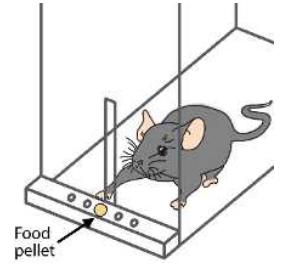


Nov 14, 2024

Forelimb Reaching Task in Mice

DOI

<https://dx.doi.org/10.17504/protocols.io.e6nvw1n5dlmk/v1>



Fuu-Jiun Hwang¹, Richard Roth¹, Jun B. Ding¹, Yue Sun¹

¹Stanford University



Christine Weber-Schmidt

Allen Institute

Create & collaborate more with a free account

Edit and publish protocols, collaborate in communities, share insights through comments, and track progress with run records.

Create free account

OPEN  ACCESS



DOI: <https://dx.doi.org/10.17504/protocols.io.e6nvw1n5dlmk/v1>

Protocol Citation: Fuu-Jiun Hwang, Richard Roth, Jun B. Ding, Yue Sun 2024. Forelimb Reaching Task in Mice. **protocols.io**
<https://dx.doi.org/10.17504/protocols.io.e6nvw1n5dlmk/v1>

License: This is an open access protocol distributed under the terms of the **Creative Commons Attribution License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited

Protocol status: Working

We use this protocol and it's working

Created: August 29, 2024

Last Modified: November 14, 2024

Protocol Integer ID: 106638

Keywords: ASAPCRN, mouse, learning, task, forelimb, forelimb reaching task in mice, forelimb reaching task, memory in mice, forelimb, motor learning, reaching task, mice, memory, study

Funders Acknowledgements:

Aligning Science Across Parkinson's (ASAP)

Grant ID: ASAP-020551

Abstract

This protocol describes a forelimb reaching task used to study motor learning and memory in mice.

Attachments



Ding Lab_Forelimb Re...

3.7MB

Image Attribution

Image generated by Ding Lab

Materials

The behavior chamber is a transparent Plexiglas box (20cm height, 15cm depth, 8.5cm width) with a vertical slit opening on the front (0.5cm width) (Figure 1/image rendering of behavior chamber is associated with this protocol).

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 are placed in a reverse 12h light/dark cycle room for at least 1 week prior to training.

Food restriction (2 days):

- Mice are food restricted and fed with ~0.1 grams of food per 1 gram of body weight per day. After 2 days, their body weight should be reduced to 85-90% of baseline weight and maintained throughout training.
- If TRAP mice are used and 4-Hydroxytamoxifen (4-OHT) injections are planned during training, mice are habituated to the injection procedure. Starting on the same day as food restriction, mice receive 0.3 ml saline injections IP daily throughout the experiments. Food chow is provided as a reward immediately after injections.



Shaping (3~7 days)

- 1 **Shaping Day 1**-One or two mice (same sex and previously housed together) are placed in the behavior chamber for 20 mins with food pellets provided on the chamber floor.
- 2 **Shaping Day 2**-Mice are placed individually in the chamber with food pellets provided on the chamber floor.
- 3 **Shaping Days 3~7**-A tray filled with food pellets is placed against the wall outside the chamber, allowing the mice to reach the pellets through the chamber opening.
 - 3.1 Mice are placed individually in the chamber for 20 minutes or until they made 5 consecutive reaching attempts using one limb or a total of 20 reaching attempts.

The goal of shaping on Day 3 is to determine the dominant limb of each mouse. Shaping is considered complete when a mouse makes 5 consecutive reaching attempts using one limb or made over 70% of its attempts using the same limb (dominant limb).
 - 3.2 This process could be repeated for up to 5 days (total of 7 days). Mice not meeting the criteria after 5 days are dropped from the experiment.
 - 3.3 **Note:** Although training typically begins the day after shaping, it is acceptable to wait a few days between shaping and training.
- 4 Shaped mice are trained for 8-10 days. Each day, mice are placed individually in the chamber and trained to reach, grasp, and retrieve food pellets from a platform using their dominant limbs.

STEP CASE

Standard Training

2 steps

This is for experiments that do not involve capturing neurons involved during the reaching task.

- 5 Mice are trained for 30 reaches or 20 minutes per day, **whichever came first**.
- 5.1 Criteria for reach performance is monitored by recording the type of each reach:
 - **Success:** The mouse reaches with its preferred limb, grasps the pellet, retrieves it, and feeds it into its mouth.



- Drop: The mouse reaches with its preferred limb, grasps the pellet, but drops it before feeding.
- Fail: The mouse reaches with its preferred limb but misses or knocks the pellet off the holding plate.
- In-vain Reaches: Reaches made when no pellet is on the platform; not counted towards total reaching attempts.
- Contralateral Reaches: Reaches made with the non-dominant limb; not counted towards total reaching attempts. Success rate is calculated by the formula: $\text{Number of Success reaches} / (\text{Success} + \text{Drop} + \text{Fail reaches})$. In-vain and contralateral reaches are not included.