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Zebrafish Larval Locomotor Activity is Depressed by Lack of Swim Bladder Inflation or Dimethyl sulfoxide

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INTRODUCTION AND OBJECTIVE

The U.S. Environmental Protection Agency is evaluating alternative methods to screen chemicals for their potential to cause developmental neurotoxicity, including locomotor activity of zebrafish larvae in response to photoperiod changes.

- Recently [1], the commonly-used solvent, dimethyl sulfoxide (DMSO) was shown to alter zebrafish locomotor activity and decrease swim bladder inflation.
- It is unclear, however, whether the two endpoints were related to each other or independently related to DMSO exposure during development.

Our objective was to understand the relationship between swim bladder inflation and locomotor activity following DMSO exposure.

METHODS

Experiment 1:

DMSO given during development

Fertilization

6-8 hours post fertilization

5 days post fertilization

6 days post fertilization

Experiment 2:

Acute DMSO

Fertilization

6-8 hours post fertilization

5 days post fertilization

6 days post fertilization

6 dpf larvae

Inflated, normal looking 6 dpf larvae

Locomotor assay

Swim bladder, mortality and morphological assessments

Light

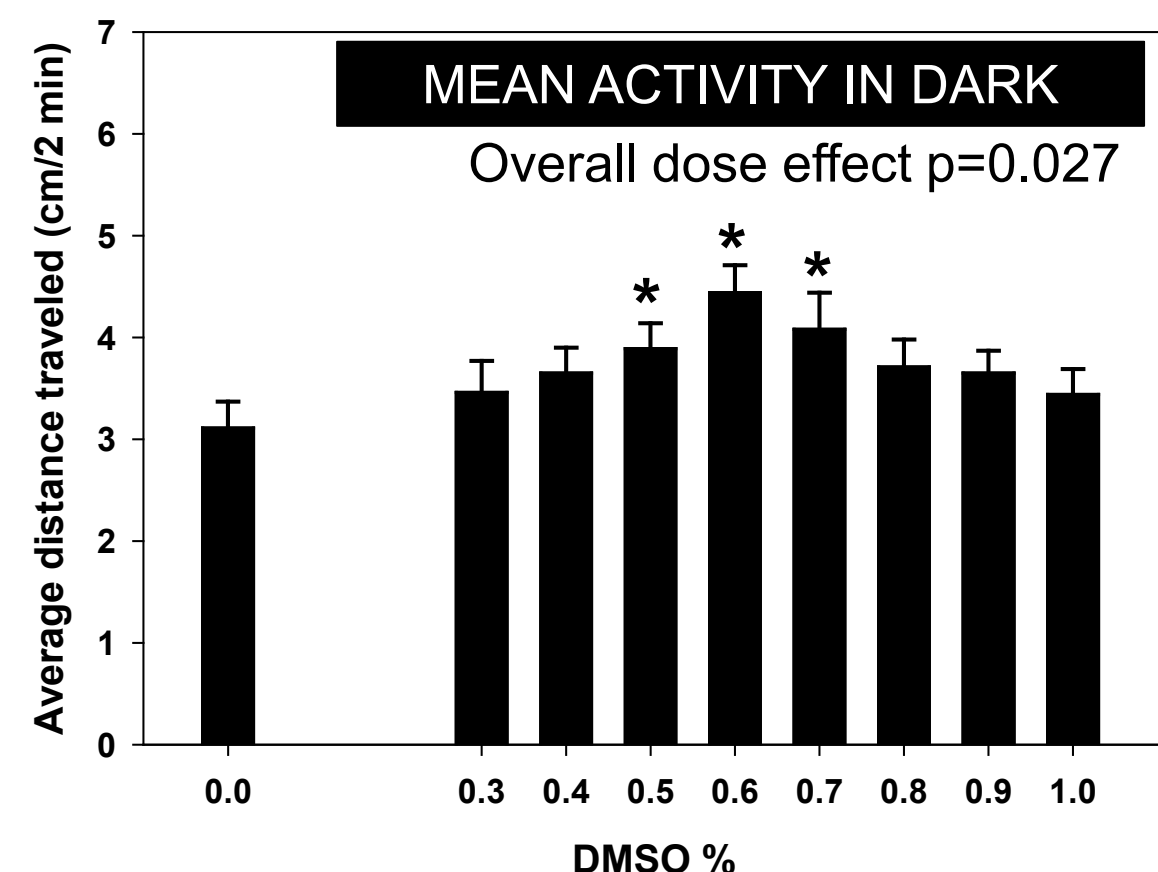
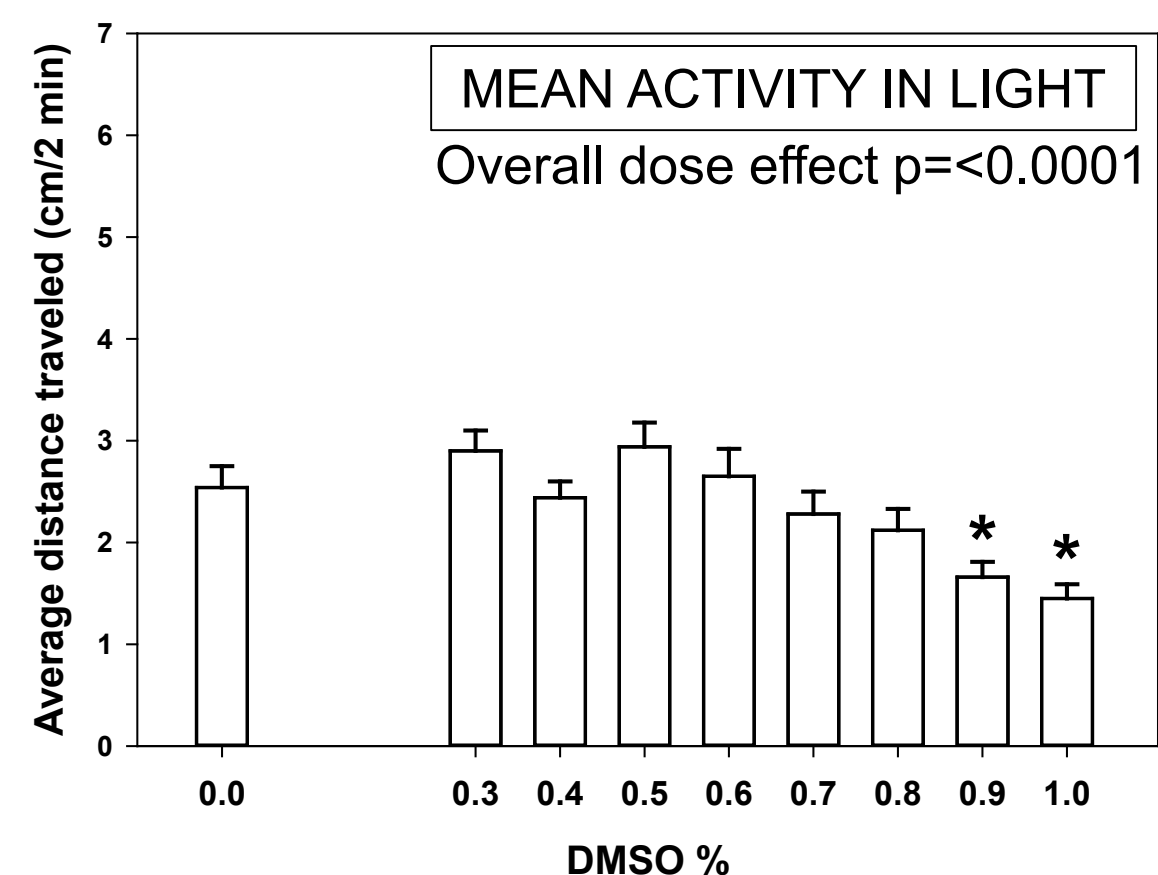
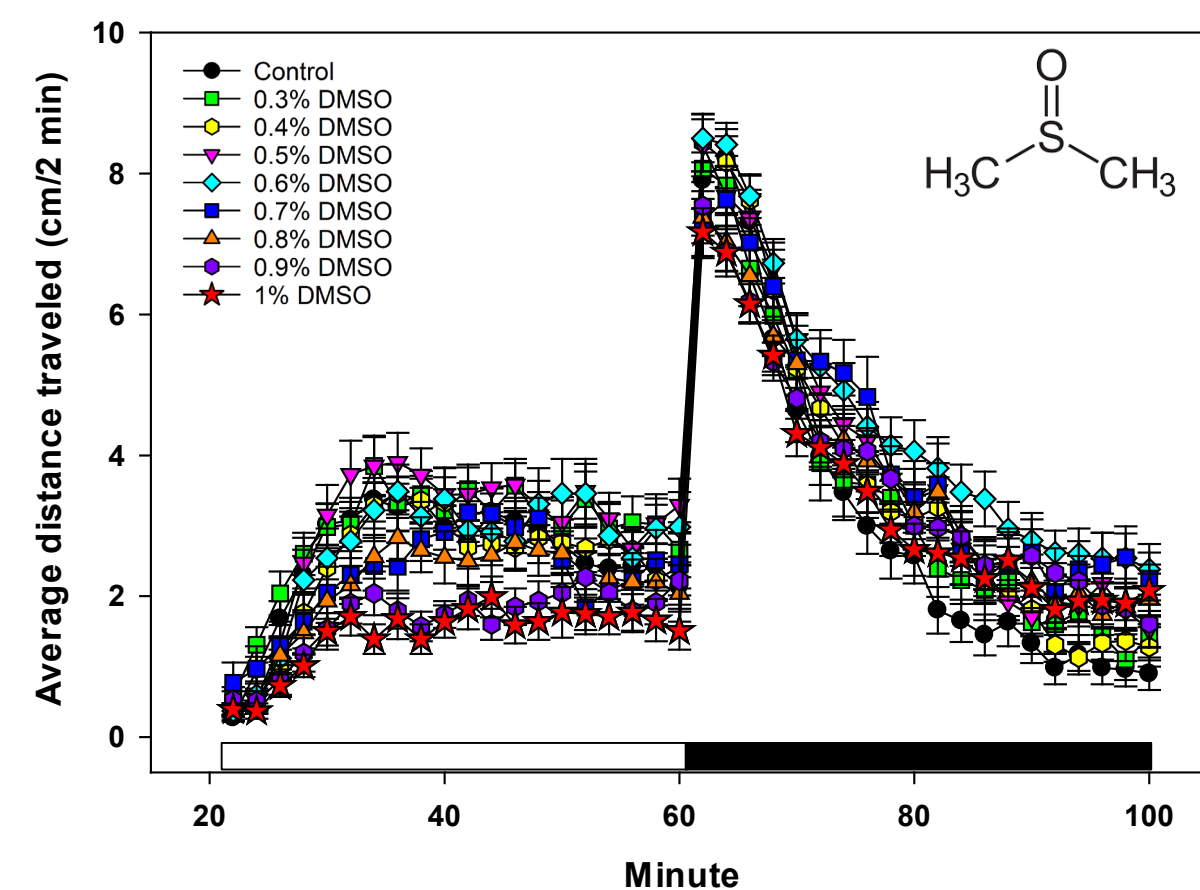
Dark



