

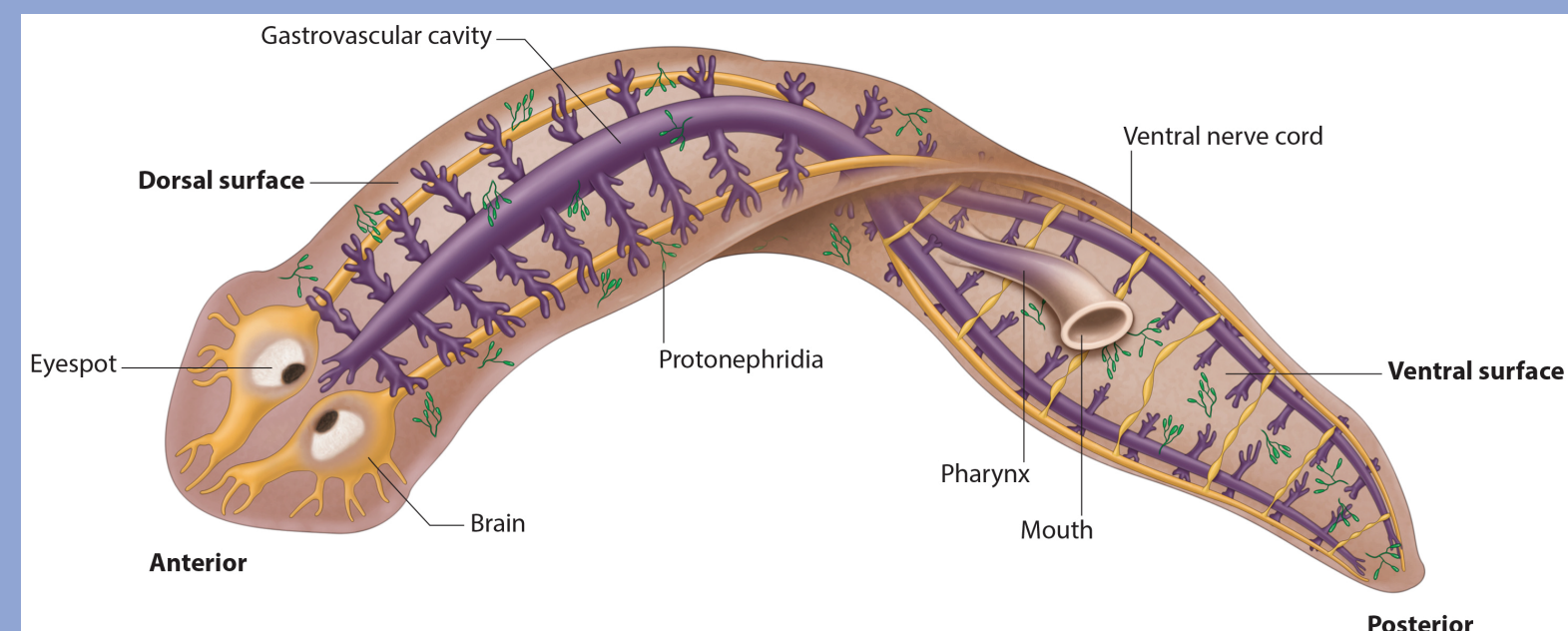
# Ingestion of Tire Wear Microplastics Causes Potential Neurological Harm in Planarians, Manifested as Slower Phototaxis

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## Project Statement

Tire Wear Particles (TWP) significantly impact the environment, wildlife, and human health. This project explores the effect of TWP on the phototaxis behavior of planaria, which typically live in freshwater ecosystems that contain TWP-laden sediments. Planaria are useful in this study because of their nervous system which is similar to humans. Specifically, this experiment examines planarian's phototaxis behavior after ingestion of different concentrations of TWP. We hypothesize that TWP will increase the time for planaria to move away from light due to damage in the nervous system.

