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Behavioral analyses in mice

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Nicolas Giguère[1,2], louis-eric.trudeau Trudeau[1,2]

[1]Department of Pharmacology and Physiology, Faculty of Medicine, Université de Montréal;
[2]Department of Neurosciences, Faculty of Medicine, Université de Montréal

ASAP Collaborative Rese…

L Lilia Rodriguez
Université de Montréal

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Abstract

This collection of protocols describes different behavioural assays performed in mice including, grip strength test, pole test, rotarod, open field and nose poking learning task.

Guidelines

This protocol needs prior approval by the users' Institutional Animal Care and Use Committee (IACUC) or equivalent ethics committee

Materials

- Grip strength apparatus (BioSeb instruments, BIO-GS3, France)

Equipment

Grip strength apparatus (BioSeb instruments, BIO-GS3, France)	NAME
BioSeb instruments	BRAND
BIO-GS3	SKU
https://pdf.medicalexpo.com/pdf/bioseb/bio-gs3/99329-259294.html	LINK

- Rotarod apparatus (Harvard Apparatus, LE8205, USA)

Equipment

rotarod apparatus (Harvard Apparatus, LE8205, USA)	NAME
Rota Rod with Touchscreen, 5 Mice	TYPE
Rota Rod	BRAND
76-0770	SKU
https://panlab.com/en/products/rotarod	LINK

- Infrared actimeter (Superflex sensor version 4.6, Omnitech) using the Fusion software (v5.6 Superflex Edition, RRID:SCR_017972)
- 0.9% sodium chloride saline solution (Halyard, #cat 116)
  Halyard Saline Unit Single Dose 0.9% Sodium Chloride Solution - 15mL - Box 24 **Halyard health Catalog #**116
- Cocaine hydrochloride 20 mg/kg (Medisca, cat# 53-21-4, Canada) Cocaine Hydrochloride **Medisca Inc.**
- D-amphetamine sulfate at 5 mg/kg (Tocris, 2813, UK) D-Amphetamine sulfate **Tocris Catalog #**2813
- SCH23390-HCl 50 µg/kg (Sigma, D-054, Canada)
  R(+)-SCH-23390 hydrochloride **Merck MilliporeSigma (Sigma-Aldrich) Catalog #**D-054

- Quinpirole-HCl 0.2 mg/kg (Sigma, Q-102, Canada)

  (−)-Quinpirole hydrochloride **Merck MilliporeSigma (Sigma-Aldrich) Catalog #**Q-102

- Raclopride L-tartrate 1 mg/kg (Sigma, R-121, Canada)

  S(−)-Raclopride (+)-tartrate salt **Merck MilliporeSigma (Sigma-Aldrich) Catalog #**R-121

Grip strength test

2h 30m

1 A grip strength apparatus (BioSeb instruments, BIO-GS3, France) was used to evaluate paw force of 10-12-week-old male or female mice.

Procedure:

1.1 Habituate the mouse in the testing room for at least 01:00:00 . 1h

1.2 Hold the mouse firmly by the tail and slowly lower it on the grid of the grip strength apparatus until the forepaws grasp the middle of the grid.

1.3 Lower the mouse to a horizontal position and slowly pull following the axis of the sensor until the mouse releases its grasp on the grid.

1.4 Repeat the test 3 times with 30 min resting period between each trial. 1h 30m

- Repeat the test for 00:30:00 (1/3).
- Repeat the test for 00:30:00 (2/3).
- Repeat the test for 00:30:00 (3/3).

1.5 Once testing is completed, place the mouse back into its home cage and clean the apparatus before testing the next mouse.

Pole test

1h

2 The test was conducted with a homemade 48 cm metal rod of 1 cm diameter covered with adhesive tape to facilitate traction. Male or female mice of 10-12-weeks of age were used.

Procedure:

2.1 Habituate the moude in the testing room for at least 01:00:00 . 1h

2.2 Hold the mouse on the surface of your hand and bring it up to the top of the pole.

2.3 Position the mouse head-up at the top of the pole.

2.4 Record the time required to turn (t-turn) and to climb down completely.

2.5 Once testing is completed, place the mouse back into its home cage and clean the metal rod before testing the next mouse.

