

Supplementary Information

Inhibition within a premotor circuit controls the timing of vocal turn-taking in zebra finches

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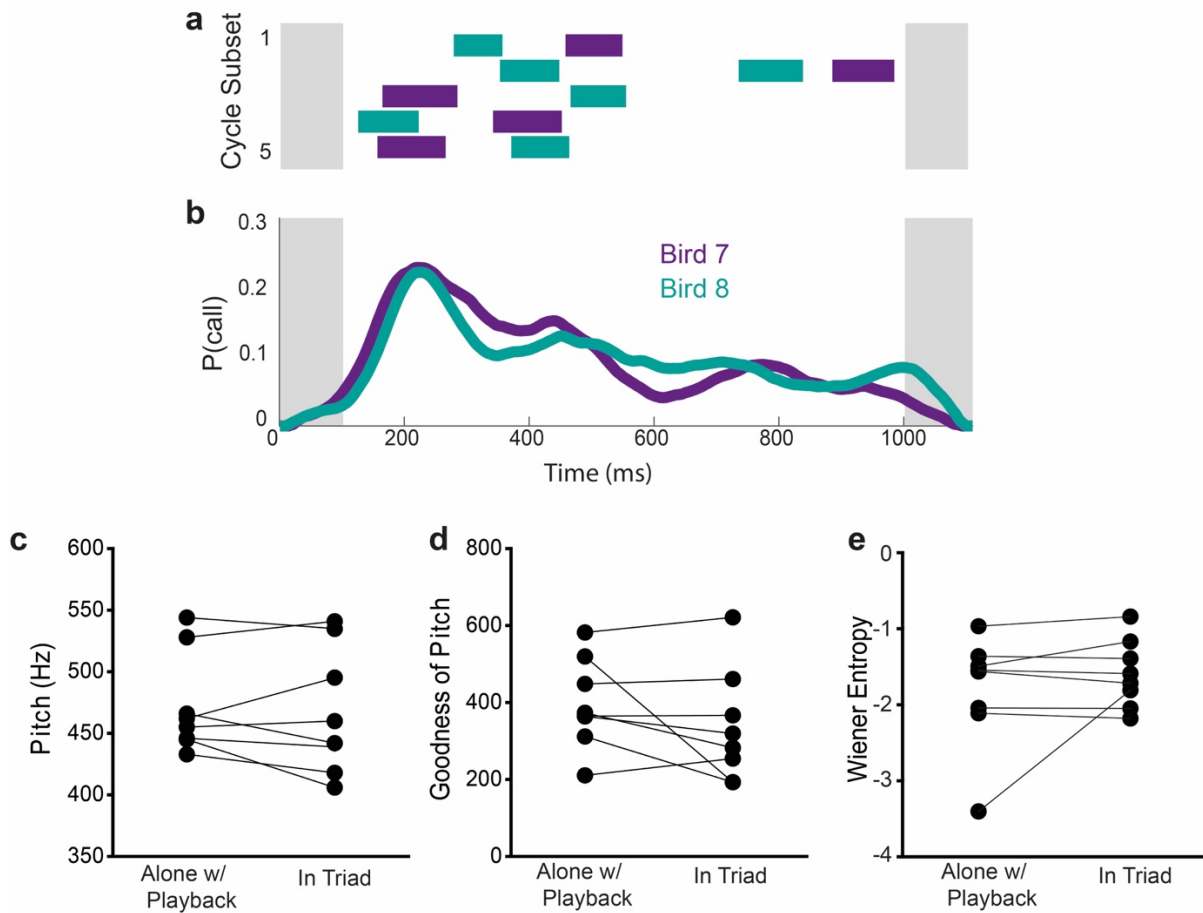
This PDF file includes:

Supplementary Figs. 1–4

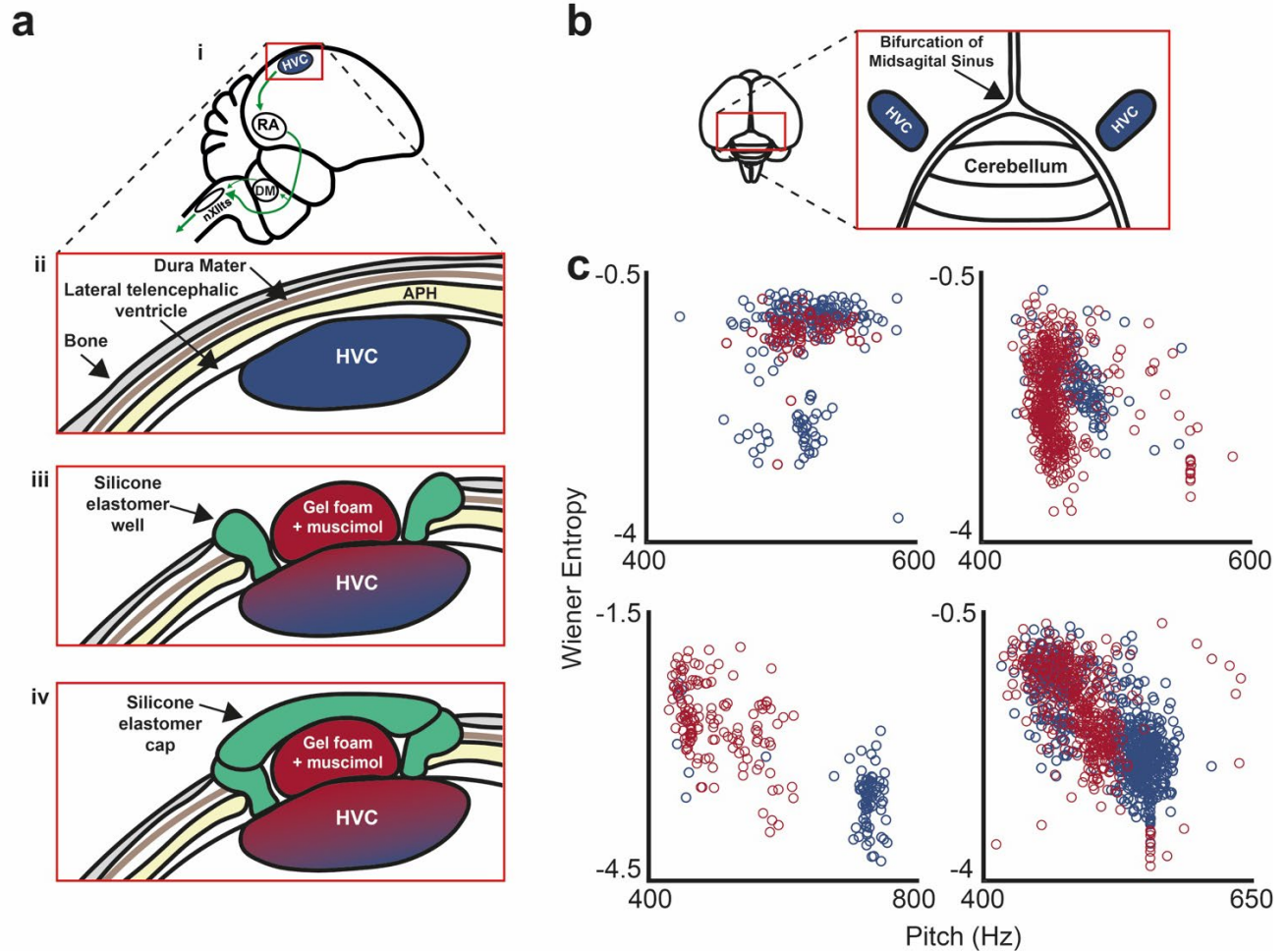
Captions for Supplementary Video 1

Other Supplementary Materials for this manuscript include the following:

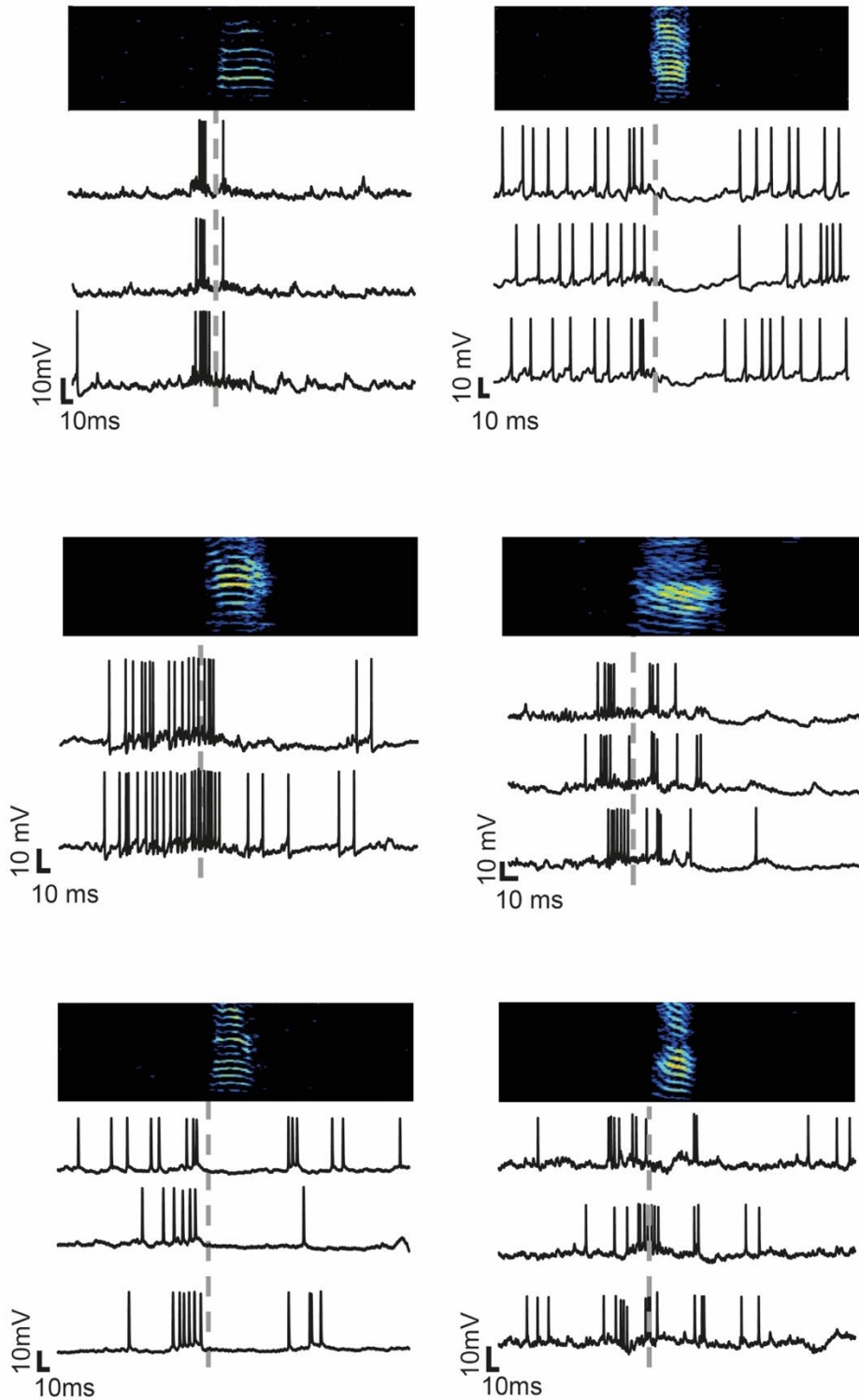
Supplementary Video 1



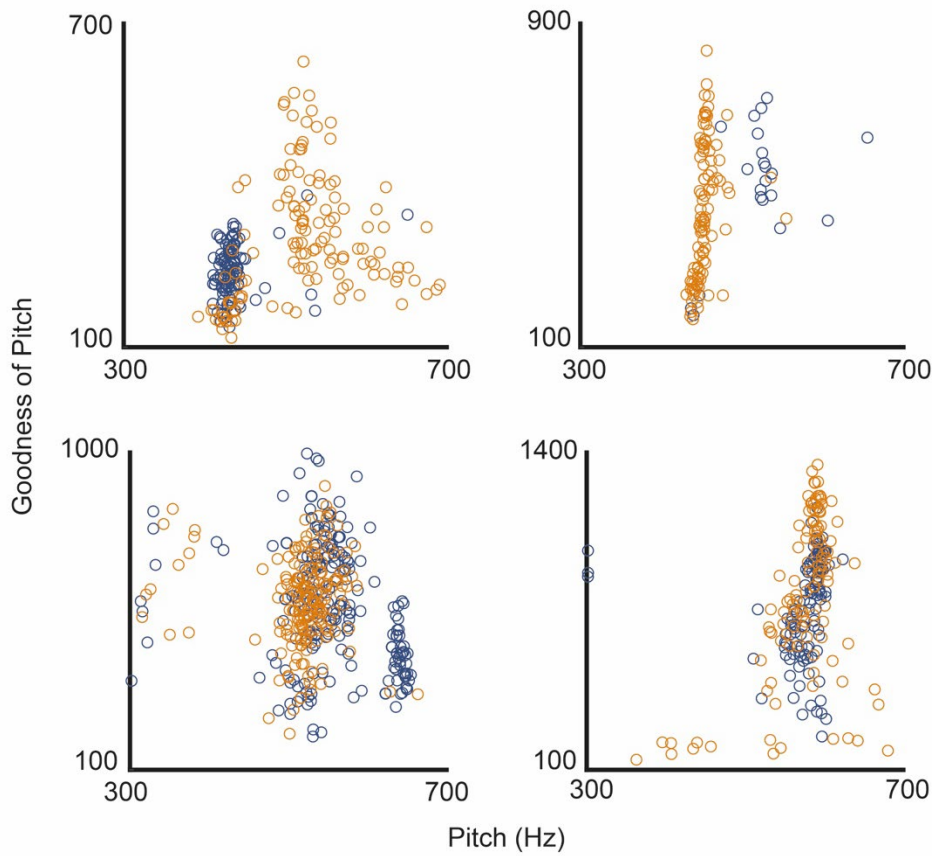
Supplementary Fig. 1 Call Coordination and Call Acoustic Structure in Vocal Triads. **a** A subset of sequential call cycles demonstrating an alternating response pattern between Bird 7 (purple) and Bird 8 (turquoise) during the vocal triad condition. **b** Call response probability distributions for Birds 7 and 8 for a full 10-minute session when in triad with call playbacks (in grey). Peak response latencies remain similar, although the pair's alternating call sequences result in lower than expected simultaneous calling. **c** Mean call pitch for $n = 8$ birds while alone with playbacks vs. in the triad condition (Alone w/playbacks = 472 ± 40 Hz, in triad = 467 ± 51 Hz, Wilcoxon sign rank test, $p = 0.4609$). **d** Harmonic structure of calls as measured by mean Goodness of Pitch for $n = 8$ birds while alone with call playbacks vs. in the triad condition (mean (alone w/playback) = 397 ± 118 , (in triad) = 337 ± 146 , Wilcoxon signed rank test, $p = 0.3125$). **e** Average Wiener Entropy of calls for $n = 8$ birds while alone with call playbacks vs. in triad condition (mean(alone w/playback) = -1.81 ± 0.74 , (in triad) = -1.59 ± 0.45 , Wilcoxon signed rank test, $p = 0.8438$). Note: Each bird's average was calculated from 54-243 calls for all acoustic features.