## Behavior of Planaria



Anatomy of Planaria (Anatomy | Planarian Educational Resource, 2013)

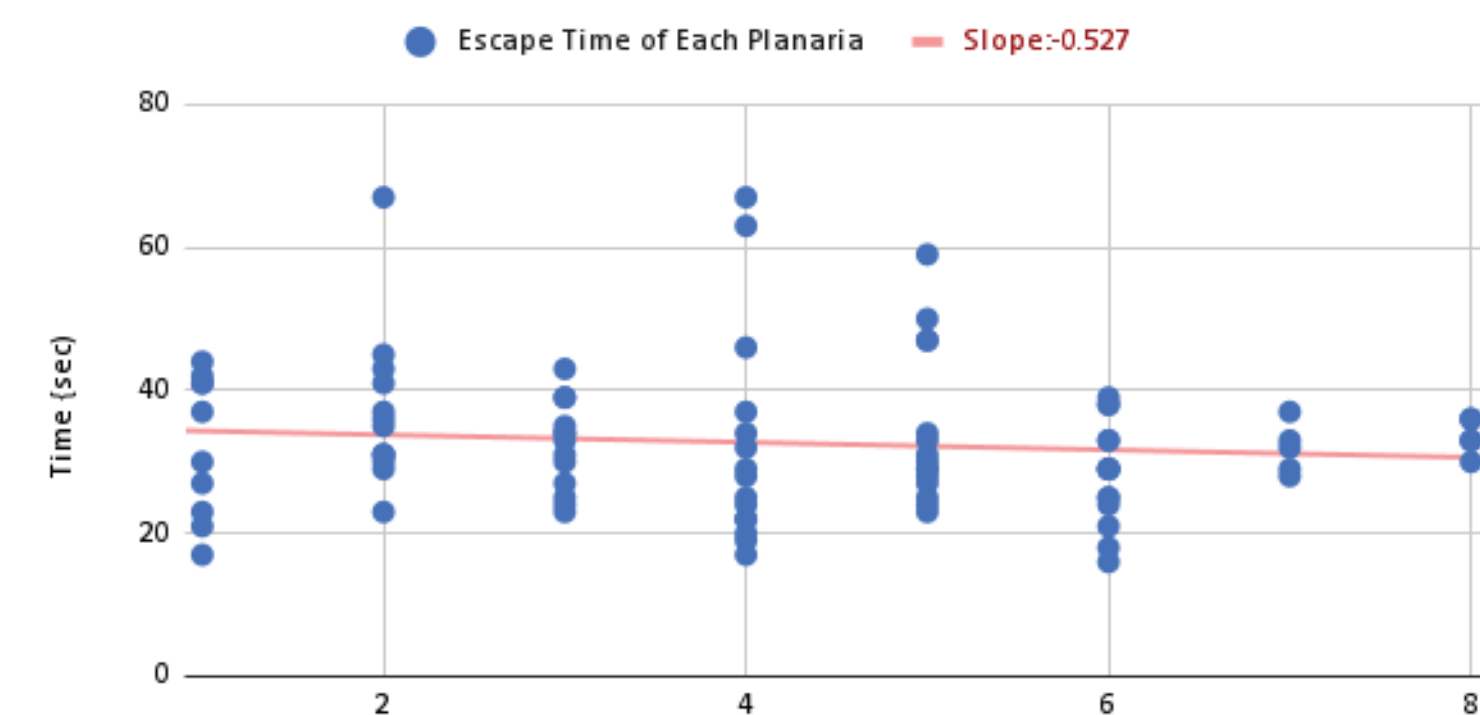
The planaria nervous system affects behaviors such as negative phototaxis response (light avoidance). The ocelli (eyespot) absorb the light signals from the planaria's pigment cells, which are received at the neural ganglia, and send a message to their motor system, creating a physiological response (Paskin et al., 2014). Nervous system damage will inhibit neural reception or motor system messaging.



