

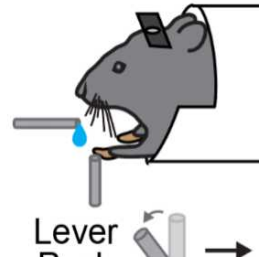


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Head-fixed Lever-pushing Task in Mice

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Protocol status: Working

We use this protocol and it's working

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Abstract

This protocol describes a head-fixed lever-pushing task used to study motor learning and memory in mice suitable for recording neuronal activity concurrently.

Attachments



Ding Lab_Head-fixed ...

5.3MB

Image Attribution

Image- partial schematic of head-fixed training apparatus, showing mouse with head-plate, mouse body restraining tube, water port, and lever.

Guidelines

Animals: Mice are placed in a reverse 12h light/dark cycle room for at least one week prior to training.

Safety warnings

 Wear appropriate PPE as required by your institution.

Ethics statement

Prior ethics approval (e.g. IACUC) should be obtained before performing these experiments. Approval was obtained by the Stanford University IACUC before any procedures were performed.



Before start

Mice in this task must have a head plate which is typically a minor surgery prior to this protocol.

Water restriction required (2 days):

Mice are water restricted and fed with ~1 ml of water per day. After 2-3 days, their body weight should be reduced to 85-90% of baseline weight and maintained throughout training.

Habituation (3~7 days)

- 1 Following water restriction mice will be habituated to head fixation and receiving water from a water port for at least 3 days.
- 2
 - Over the course of habituation mice will be gradually habituated to longer head fixation times by being placed on the head-fixation setup.
 - Note:** Head-fixation times per day depend on mouse comfort and will increase gradually until mice are comfortable for at least 20 minutes and actively drink water from the water port.
- 2.1 Mice are placed in the head fix set up for ~5 minutes on day 1.
- 2.2 Mice are placed in the head fix set up for 5~10 minutes on day 2.
- 2.3 Mice are placed in the head fix set up for 15~20 minutes on day 3.



Training (8+ days)

- 3 Habituated mice are trained for at least 8 training days. Each day, mice are placed on the head-fixed training apparatus, which consists of a head-plate holder, a mouse body restraining tube, a water port, and a joystick or lever (Fig. 1 in attached protocol).
- 4 **For a cued lever-pushing task**, training sessions typically last 20–60 minutes daily which consist of 100–300 trials.
- 4.1 Each trial begins with a 500 ms, 6-kHz pure tone.
- 5 After cue onset, mice that push the lever over a set threshold (1–6 mm depending on mouse and training stage) during the task period will receive a drop of water (approximately 8 μ l) as a reward.
- 5.1 Failure to push the lever over the threshold or no pushing will optionally trigger a loud white noise.



- 6 For each trial the task period lasts 10-30 seconds depending on the training stage, with an inter-trial interval (ITI) of 3 to 6 seconds.
- 6.1 Un-cued lever pushes during the ITI will cause an additional timeout for that trial.
- 7 For an un-cued lever-pushing task, training sessions typically last 15-30 minutes.
- 7.1 During this time mice can self-initiate lever-pushing movements.
- 7.2 Lever movements that cross the set threshold (1-6 mm depending on mouse and training stage) will be rewarded with a drop of water (approximately 8 μ l).
- 8 Mice that do not perform any lever pushes on the first 3 days of training will be removed from the study.
- 9 Training will last for at least 8 training days.