SPIKING ACTIVITY IN THE POSTERIOR STRIATUM IS LINKED TO DISTINCT BEHAVIOR AND TONE PRESENTATION IN AWAKE MICE

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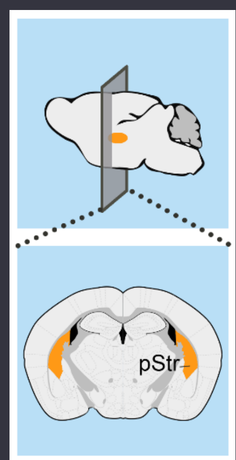
Introduction

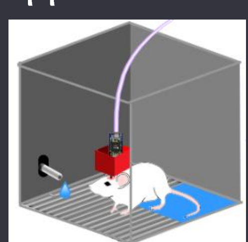


Posterior striatum (or tail of the striatum) receives inputs from various cortical structures and thalamic nuclei. Its function has begun to be elucidated recently, but knowledge is limited how the microcircuits in the posterior striatum contribute to neural processes.

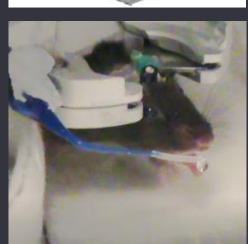
Our AIM is to get deeper insights into the function of the posterior striatum, thus we analysed the spiking activity of individual neurons in freely moving and head-fixed mice.

Methods

We analysed the spiking activity of well-isolated single units and multi-unit activity in awake mice using two different approaches.

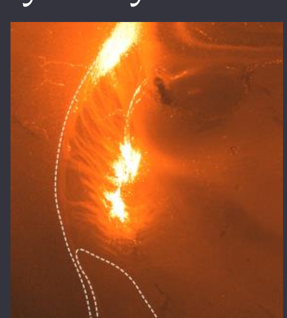


In Freely moving conditions, recordings of extracellular units were conducted by a bundle of 32 Nickel-Chrome wires.

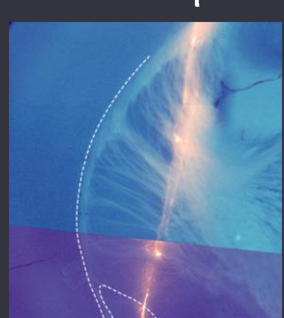


In Head-fixed conditions in a floating platform (Mobile Home Cage, Neurotar). Recordings were conducted using silicon probes.

The single unit separations were performed using the MClust software and the data was analysed by custom-made MATLAB scripts.



Freely moving example track



Head-fixed example track

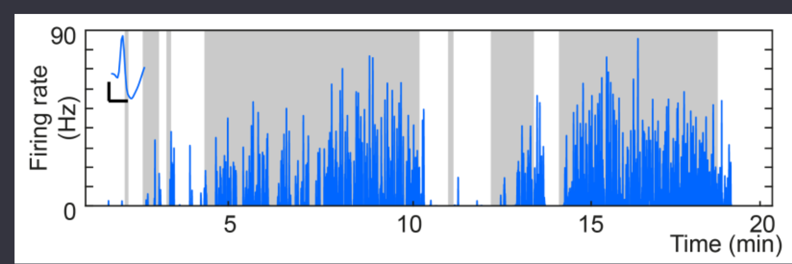
Highlights

- The activity of a large portion of posterior striatal neurons (30.26%) is related to a wide range of behavioural responses.
- These neurons respond to acoustic stimulation (46%), either to pure or broadband frequencies, with short latencies.
- The average population response to the acoustic stimulation is comparable to that of the primary auditory cortex.
- Neural circuits comprising the posterior striatum may be involved in shifting behavioural actions controlled by environmental inputs.

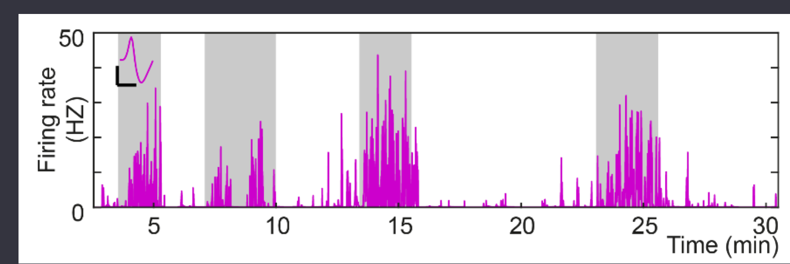
Results

BEHAVIOURAL CORRELATES

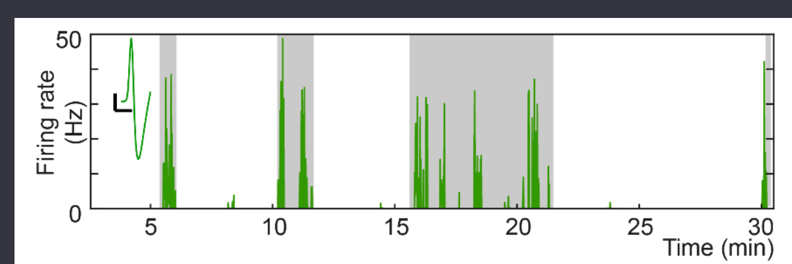
Firing change of neurons responsive to different behaviours, namely moving/ exploring, resting, grooming and licking (N = 76 neurons).