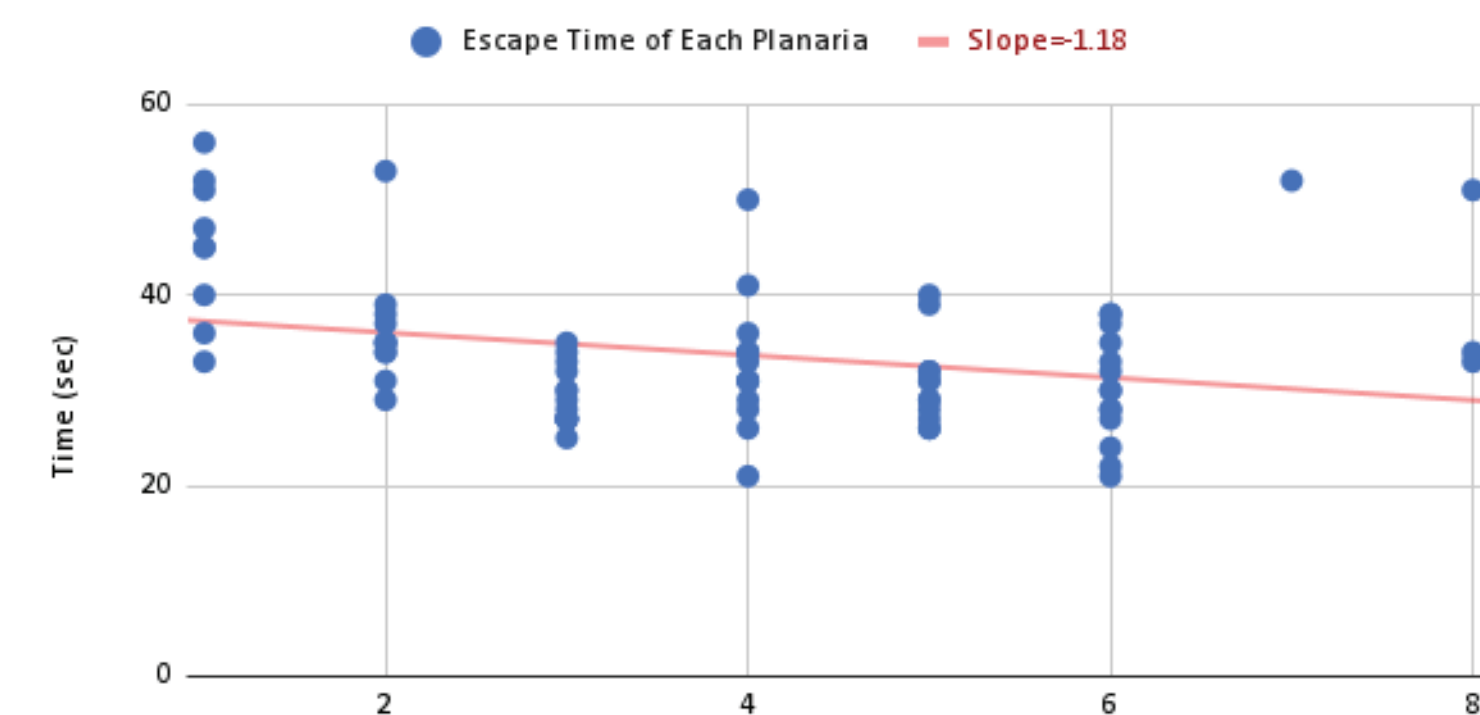
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## Tire Wear Microplastics Delay Phototaxis in Planaria

