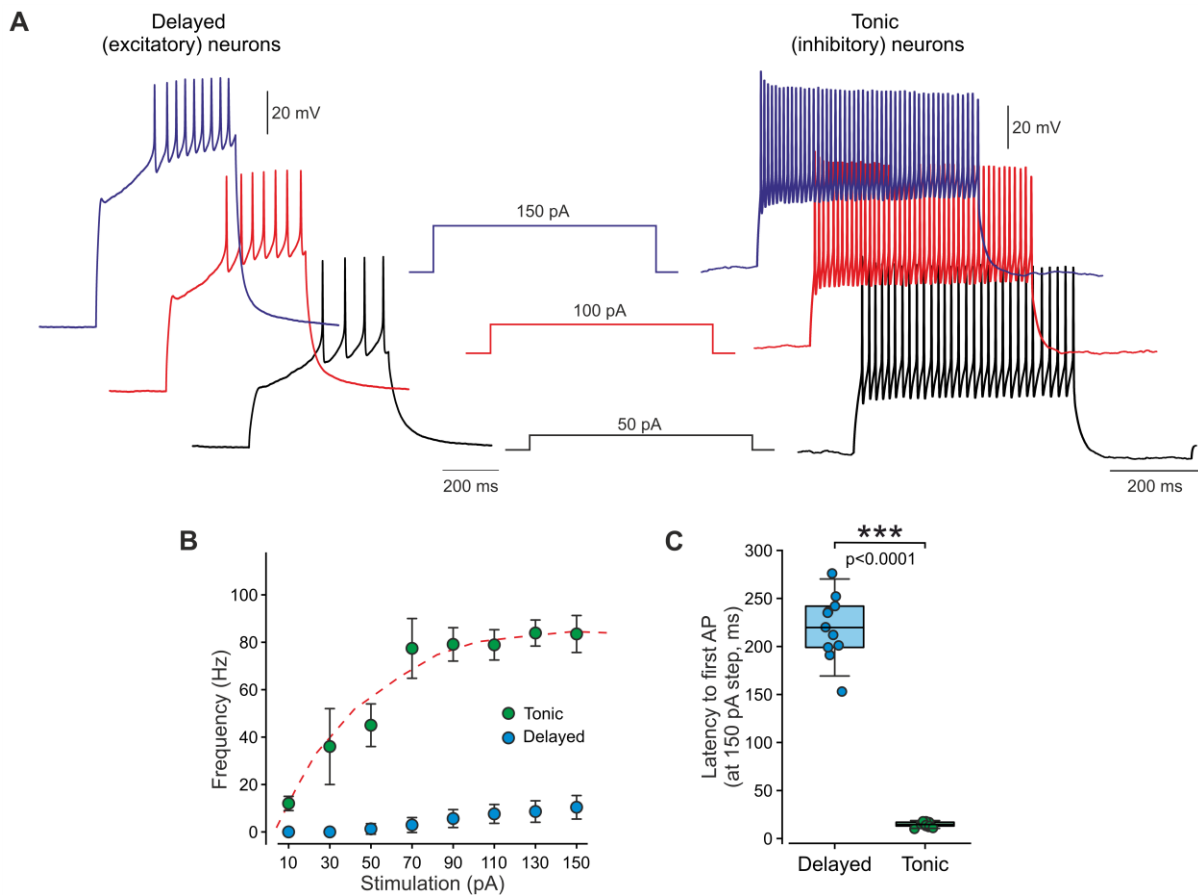
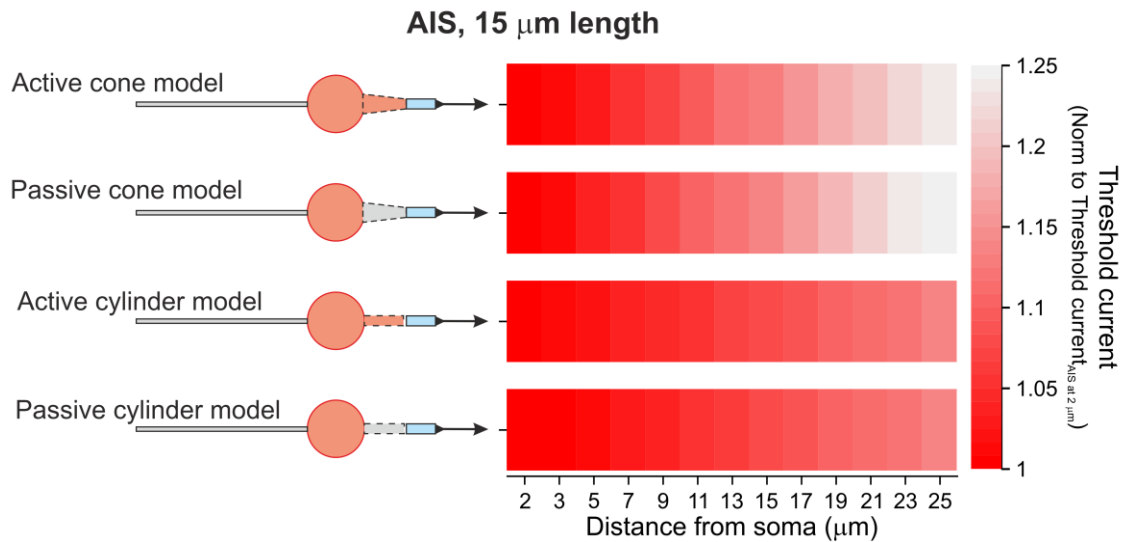


