
Supplementary information

Kinetic features dictate sensorimotor alignment in the superior colliculus

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	N	RMP (Vm)	RI (MOhm)	Sag (mV)
<i>Direct</i>	13	-47.3 +- 0.9	543 +- 28	31.2 +- 5.9
<i>Polysynaptic</i>	13	-50.2 +- 0.9	627 +- 24	136.6 +- 17.3
<i>RAMP</i>	10	-52.6 +- 1.2	845 +- 90	39.7 +- 7.2
<i>No activation</i>	11	-43.8 +- 0.9	599 +- 24	16.4 +- 1.2

	AP threshold (mV)	AP amplitude (mV)	AP width (ms)	AHP Amplitude (mV)	AHP width (ms)
<i>Direct</i>	-37.7 +- 0.4	55.7 +- 0.8	1.0 +- 0.0	13.3 +- 0.5	20.5 +- 1.8
<i>Polysynaptic</i>	-32.4 +- 0.5	43.7 +- 1.1	1.4 +- 0.0	15.5 +- 0.4	52.5 +- 2.5
<i>RAMP</i>	-37.0 +- 0.8	55.7 +- 0.8	1.3 +- 0.0	15.3 +- 0.8	26.9 +- 3.2
<i>No activation</i>	-38.4 +- 0.6	61 +- 1.1	0.9 +- 0.0	15.8 +- 0.6	14.3 +- 1.4

<i>+ 100 pA</i>	Num of AP	Frequency of burst (Hz)	Freq. Adaptation (%)	Freq. spikes 1 to 3 (Hz)	Delay to 1 st AP (ms)	Time after last AP (ms)
<i>Direct</i>	19.3 +- 1.2	38.3 +- 1.5	183.2 +- 7.2	51.6 +- 1.9	24.8 +- 1.4	206 +- 24
<i>Polysynaptic</i>	13.4 +- 1.2	18.2 +- 1.5	245.4 +- 45.7	26.2 +- 2.2	24.7 +- 2.8	332 +- 30
<i>RAMP</i>	18.4 +- 2.2	40.2 +- 2.8	172.1 +- 8.1	57.3 +- 5.1	43.2 +- 7.1	285 +- 35
<i>No activation</i>	33.7 +- 1.4	50.1 +- 1.2	201.2 +- 6.2	74.1 +- 1.8	22.2 +- 2	123.2 +- 23

<i>+ 200 pA</i>	Num of AP	Frequency of burst (Hz)	Freq. Adaptation (%)	Freq. spikes 1 to 3 (Hz)	Delay to 1 st AP (ms)	Time after last AP (ms)
<i>Direct</i>	3.8 +- 0.2	62.7 +- 4.2	103.1 +- 7.3	73.7 +- 4.8	3.9 +- 0.4	702 +- 16
<i>Polysynaptic</i>	6.8 +- 1.4	30.7 +- 3.9	72.2 +- 10.8	40.9 +- 5.2	6.6 +- 0.5	648 +- 25
<i>RAMP</i>	9.7 +- 2.1	42.1 +- 5.3	82.1 +- 9.1	49.4 +- 6.4	11.6 +- 1.3	672 +- 27
<i>No activation</i>	14.1 +- 1.8	102.4 +- 2.3	173.8 +- 15.7	135.4 +- 5.1	4.1 +- 0.5	647 +- 22

Supplementary Table 1. Electrophysiological properties of neurons recorded in acute brain slices and included in Figure 1.

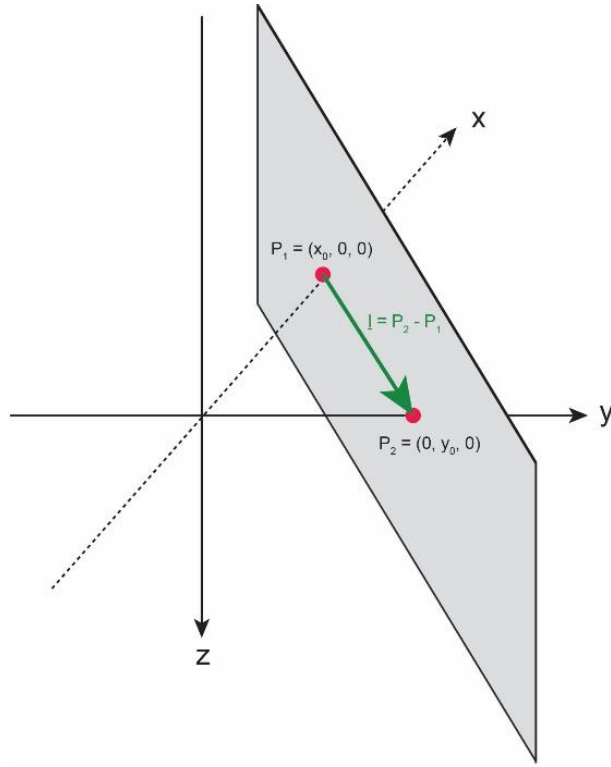
	N	RMP (Vm)	RI (MOhm)	Sag (mV)	Tuft width (um)	Tuft length (um)
<i>Superficial</i>	24	-50.1 +- 3.4	282 +- 44	28.2 +- 17	277 +- 160 (N =2)	468 +- 3 (N =2)
<i>Upper Intermediate</i>	12	-41.9 +- 3.5	297 +- 97	3.8 +- 1.6	362 +- 49 (N =12)	401 +- 44 (N =12)
<i>Lower Intermediate/Deep</i>	9	-42.2 +- 3.4	164 +- 25	2.3 +- 1.0	379 +- 174 (N =3)	452 +- 241 (N =3)