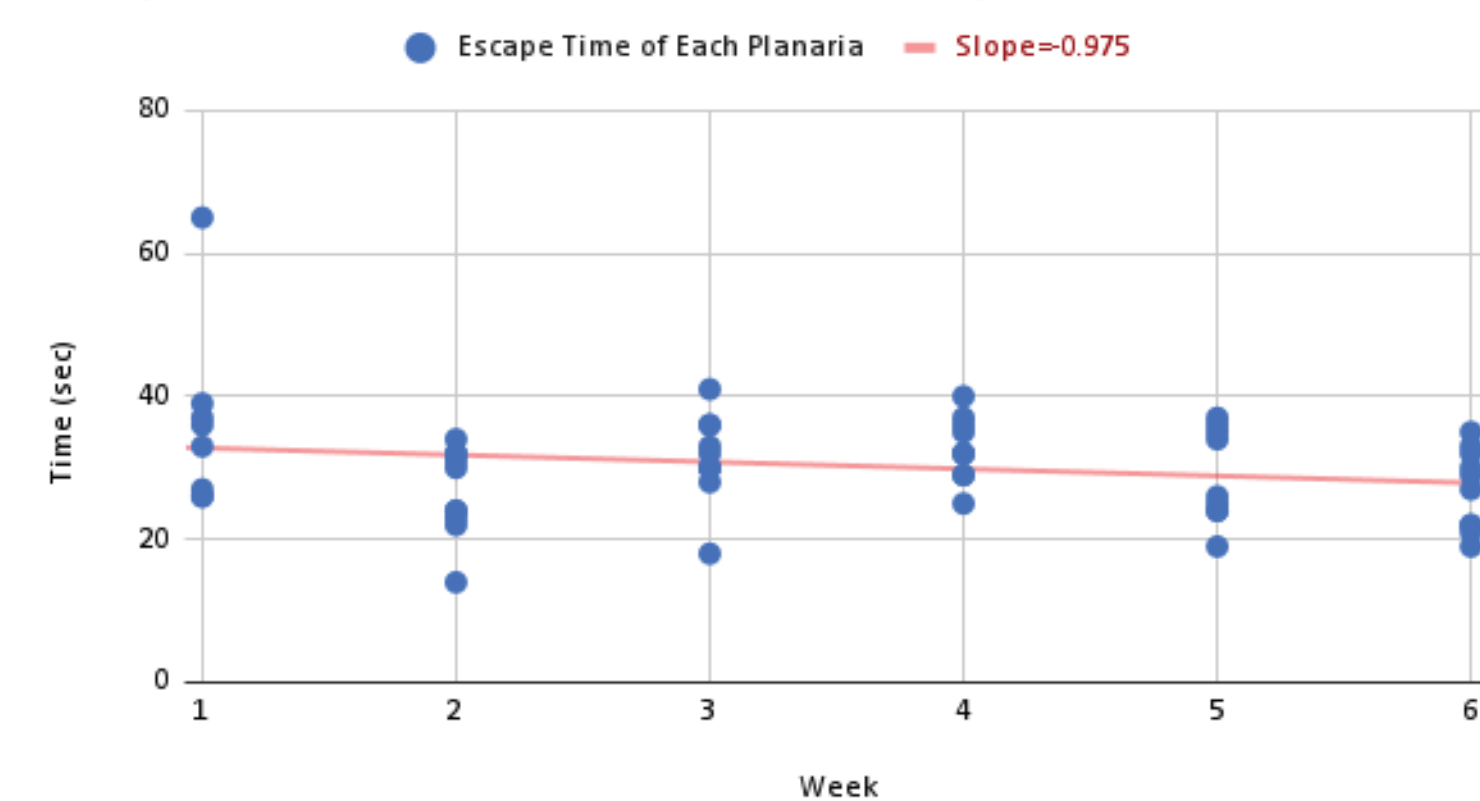
Escape Time after Illumination for Control Group