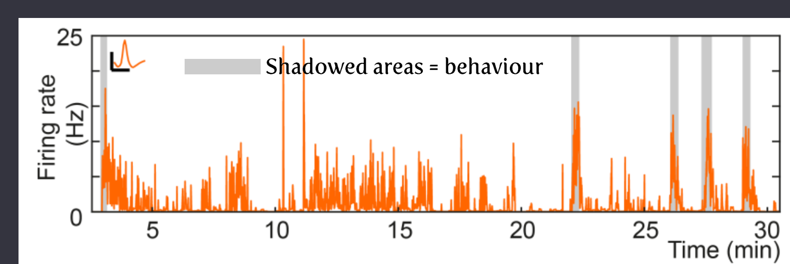
Moving/ Exploring (15.76%, N = 12)



Resting (9.21%, N = 7)



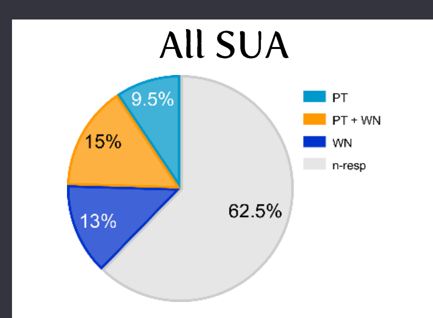
Grooming (3.95%, N = 3)



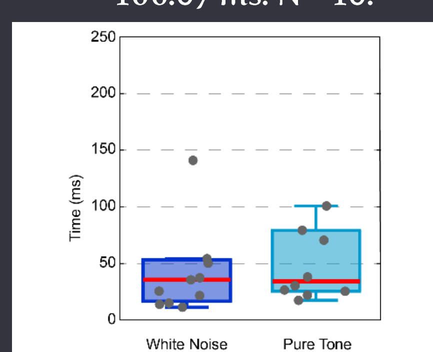
Licking (1.32%, N = 1)

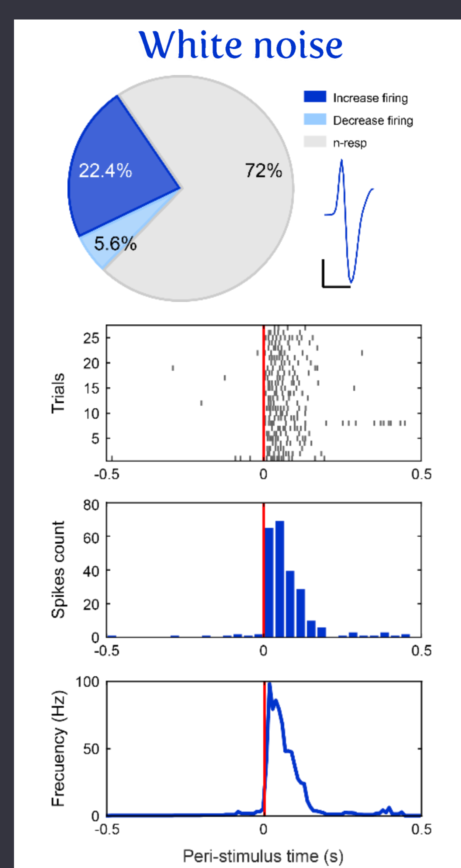
TONE PRESENTATION - SUA

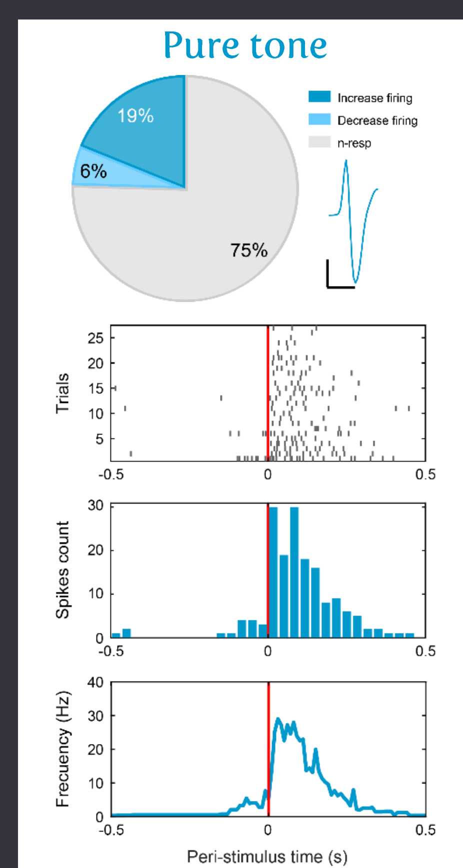
Responsiveness of the well-isolated neurons (Single-Unit Activity) in the posterior striatum to acoustic stimulation (N = 53).



