



Mar 11, 2025

Open Field & Cylinder test Behavior Assays

DOI

<https://dx.doi.org/10.17504/protocols.io.eq2ly6ypegx9/v1>

Akira Fushiki^{1,2,3}

¹Allen Institute; ²Zuckerman Mind Brain Behavior Institute, Columbia University;

³Aligning Science Across Parkinson's (ASAP) Collaborative Research Network



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.eq2ly6ypegx9/v1>

Protocol Citation: Akira Fushiki 2025. Open Field & Cylinder test Behavior Assays . **protocols.io**
<https://dx.doi.org/10.17504/protocols.io.eq2ly6ypegx9/v1>

Manuscript citation:

A Vulnerable Subtype of Dopaminergic Neurons Drives Early Motor Deficits in Parkinson's Disease
Akira Fushiki, David Ng, Zachary R. Lewis, Archana Yadav, Tatiana Saraiva, Luke
A. Hammond, Christoph Wirblich, Bosiljka Tasic, Vilas Menon, Joaquim Alves da Silva, Rui M. Costa
bioRxiv 2024.12.20.629776; doi: <https://doi.org/10.1101/2024.12.20.629776>

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: February 19, 2025

Last Modified: March 11, 2025

Protocol Integer ID: 122195

Keywords: ASAPCRN, cylinder test behavior assay, open field test, cylinder test, protocols for mouse, assay, behavioral study, cylinder test from fushiki et al, mouse, open field, test

Funders Acknowledgements:

Aligning Science Across Parkinson's

Grant ID: ASAP-020551

Abstract

Protocols for mouse behavioral studies using the open field test and the cylinder test from Fushiki et al 2024.

Guidelines

The habituation period is used in this protocol and is recommended especially for assessing basic locomotor activity or movement, but it depends on the experiment. Longer acclimation periods can reduce exploratory behaviors, so extending the period may not be ideal for studies focused on such behaviors.

Materials

Read through protocol for full details on software and programs used.

The materials used are:

- Open Field square arena (40 × 40 × 20 cm, length x width x height) housed inside a sound-attenuating chamber
- Cylinder arena: 15cm diameter x 30cm length housed inside a sound-attenuating chamber
- Video recording set up: FLIR (Point Grey Flea) camera with a CS-mount lens at a resolution of 1280 × 1024 pixels and a frame rate of 30 Hz
- Wireless motion sensor compatible with WEAR system by the Champalimaud Hardware Platform

Safety warnings

 Wear appropriate PPE as required by your institution.

Ethics statement

This protocol was approved by Columbia University IACUC. Please do not perform any of these procedures unless there is prior approval from the institution's animal ethics committee.



- 1 Mice can be put into two behavioral assays.

STEP CASE

Open-Field Test 11 steps

Sensor Habituation

- 2 Mice are acclimated to the wireless motion sensor (~1.8 g) in their home cage for 15 minutes on the first day.
- 3 On the second day, they undergo a 30-minute acclimation period in the arena before the actual behavioral testing begins.
- 4 It is crucial to confirm that the system is functioning properly within the arena and to ensure that the sensor's battery is consistently fully charged. 
- 5 Each mouse undergoes two behavioral assays over two days. 

Recording Setup

- 6 Behavioral recording is conducted using a FLIR (Point Grey Flea) camera with a CS-mount lens at a resolution of 1280 × 1024 pixels and a frame rate of 30 Hz. Ensure proper contrast and brightness settings to optimize animal tracking.
- 6.1 **Open-Field Test:** Mice are recorded from a top-down view for 30 minutes.

Video Acquisition and Data Analysis

- 7 Videos are acquired using FlyCapture software and the open-source Bonsai visual programming environment.
- 8 During the open-field test, mouse centroid coordinates are tracked in Bonsai, providing a rough estimation for post-hoc analysis. The recorded videos are later fully analyzed using DeepLabCut (DLC) to extract detailed activity metrics, including trajectory and velocity.



Wireless Motion Sensor Data Collection

- 9 Motion data is collected using the WEAR system by the Champalimaud Hardware Platform. The sensor samples nine-axis motion data from a three-axis accelerometer, gyroscope, and magnetometer, with sampling rates up to 200 Hz.
- 10 Data transmission occurs via a base station using the Harp system, accessible through software (e.g., Harp Wear) that allows for easy adjustment of sensor parameters as needed.
- 11 The WEAR system is also compatible with Bonsai, allowing for synchronized recording between motion sensor data and video data for comprehensive behavioral analysis.