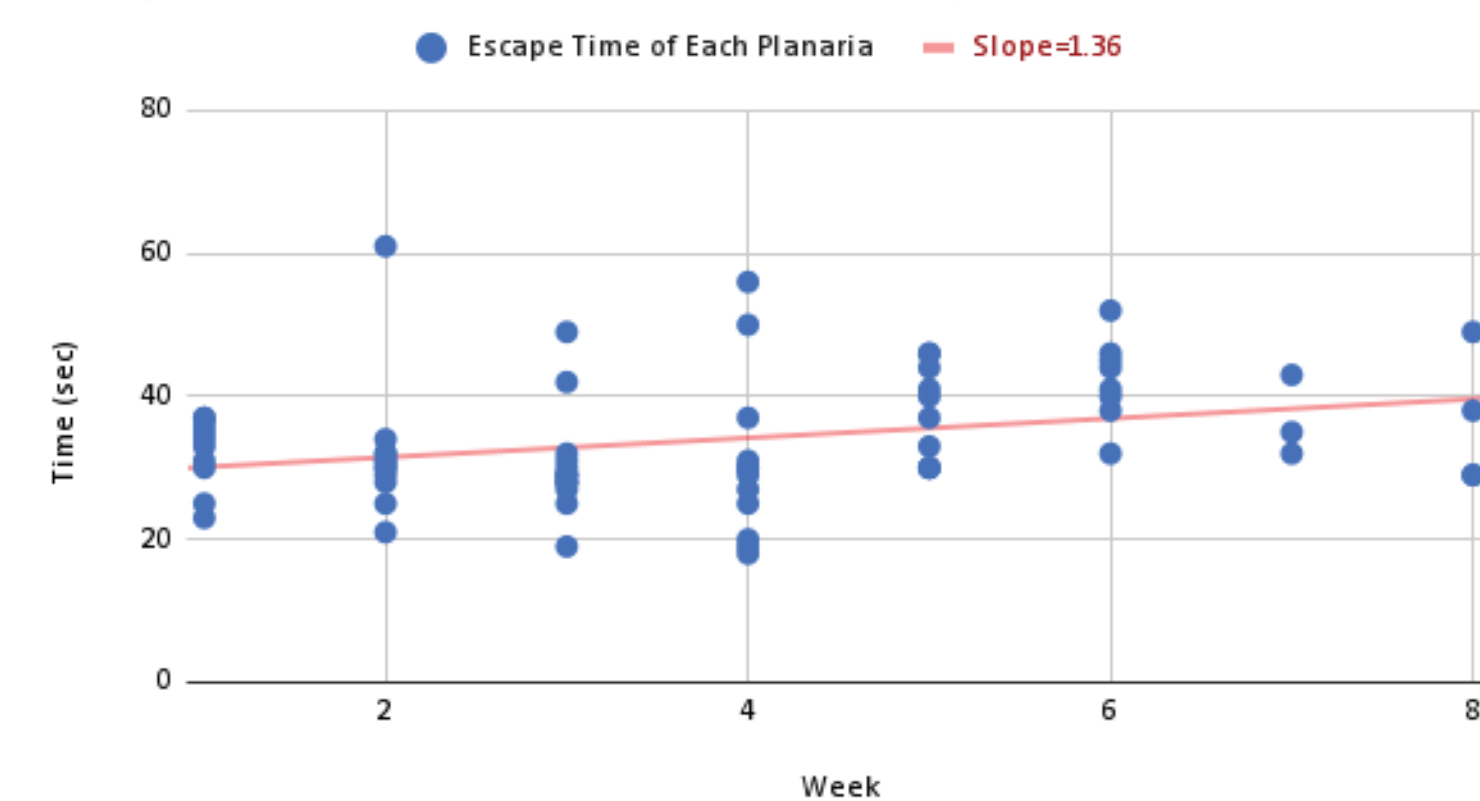
Escape Time after Illumination for 0.15% Experiment



Escape Time after Illumination for 0.75% Experiment



Escape Time after Illumination for 1.5% Experiment



Figures above display the planaria escape time after exposure to light for each concentration group  
 Positive slope = Planaria got slower when moving out of the light  
 Negative slope = Planaria got faster when moving out of the light

Possible mechanisms to explain the change in phototaxis response time include:

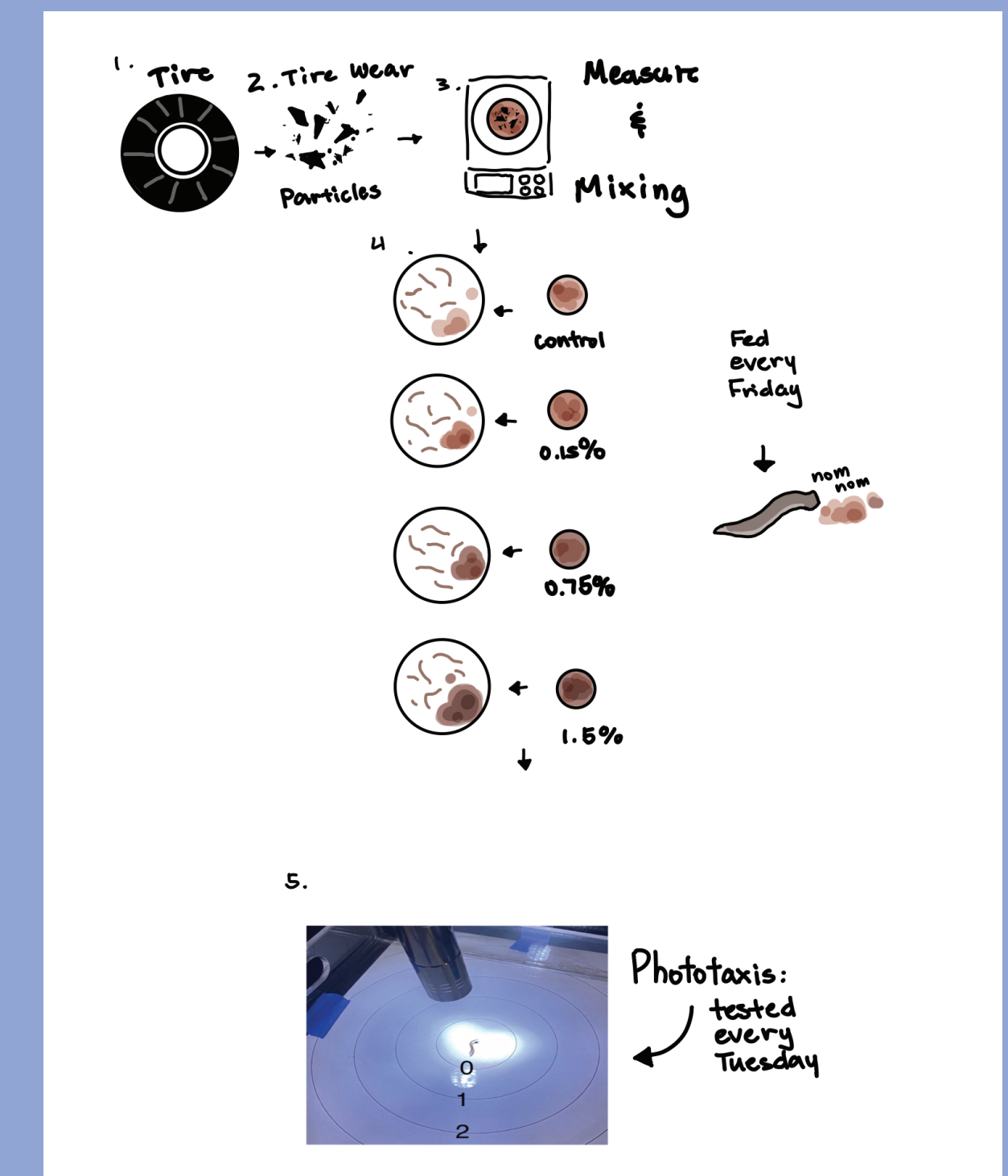
- ❌ Damage to musculature (would slow response for all groups except control)
- ❌ Damage to photoreceptors (would slow response for all groups except control)
- ✅ Neurological damage to inhibit learning (control group gets faster with learning, high TWP concentration group does not)
- ❌ Neurological damage to inhibit signal sent to the motor system (would slow response for all groups except control)

Only a learning interpretation allows for control and low TWP concentration groups to have a faster phototaxis response over time. We suggest this change in phototaxis response is caused by neurological damage to planarian learning ability.

Two significant implications:

- Potential Neurological harm in Humans:** suggested by similarities between human and planarian nervous system
- Planarian survival pressure:** damaged learning ability due to exposure to TWP results in increased predation

## Methods



## Selected References

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