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Protocol status: Working
We use this protocol and it's working

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Operant Conditioning

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ABSTRACT

This protocol is for training mice operant conditioning to assess cognitive performance using the resources described in Matikainen-Ankney BA et al 2021.

PROTOCOL REFERENCES

Matikainen-Ankney BA, Earnest T, Ali M, Casey E, Wang JG, Sutton AK, Legaria AA, Barclay KM, Murdaugh LB, Norris MR, Chang YH, Nguyen KP, Lin E, Reichenbach A, Clarke RE, Stark R, Conway SM, Carvalho F, Al-Hasani R, McCall JG, Creed MC, Cazares V, Buczynski MW, Krashes MJ, Andrews ZB, Kravitz AV. An open-source device for measuring food intake and operant behavior in rodent home-cages. Elife. 2021 Mar 29;10:e66173. doi: 10.7554/eLife.66173. PMID: 33779547; PMCID: PMC8075584.

MATERIALS

FED 3.0 operant boxes

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Operant box set-up

1 Singly house and food restrict the mice.

2 In each animal cage, position a FED3.0 operant box. To prevent wood bedding from entering the nose poke, provide reduced bedding amounts to each animal.

3 Define the FED 3.0 operant box with two nose pokes using infrared beams to determine nose entry, and position a food pellet dispenser in the middle.

Pellet training

4 Train mice to the FED3.0 for 24 hours with 6g of chow pellets placed on the floor.

5 For the following two days, expose each mouse to free-feeding sessions where 20mg sugar pellets (BioServ) are randomly delivered to habituate the mice.

6 For the next 3 days, switch to a Fixed Ratio 1 (FR1) protocol starting at 09:00.
- Pair each correct poke with an auditory cue and the delivery of a single sugar pellet, while pairing each incorrect poke was a visual cue (Blue LED positioned below the pellet dispenser).
- When a pellet is delivered, program so that both correct and incorrect nose pokes became inactive to prevent multiple pellet deliveries.

7 After three consecutive sessions of FR1, increase the protocol to Fixed Ratio 3 (FR3) for one day.
- Each time the mouse produces three correct nose pokes, deliver a 20mg pellet with the same auditory cue.
- Pair incorrect pokes with a visual cue to indicate errors.
- Similar to FR1, when a pellet is delivered, both correct and incorrect nose pokes are inactivated to avoid multiple pellet deliveries.

"Follow the light" testing

8 Finally, on the last day, switch the protocol to "Follow the Light" for 24 hours.
- Associate the poke with pellet delivery with a yellow LED light turning ON in the nose poke.
- When a poke occurrs on the correct side, deliver a 20mg sugar pellet with an auditory cue
- Pair incorrect poke with a visual cue.
- Similar to the previous protocols, when a pellet is delivered, inactivate both correct and incorrect nose pokes to prevent multiple pellet deliveries.

9 The number of correct, incorrect pokes and pellets collected within 10s of delivery were then extracted for further analyses.

Analysis

10 Extract the following measures:
- The number of correct pokes
- The incorrect pokes
- Pellets collected within 10s of delivery