Appendix 8:
IBL protocol for passive stimulation (after the task)

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The latest version of this protocol, as well as the associated material list and CAD files, can be found on Figshare via this specific link.

All IBL protocols cited in the article can be found on Figshare via this master link.

Please cite the associated article when using any of these materials and protocols

https://www.biorxiv.org/content/10.1101/2022.05.09.491042

Note: Some of the links may forward to internal documents of the IBL that are unpublished. If you do not have access but wish to obtain it, please send an email to info@internationalbrainlab.org to request it.

Appendix 8: IBL protocol for passive stimulation (after the task)

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Introduction

A recording in behaving animals will comprise two parts:
1) Recording during the behavioral protocol
2) Recording during passive stimulation

The aim is to record sensory, task-related and spontaneous responses from the same neurons whose activity was recorded during the behavior task.
The recording will be continuous across parts 1) and 2).

This document outlines the stimulus details used in protocol 2).

Passive stimulation protocol

Stop the behaviour task as per the IBL protocol for electrophysiology recording using Neuropixels probe.
Do not stop recording !
- Continuous recording of ephys data
- Continuous recording of the wheel data
- Continuous recording of cameras data
- Continuous recording of microphone data

Block the reward delivery (10% sucrose water), and launch the protocol below.

1. Spontaneous activity

Once the behavior session has ended, perform recordings of spontaneous activity from the same location for **10 minutes**.

2. Receptive field mapping

Parameters: Receptive fields are mapped with white and black squares of 8-degree visual angle (dva) edge length, corresponding approximately to a ~15x15 (HxW) grid (some stimulus position are located partially off-screen) on a gray background. The gray background is the same as used during the behavioral task. The grid position is adjusted so that the center of the middle square is aligned to the crossing of azimuth and elevation. For a given position, a stimulus will be presented (ON) for a set amount of time (200ms), and turned OFF for a random amount of time (independent poisson process; ~0.1Hz average rate).

Black and white squares are presented in an interleaved fashion. A sequence contains 10 repeats of a stimulus presented for each position.

Total time: ~ **5 min**.

References: Steinmetz et al. (2018); Roth et al. (2016)

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3. *Replay of task stimuli*

The replayed task stimuli were: left, right (±35 deg azimuth) visual stimuli of each contrast (6%, 12%, 25%, 100%; 20 repeats/each side; 20 trials at 0% contrast); go cue beep; white noise burst; reward valve sound (40 repeats).

In details:

1) Visual stimulus (Gabor patch) was displayed for 300 ms stimulus duration, with 500-1900 ms uniform random delay between stimuli.
2) The reward valve clicks was presented for 40 times, once every six seconds on average (e.g. 1-11 sec uniform random intervals).
3) The go cue and white noise burst were presented 40 times each, once every three seconds on average (e.g. 1-5 sec uniform random intervals).

Note: Timings of presentation are independent in those 3 channels, and start concurrently. Stimuli are thus superimposed, as displayed in the figure below.

In total: **~ 5 min.**
- 20 repeats - visual stimulus (~20s)
- 40 repeats - valve, go cue, white burst noise

The sequence is frozen and kept constant for each recording.

Overall stimulus sequence

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1. Spontaneous activity (**10 min**)
2. Receptive fields mapping: for visual responses; no water delivered (**5 min**)
3. Replay of Task Stimuli: Task-related events will be randomised and displayed (no water delivered) for (**5 min**).

Overall : **20 minutes**