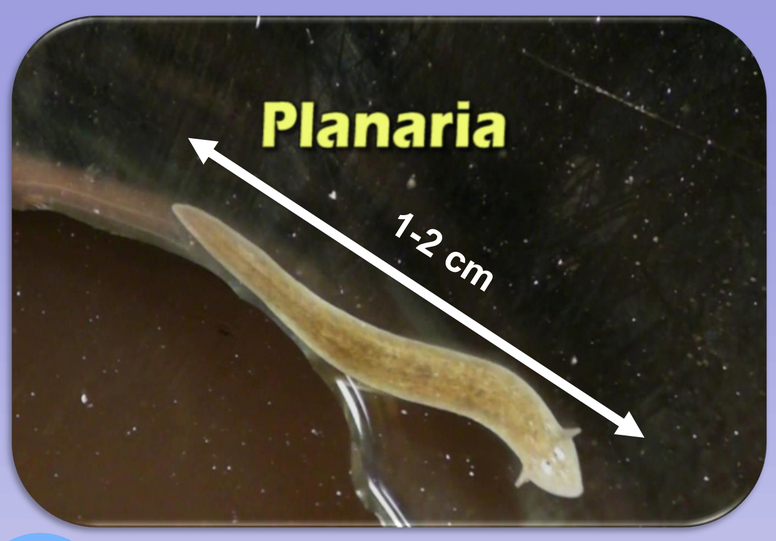
Sucrose addiction: Learn how sugar can affect your behaviour by using flatworms as a model

Rafat A. Mohammed Jawad, Claire V. Hutchinson, and Jose Prados
Department of Neuroscience, Psychology and Behaviour



Introduction

- Sucrose is an example of a natural substance that can cause addiction-like behaviour.
- The abuse of sucrose could play a relevant role in eating disorders like obesity and binge eating.
- The studies presented here show that sucrose elicits addictive-like behaviour in the invertebrate flatworm,

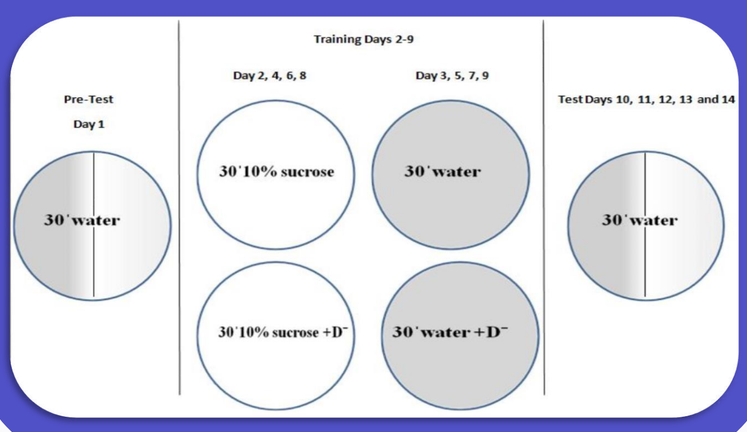
1

Conditioned Place Preference (CPP)

Objectives

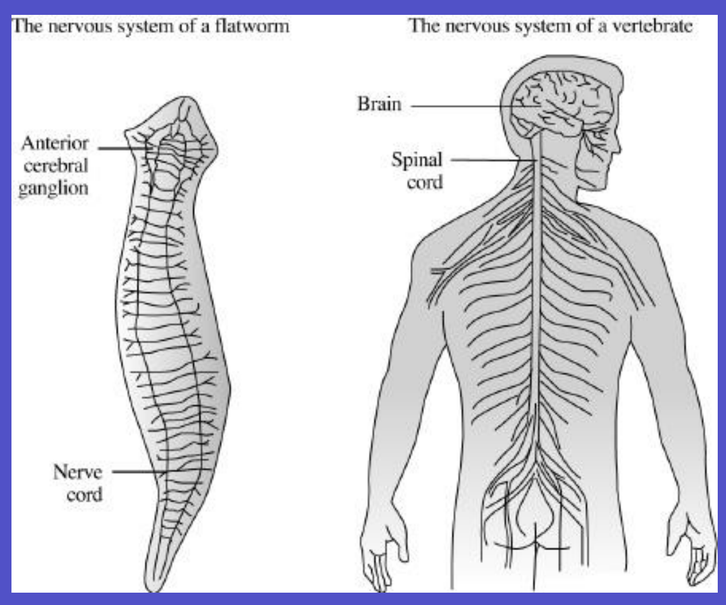
- Assess CPP in planaria using sucrose.
- Assess whether the development of CPP depends upon the dopamine system.
- Assess extinction of CPP.
- Check whether exposure to the rewarding agent reinstates a previously extinguished CPP response.

Schematic Representation of the Procedure



Planaria

- Their nervous system has key similarities to the nervous system of vertebrates.
- They can show addictive symptoms, like Conditioned Place Preference (CPP) and Tolerance.