Latency of first spike:
White noise, median 35.55 ± 96.16 ms. N = 11.
Pure tone, median 34.80 ± 166.07 ms. N = 10.

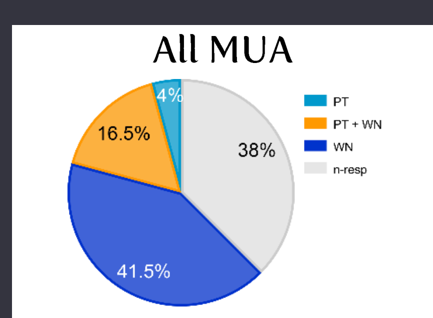




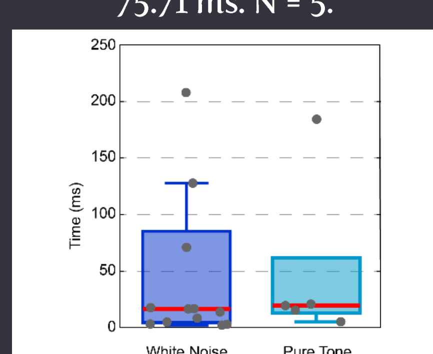


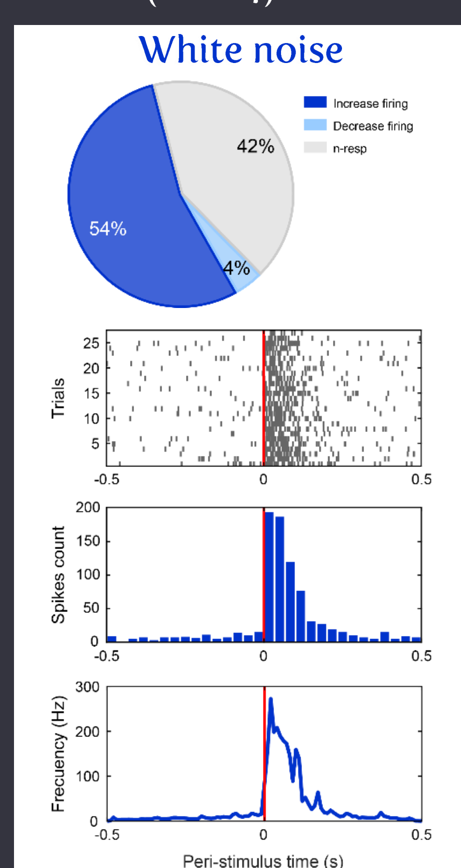
TONE PRESENTATION - MUA

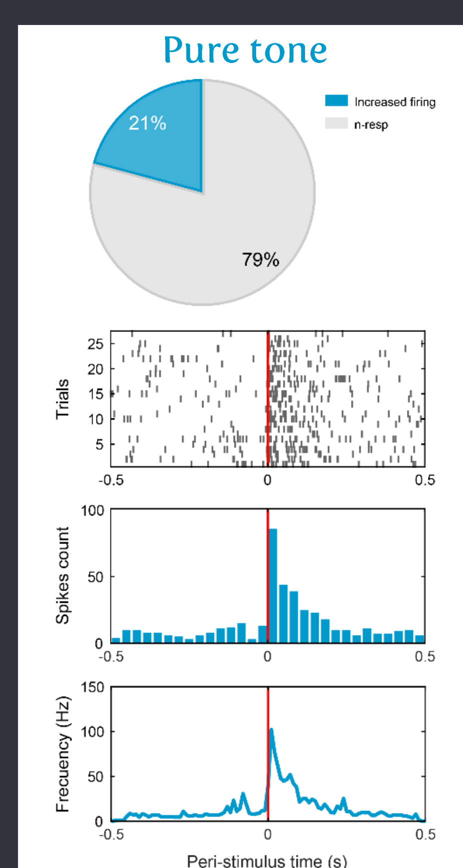
Responsiveness of the average spiking of small neuronal populations (Multi-Unit Activity) in the posterior striatum to acoustic stimulation (N = 24).



Latency of first spike:
White noise, median 16.93 ± 139.87 ms. N = 13.
Pure tone, median 19.16 ± 75.71 ms. N = 5.







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