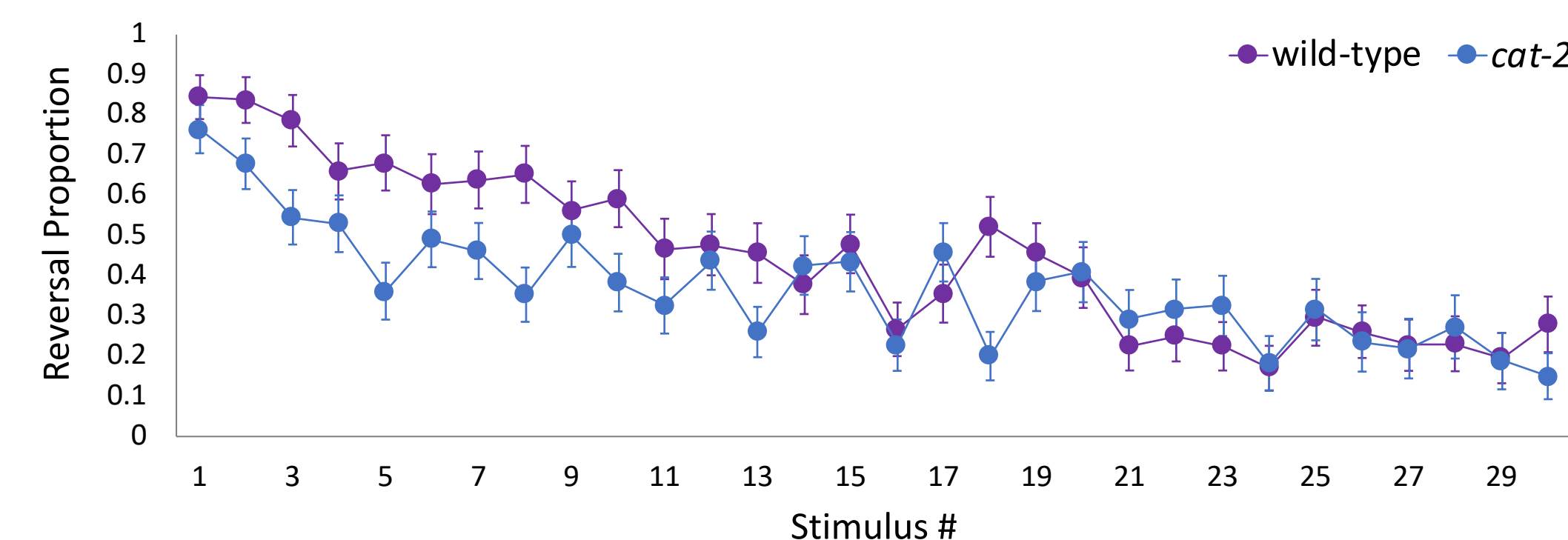


Figure 1. Comparison of tap habituation (reversal responses) in wild-type and *cat-2* animals.

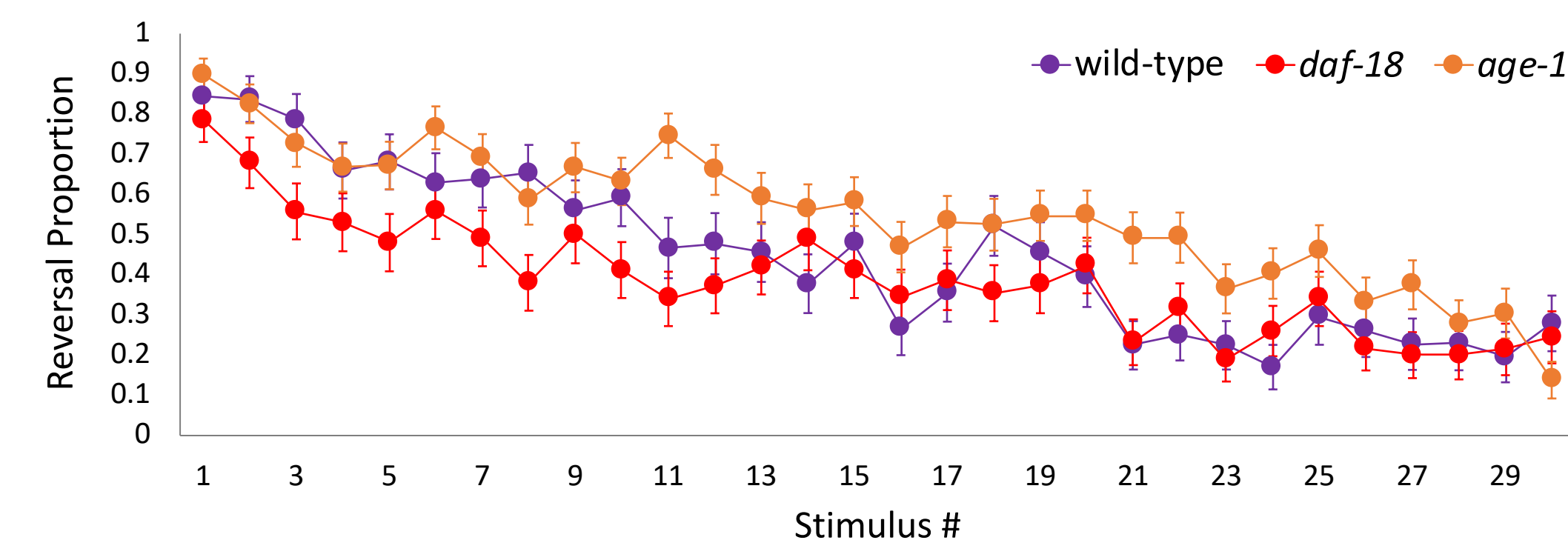


Figure 2. Comparison of tap habituation (reversal response) in wild-type, *daf-18*, and *age-1* animals. Repeated measures ANOVA showed a significant effect of genotype and stimulus number ($p < 0.05$). Data are mean reversal proportions +/- SEM from 15 plates of 5 worms collected over 3 separate days.

CONCLUSIONS

- Impaired dopamine function observed in *daf-18* animals suggests that increased or dysregulated PI3K/Akt activity may directly affect dopamine function.
- Future research will focus on understanding aspects of dopamine function affected by PI3K/Akt signaling.

CITATIONS

- [1] Rankin, Beck & Chiba *Behavioral Brain Research* 37: 89-92 (1990).
[2] Kindt et al. *Neuron* 55(4): 662-676 (2007).
[3] De La Torre *J Neurosci Methods* 3(1): 1-5 (1980).

ACKNOWLEDGEMENTS

- We would like to thank the McElroy Foundation for the Student/Faculty research grant.