Similarity of the CNS between Planaria and Human

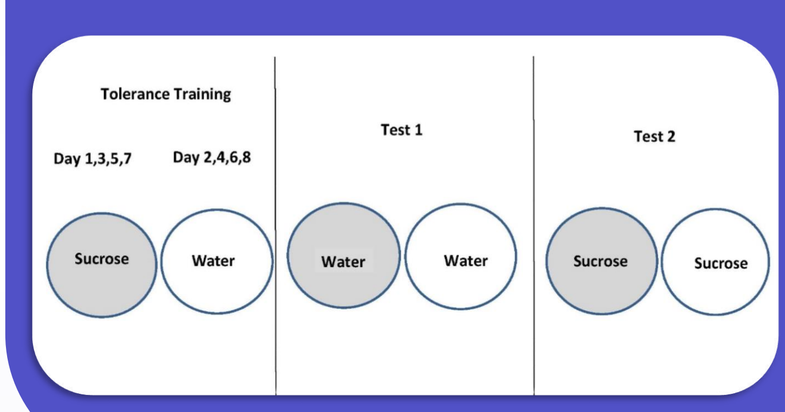
2

Development of Tolerance

Objectives

- Demonstrate whether planaria develop a compensatory response and tolerance.
- Explore the potential role played by the context in which the animals are exposed to the sucrose solution.

Schematic Representation of the Procedure



3

Results

Experiment 1

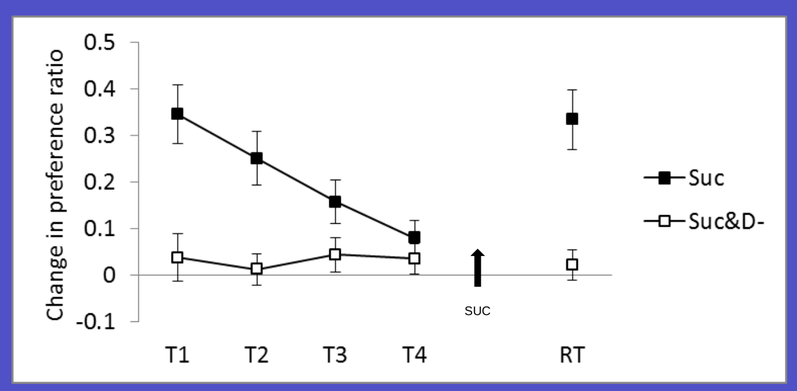


Figure 1. Change in preference ratio for the four tests in extinction trials (T1-T4) and the Reinstatement Test (RT).

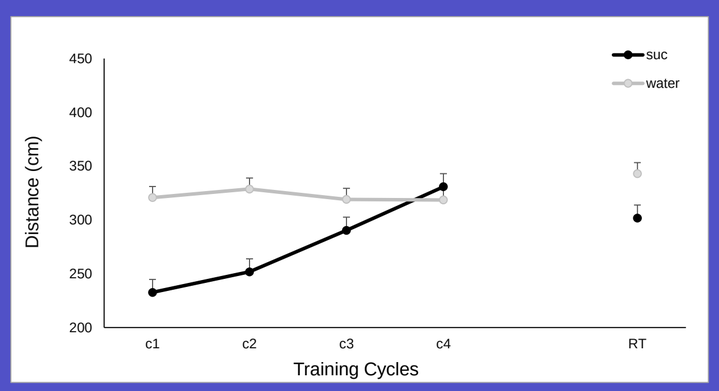


Figure 2. Mean of distance (± SEM) covered by the animals in the Sucrose and Water during the Exposure phases of the experiment.

Experiment 2

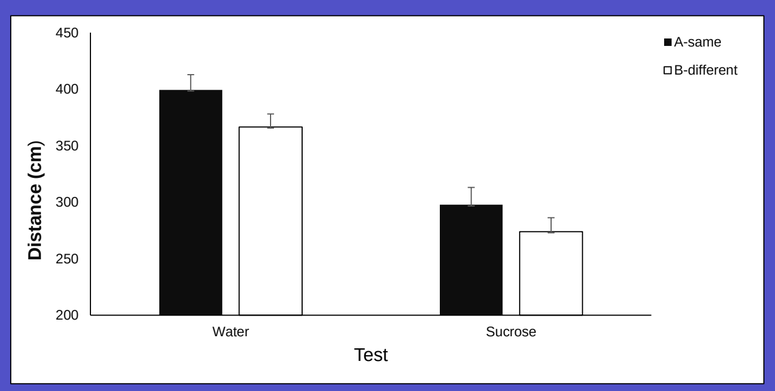


Figure 3. Mean of distance (± SEM) covered by the animals in the Water and Sucrose (same and different context) during the Test phases of the experiment.

4

Discussion

- Animals developed CPP and Tolerance after repeated exposure to sucrose.
- This instance of CPP depends upon the dopamine reward system.
- CPP extinguishes in planaria over four non-rewarded trials.
- The extinguished CPP response is reinstated by exposure to the rewarding agent (sucrose) in a different context.
- The contextual cues play an important role in the mechanism of tolerance.

5

Conclusion

- Planaria learn according to the same principles that rule learning in vertebrates.
- They are reactive to dopamine–related drugs in the same way as vertebrates (i.e., rats).
- Therefore, planaria is a good model for psychopharmacological research.

E-mail contact details
ramj1@le.ac.uk (Rafat A. Mohammed Jawad)