Supplementary Information for

Attention-dependent reductions in burstiness and action potential height in macaque area V4

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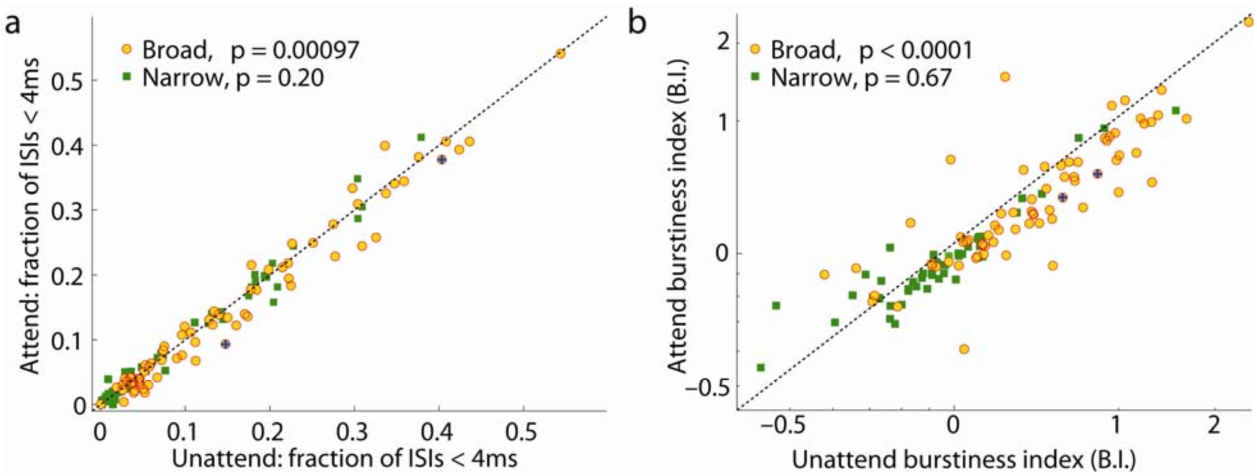

Figure S1. Attention-dependent reduction in burst firing among broad, but not narrow, spiking neurons. a: Reduction in fraction of ISIs < 4 milliseconds (ms) with attention. Each point corresponds to one neuron. Note that most of the broad spiking neurons (45 of 71) fall below the line of unity, indicating greater burstiness in the unattended condition. Blue crosses indicate example units in Figure 1. **b**: Attention-dependent reduction in the burstiness index (B.I.) among broad, but not narrow, spiking neurons. Note that most of the broad spiking neurons (51 of 71), fall below the line of unity, again indicating greater burstiness in the unattended condition. Blue crosses correspond to example units in Figure 1. Significance values, Wilcoxon signed rank test.

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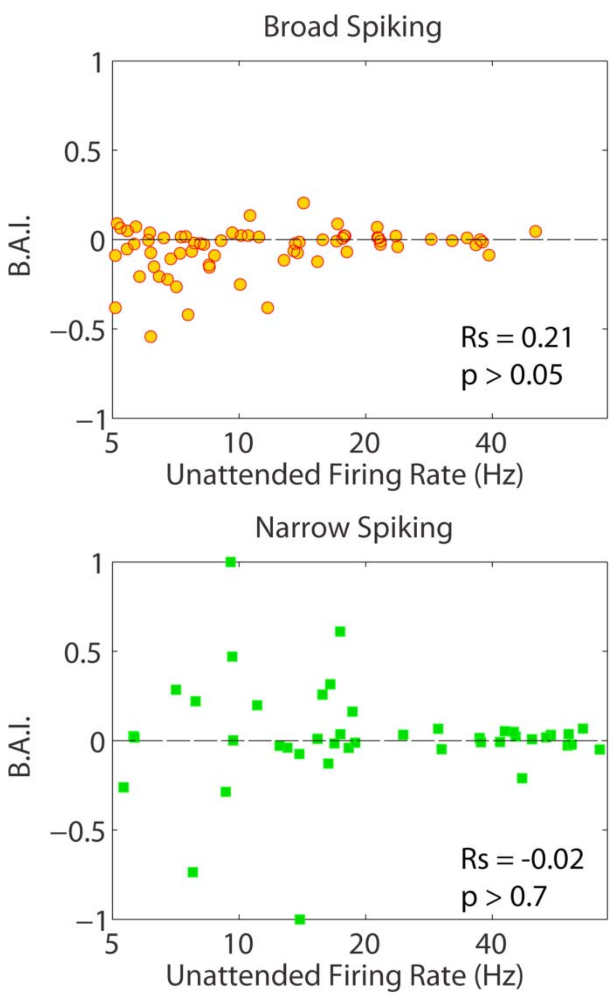
Figure S2. Attention-dependent reductions in burstiness occur among low-firing rate broad spiking neurons. **upper panel**: Among broad spiking neurons (N=71), there was a non-significant trend towards greater attention-dependent reductions in burstiness (B.A.I.) among lower firing rate neurons. **lower panel**: B.A.I. as a function of firing rate in the unattended condition for the narrow spiking neurons (N=47). In two narrow spiking neurons, B.A.I values of -1 and +1 occurred because these neurons had no spikes with ISIs < 4 ms in one of the two attention conditions. When these two narrow spiking outliers were removed, the correlation between unattended firing rate and B.A.I. remained non-significant (Spearman's rank correlation, p = 0.65).