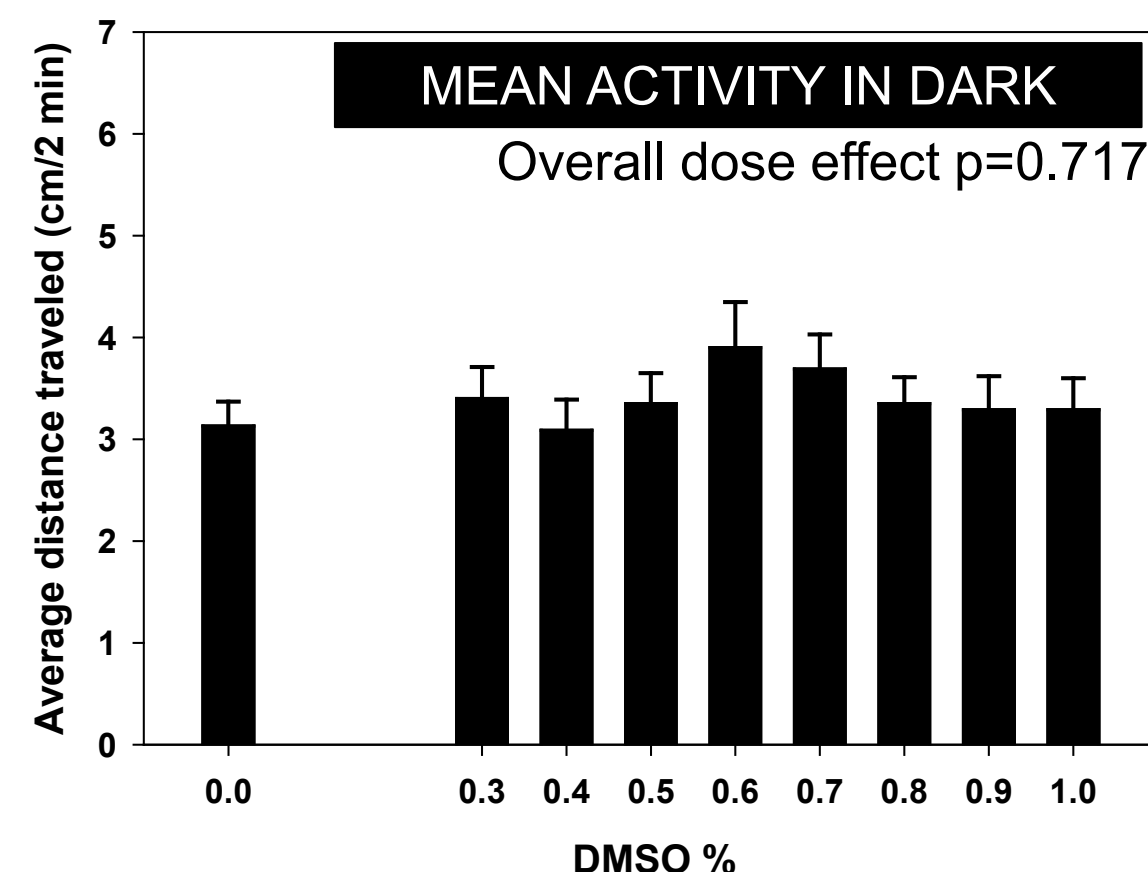
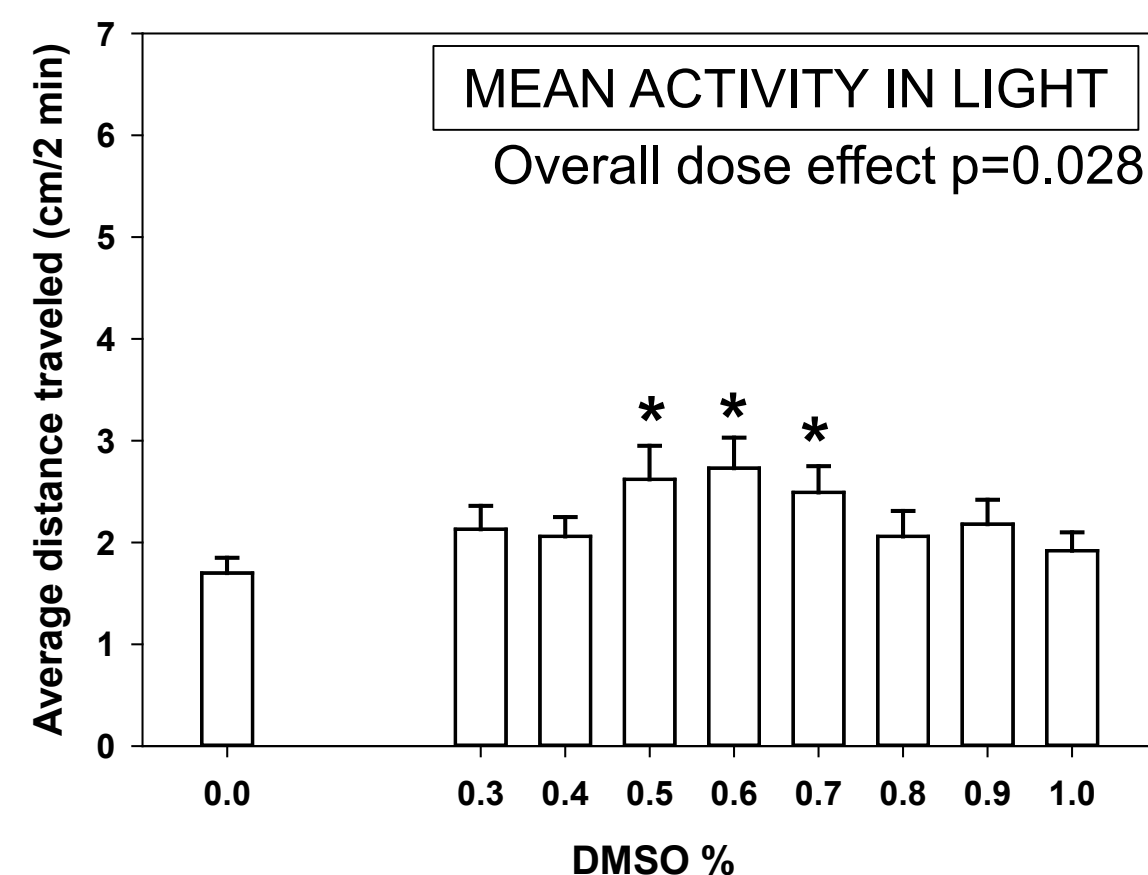
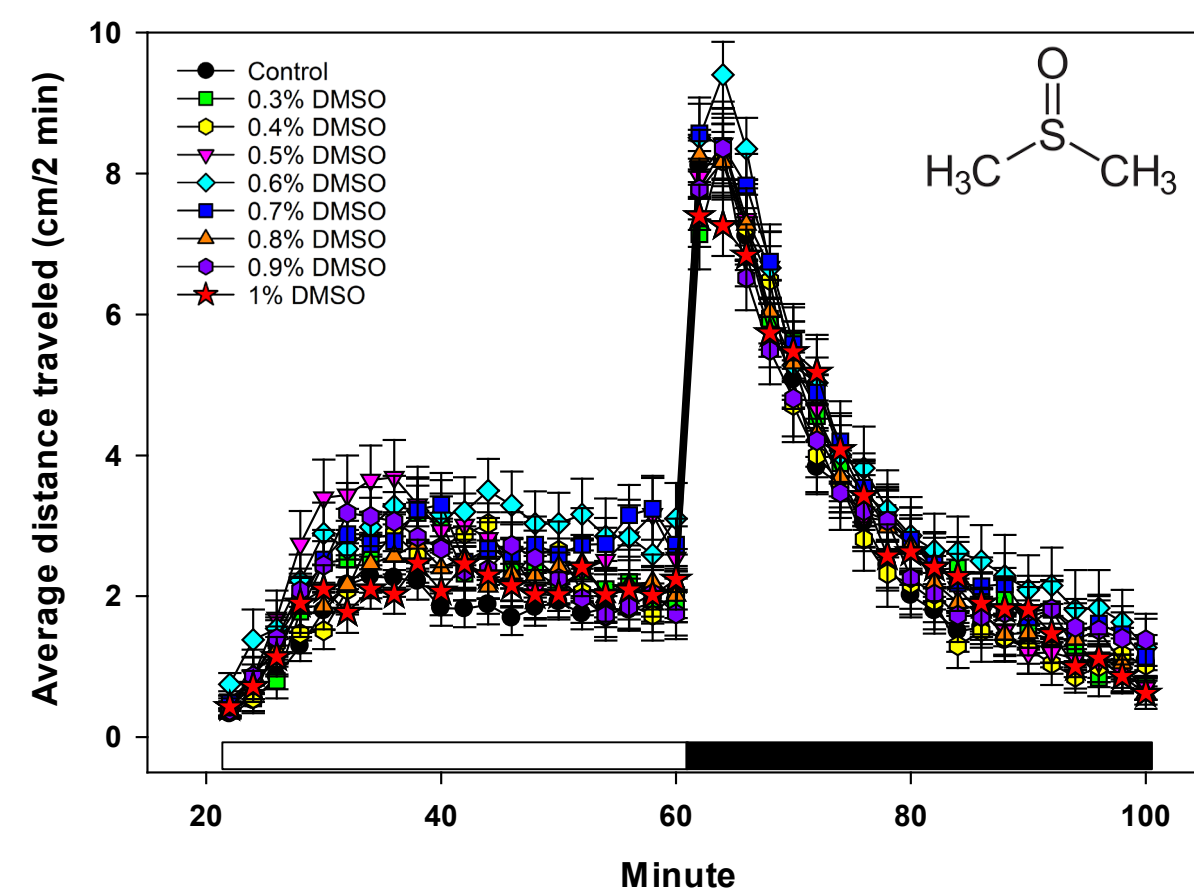
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DMSO affects locomotor activity independent of swim bladder status