Supplementary Fig. 2 a) Schematic of pharmacological infusion from the dorsal surface of HVC. i) Illustration of sagittal section of zebra finch vocal motor pathway (RA:robust nucleus of the arcopallium; DM: dorsomedial part of the intercollicular nucleus; nXIIts: 12th cranial (tracheosyringeal) nerve. ii) Bone, dura mater, APH (area parahippocampalis), and the lateral telencephalic ventricle are situated above HVC. iii) A craniotomy is cut, dura mater and APH are resected, and a silicone elastomer well is created around the perimeter of the craniotomy. A gel foam sponge soaked in 40°C 5mM muscimol is placed directly on the surface of HVC. iv) A silicone elastomer cap seals the well and the animal is returned to the recording chamber for behavioral testing. **b)** Schematic of a dorsal view of the zebra finch brain, indicating positions of bilateral craniotomies above HVC. **c)** Acoustic Features of Calls During Control and Muscimol Conditions. Changes in acoustic features of calls for 4 birds during infusion with muscimol (red) vs. saline controls (blue, as in Fig. 2g); entropy(control) = -2.52 ± 1.13 , entropy(muscimol) = -2.21 ± 0.79 , 2d-Kolmogorov-Smirnov test¹, $p < 0.01$ Bonferroni correction).



Supplementary Fig. 3 HVC Interneuron Activity During Call Production. Intracellular recordings of six HVC interneurons during multiple renditions of call production. Dotted grey lines indicate onsets of calls.



Supplementary Fig. 4 Acoustic Features of Calls During Control and Gabazine Conditions. Changes in acoustic features of calls for 4 birds during infusion with saline controls (blue) vs. gabazine (orange), (as in Fig. 5g), (2d-Kolmogorov-Smirnov test ¹, $p < 0.01$ Bonferroni correction (4/5 birds)).

References

1. Peacock JA. Two-Dimensional Goodness-of-Fit Testing in Astronomy. *Mon Not R Astron Soc* **202**, 615-627 (1983).