Behavioral Discrimination of Auditory Space Is Predicted by Average Neuronal Discrimination

Avinash Bala, Matthew Spitzer and Terry Takahashi. Institute of Neuroscience, University of Oregon, Eugene OR 97403

**Behavior**

Spatial discrimination was measured using the habituation and recovery of the acoustically evoked pupillary dilation response (PDR). The PDR was habituated by repeated presentation of sound from a source at one location, then retested by presenting sound from a source at another location, incremented azimuthally by 1°.

The minimum discriminable separation was 2°. The same value was obtained when the data were analyzed using empirical ROC curves (proportion correct), or Naïve. One subject (s) was also used for neurophysiology (following panels).

**Space-specific neurons**

Receptive fields were assessed at a 1° resolution in virtual space, at a sound level of 52 dB SPL. Azimuthal tuning was then assessed at the finer resolution of 1°.

Most (90%) of the neurons can, with some variability, distinguish azimuthal separations at levels better than behavior. Behavioral performance (red line) is indistinguishable from the mean discrimination performance of the neuronal population (blue arrows).

Conclusions

1. Neuronal performance can equal behavioral performance; thus, coarse coding is not required to explain spatial discrimination by the owl.
2. Neuronal performance frequently exceeds behavioral performance, suggesting that the 'lower envelope principle' does not apply to spatial discrimination by space map neurons.
3. The average discrimination achieved by the responding population of neurons provides the best estimate of behavioral performance.
4. The total change in space map population activity that results when a source is displaced in azimuth can be used as a decision statistic, yielding a discrimination ability of these neurons.

Discrimination (D)

Response (mVs)

Azimuth (°)

Behavioral Discrimination of Auditory Space Is Predicted by Average Neuronal Discrimination

Avinash Bala, Matthew Spitzer and Terry Takahashi. Institute of Neuroscience, University of Oregon, Eugene OR 97403

Behavioral Discrimination of Auditory Space Is Predicted by Average Neuronal Discrimination

Avinash Bala, Matthew Spitzer and Terry Takahashi. Institute of Neuroscience, University of Oregon, Eugene OR 97403