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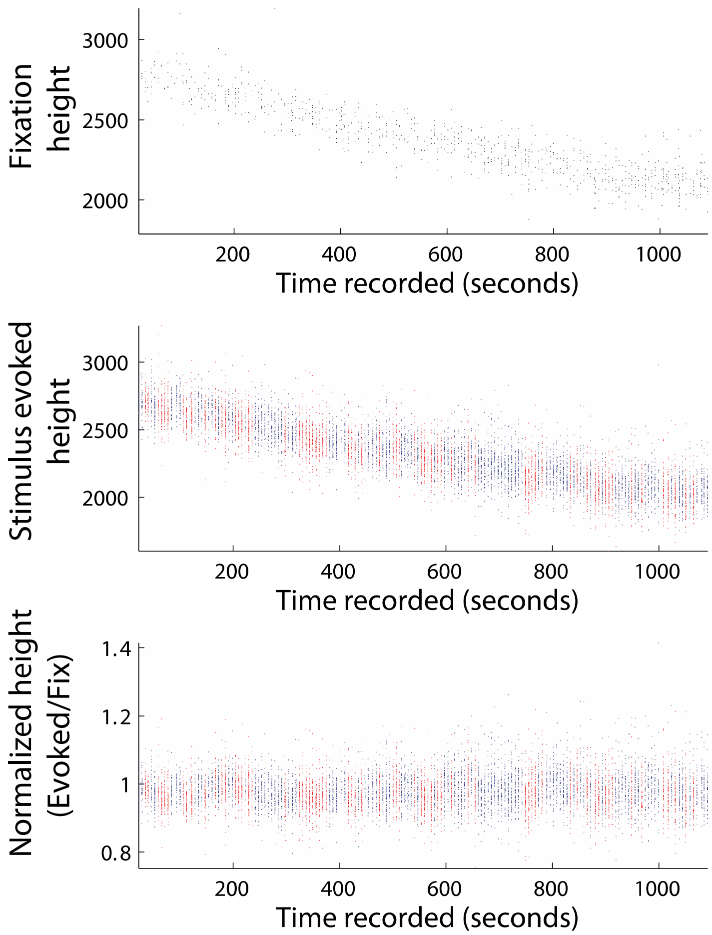

Figure S3. Removing gradual drifts in action potential height. During extracellular recording, gradual changes in the position of the electrode, relative to the recorded neuron, occasionally result in slow changes in action potential height and duration. For most neurons this drift was modest compared to the variance in action potential height over the course of a recording session. The example neuron shown here is one of the most extreme examples of this slow drift in waveform height (top panel). To correct for this, we normalized the height of each action potential by the average height of the 50 most recent action potentials recorded in the pre-stimulus fixation period. The top panel shows the height of action potentials in the preceding prestimulus period, the middle panels the unnormalized height during the stimulus-evoked response period, and the bottom panel the resulting normalized height in the sustained period. Red dots correspond to action potentials in correctly performed attend receptive field trials, blue dots correspond to action potentials in correct attend away trials.