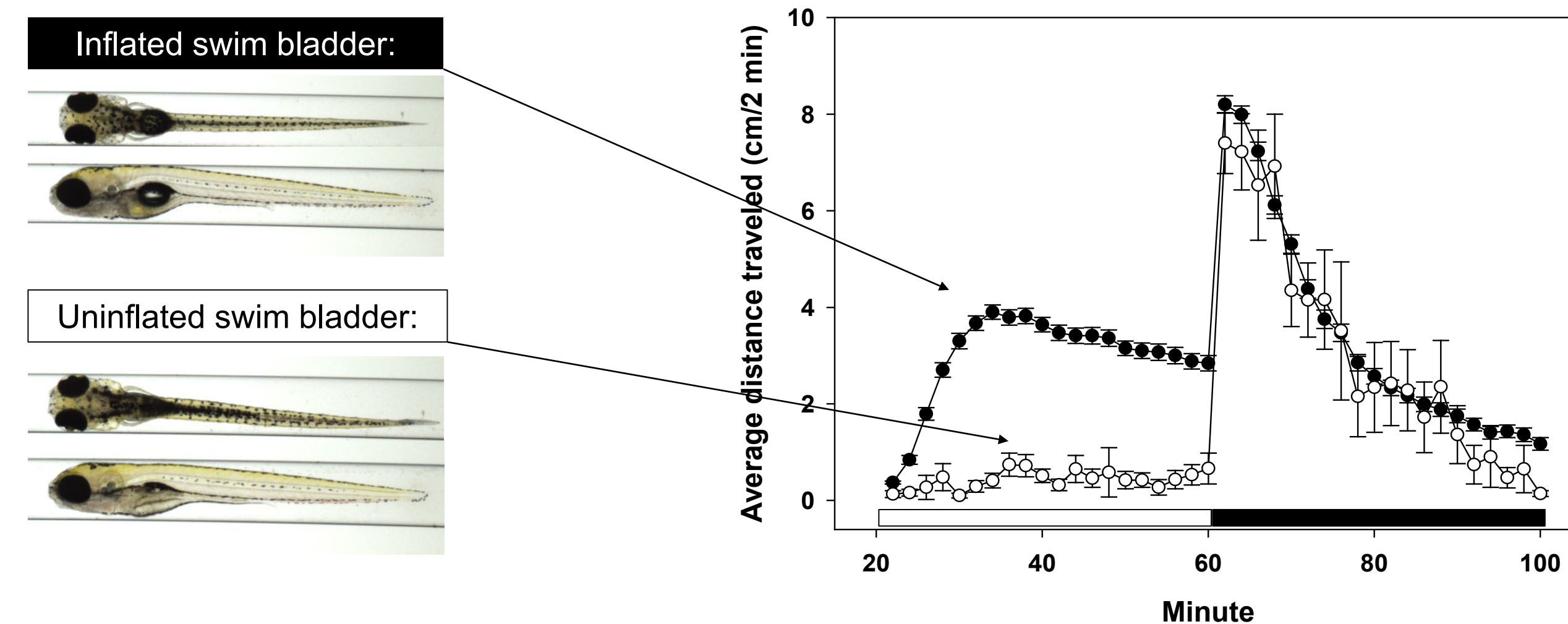
1. Developmental DMSO exposure elicits locomotor effects in both light and dark phases of testing