	AP threshold (mV)	AP amplitude (mV)	AP width (ms)	AHP Amplitude (mV)	AHP width (ms)
<i>Superficial</i>	-28.8 +- 2.0	21.5 +- 2.9	0.7 +- 0.1	7.3 +- 1.2	31.0 +- 7.0
<i>Upper Intermediate</i>	-26.0 +- 3.7	14.9 +- 2.4	0.7 +- 0.1	5.5 +- 0.9	26.5 +- 6.0
<i>Lower Intermediate/Deep</i>	-31.3+- 2.3	11.4 +- 0.8	0.6 +- 0.0	6.0 +- 0.7	41.0 +- 14.9

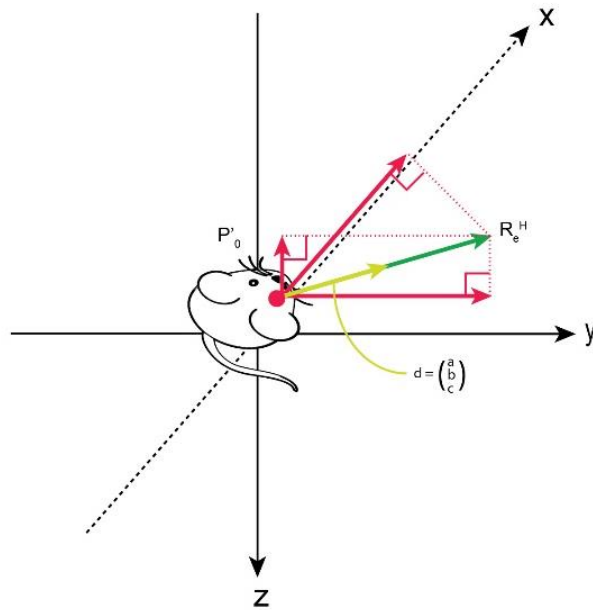
<i>+ 100 pA</i>	Num of AP	Frequency of burst (Hz)	Freq. Adaptation (%)	Freq. spikes 1 to 3 (Hz)	Delay to 1 st AP (ms)	Time after last AP (ms)
<i>Superficial</i>	8.9 +- 2.4	11.4 +- 3.2	150.5 +- 63.0	23.7 +- 7.2	198.6 +- 59.6	49.9 +- 13.9
<i>Upper Intermediate</i>	13.4 +- 1.2	18.2 +- 1.5	245.4 +- 45.7	26.2 +- 2.2	24.7 +- 2.8	332 +- 30
<i>Lower Intermediate/Deep</i>	18.4 +- 2.2	40.2 +- 2.8	172.1 +- 8.1	57.3 +- 5.1	43.2 +- 7.1	285 +- 35

<i>+ 200 pA</i>	Num of AP	Frequency of burst (Hz)	Freq. Adaptation (%)	Freq. spikes 1 to 3 (Hz)	Delay to 1 st AP (ms)	Time after last AP (ms)
<i>Superficial</i>	19.8 +- 8	33.5 +- 12.1	238.0 +- 91.6	54.2 +- 17.9	3.9 +- 0.4	702 +- 16
<i>Upper Intermediate</i>	6.8 +- 1.4	30.7 +- 3.9	72.2 +- 10.8	40.9 +- 5.2	6.6 +- 0.5	648 +- 25
<i>Lower Intermediate/Deep</i>	9.7 +- 2.1	42.1 +- 5.3	82.1 +- 9.1	49.4 +- 6.4	11.6 +- 1.3	672 +- 27

Supplementary Table 2. Electrophysiological and morphological properties of neurons recorded in whole-cell mode *in vivo* and included in Figure 2.



Supplementary Figure 1. Geometrical set-up of the visual stimulation screen in the laboratory's frame of reference.



Supplementary Figure 2. Geometric set-up of the $\mathbf{r}_e^H$ vector in the mouse's head reference frame, coinciding with the laboratory's reference frame at time zero.