Rotarod

5h 21m

3 Motor coordination was evaluated with a rotarod apparatus (Harvard Apparatus, LE8205, USA) on 10-12-week-old male or female mice.

Mice were pre-trained on the rotarod for two consecutive days to reach a stable performance and then tested on the third day.

Procedure:

3.1 Day 1

1h 1m

- Habituate the mouse in the testing room for at least 01:00:00 .
- Place the mouse on the rotarod at 4 rpm for up to 00:01:00 or a maximum or 3 trials.
- Once testing is completed, place the mouse back into its home cage and clean the apparatus before testing the next mouse.

3.2 Day 2

2h 10m

- Habituate the mouse in the testing room for at least 01:00:00 .
- Place the mouse on the rotarod with an accelerated rotation of 4 rpm - 40 rpm for 00:10:00 .
- Repeat 2 more times with 30 minutes resting period between each trial.

- Repeat for 00:30:00 (1/2).
- Repeat for 00:30:00 (2/2).

3.3 Day 3 2h 10m

- Habituate the mouse in the testing room for at least 01:00:00 .
- Place the mouse on the rotarod with an accelerated rotation of 4 rpm - 40 rpm for 00:10:00 .
- Repeat 2 more times with 30 minutes resting period between each trial.

- Repeat for 00:30:00 (1/2).
- Repeat for 00:30:00 (2/2).

- Record the latency to fall of all 3 trials.

Open field 1h

4 The locomotor behavior of 11-12-week-old male or female mice was recorded using an infrared actimeter (Superflex sensor version 4.6, Omnitech) using the Fusion software (v5.6 Superflex Edition, RRID:SCR_017972). A chamber partition was used to test two mice at the same time. Subjects were not given time to acclimate to the chamber and spent a total of 01:00:00 in the chamber with the following protocol: 1h

4.1 Habituate the mouse in the testing room for at least 01:00:00 . 1h

4.2 Place the mouse in the chamber and record basal locomotion for 00:20:00 . 20m

4.3 After 00:20:00 , pause the recording and administer drugs or saline. In the present study, this was one of the following substances: 20m

- 0.9% sodium chloride saline solution (Halyard, #cat 116)
- Cocaine hydrochloride 20 mg/kg (Medisca, cat# 53-21-4, Canada)
- D-amphetamine sulfate at 5 mg/kg (Tocris, 2813, UK)
- SCH23390-HCl 50 µg/kg (Sigma, D-054, Canada)
- Quinpirole-HCl 0.2 mg/kg (Sigma, Q-102, Canada)
- Raclopride L-tartrate 1 mg/kg (Sigma, R-121, Canada)

4.4 Immediately place the mouse back into the chamber and record locomotion for another 00:40:00 . 40m

4.5 Once testing is completed, place the mouse back into its home cage and clean the open field boxes before testing the next mouse.

Nose poking operant learning task

30m

5 Appetitively motivated operant learning was assessed using the open source Feeding Experimentation Device 3 (FED3) (https://doi.org/10.7554/eLife.66173). Individually housed animals were evaluated in a 12h/12h light/dark cycle.

Procedure:

5.1 Place the feeding devices in the home cages under a free feeding paradigm (automatically dispenses a new pellet each time the mouse collects the pellet in the well) for 2 days.

5.2 After 2 days, change the device mode to a fixed ratio (FR1) paradigm (the mouse learns to nose poke on the active port to receive a single pellet).

5.3 Record nose-poking rate and poke efficiency for 3 consecutive days.

5.4 After 3 days, change the device mode to a repeating progressive ratio schedule (nose-poking requirement begins at FR1 and increases by 1 poke each time a pellet is earned)

30m

o When mice fail to poke on either active or inactive port for 00:30:00, the ratio is automatically reset to FR1.

5.5 Record nose-poking rate and poke efficiency for 3 consecutive days.

5.6 Once testing is completed, remove the feeding device from the home cage and clean it before testing the next session.