## Supplemental Information



**Supplementary Figure 1 (for Figure 2). The firing pattern of SDH neurons is stable throughout the increasing stimulation. A.** An additional example of current-clamp recordings from delayed-firing (“delayed,” *left*) and tonically-firing (“tonic,” *right*) neurons following increasing current steps of 50, 100, and 150 pA demonstrates the stability of the firing properties. Representative of 11 delayed neurons (from 11 slices, 7 rats) and 13 tonic neurons (13 slices, 7 rats). **B.** Mean frequency-intensity ( $f$ -I) relation and curve (*dashed line*) of tonically-firing (*green*) and delayed-firing (*blue*) neurons. Note that the frequency of delayed-firing neurons remains substantially lower than the tonically-firing neurons even at the highest stimulation steps. Note also the differences in threshold current.  $n_{\text{Delayed}} = 11$  neurons, 11 slices, 6 rats;  $n_{\text{Tonic}} = 13$  neurons, 13 slices, 7 rats. **C.** Graph comparing box plots and individual values of the latency to the first AP (*see Methods*) in delayed-firing (*blue*) and tonically firing neurons (*green*) following 500-ms step of 150 pA. Note that in all delayed-firing neurons, the latency to the first spike at the maximal stimulating used is significantly delayed compared to the tonically-firing neurons. \*\*\* -  $p < 0.0001$ ; Student’s t-test;  $n_{\text{Delayed}} =$

11 neurons, 11 slices, 6 rats;  $n_{\text{Tonic}} = 13$  neurons, 13 slices, 7 rats. Box plots depict the mean, 25th, 75th percentile and SD.



**Supplementary Figure 2 (for Figure 5). In modeled neurons with a shorter AIS of 15  $\mu\text{m}$  length, the distal shift of AIS leads to an increase in threshold current.** Heat maps of the relation between AIS distance from the soma and the threshold current in the 1 to 25  $\mu\text{m}$  range of distances (*middle*) recorded from modeled in SDH tonically-firing neuron with AIS of 15  $\mu\text{m}$  length with various spacers' configurations (shown in *left*): tapered with active conductances (active cone); tapered without active conductances (passive cone); cylindrical with active conductances (active cylinder) and cylindrical without active conductances (passive cylinder). The threshold current values are normalized to the value measured when AIS was situated 1  $\mu\text{m}$  from soma and color-coded (shown on the *right*). Note that AIS distancing leads to an increase in threshold current regardless of the spacer parameters.