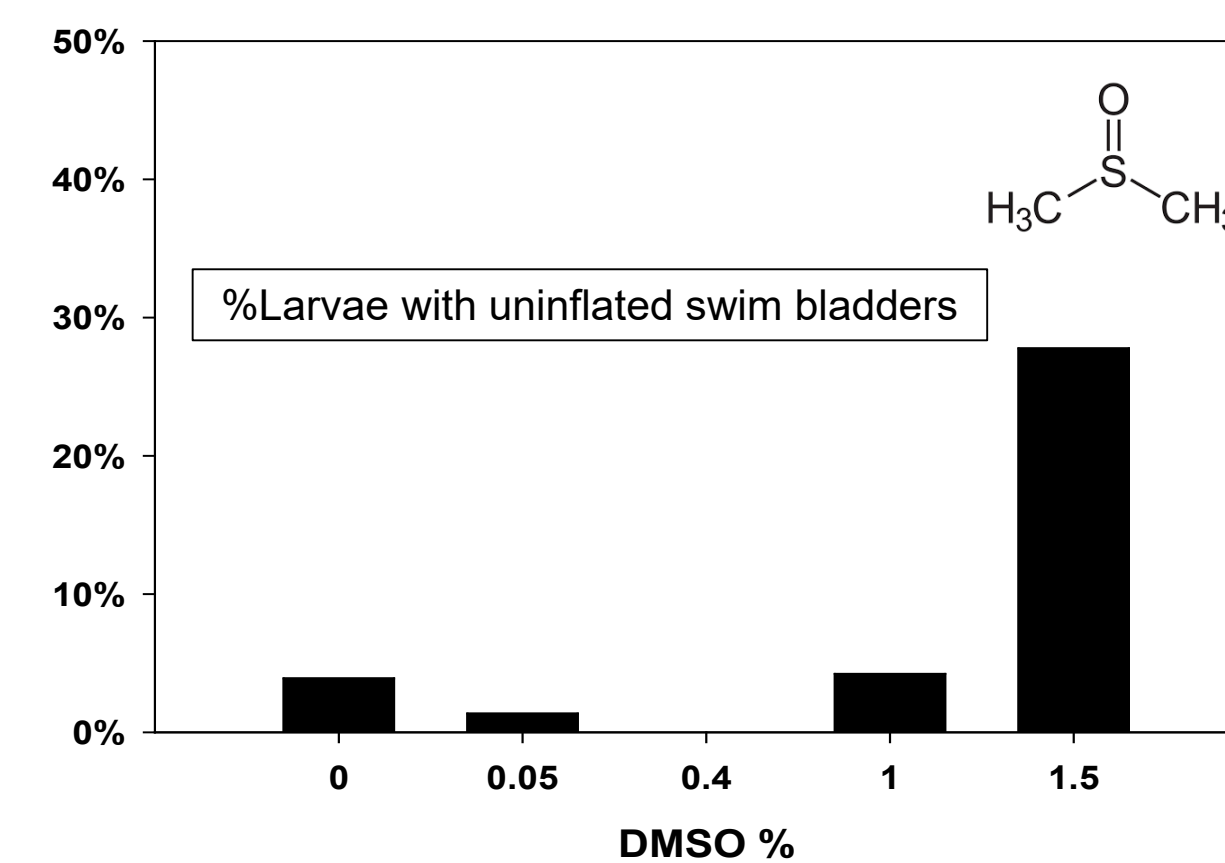
2. Acute DMSO exposure influences locomotor activity in the light phase of testing



Swim bladder status impacts control locomotor activity



1. DMSO depresses swim bladder inflation at high concentrations



CONCLUSIONS

- Swim bladder status markedly affected locomotor activity in control (i.e., not exposed to DMSO) larvae.
- DMSO appeared to independently alter swim bladder inflation and locomotor activity with locomotor activity the more sensitive endpoint.
- DMSO should be utilized with caution at or above 0.5% (v/v) in zebrafish studies where locomotor activity is assessed.

REFERENCES/ACKNOWLEDGEMENTS

[1] Teixidó et al. 2019. *Toxicological Sciences*. 167(2), 438-449

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