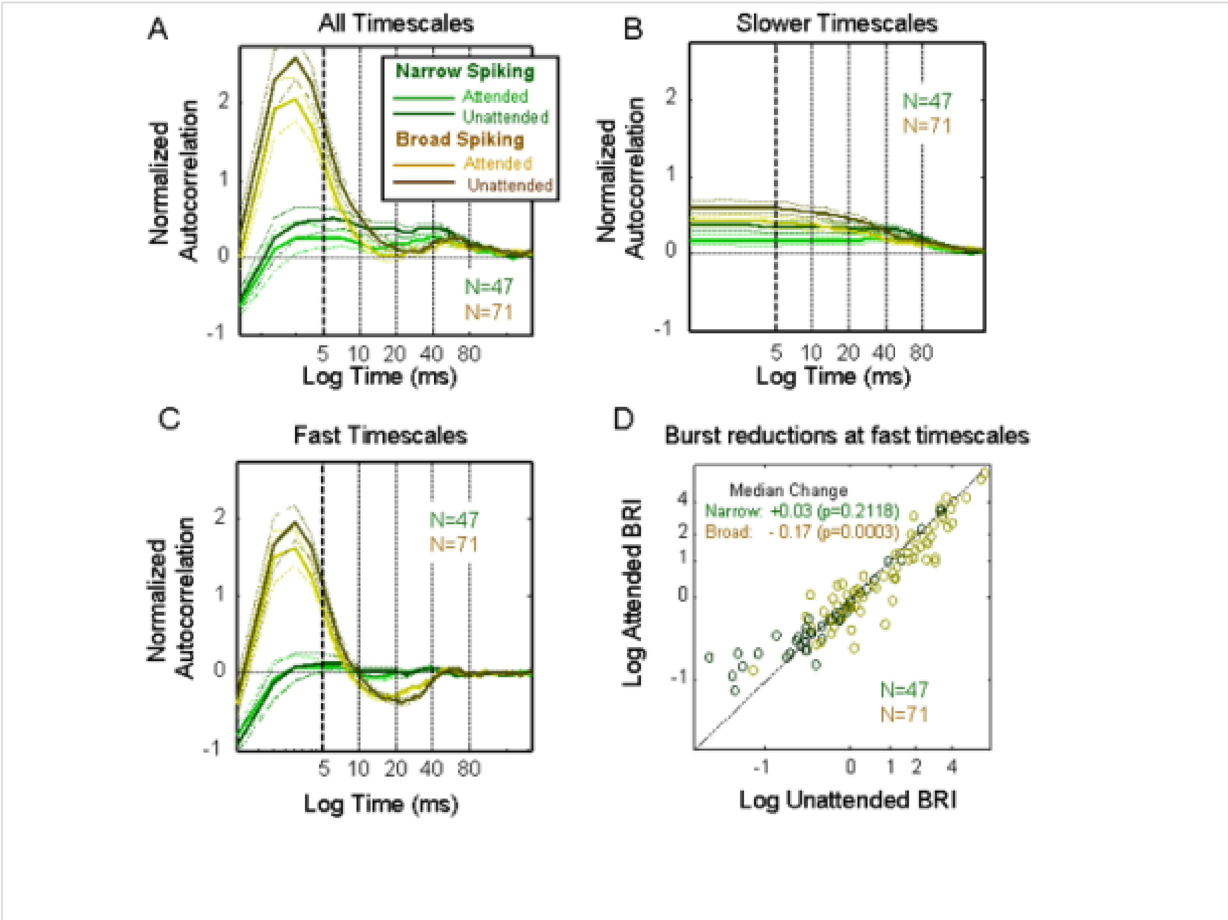

Figure S4. Jitter procedure for isolating the effects of attention-dependent reductions in slow fluctuations from changes in burst firing. a: Raw normalized autocorrelation function averaged across narrow (green) and broad spiking neurons (yellow). Dark lines show values computed over trials in which attention was directed away from RF, light lines from trials when attention was directed into RF. **b**: Identical format to **a**, but after applying the jitter procedure described by Smith & Kohn (2008) to exclude fast response fluctuations while preserving slow fluctuations[19]. See Methods. **c**: Autocorrelation function after subtracting slow fluctuations (**b**) from raw autocorrelation (**a**), to isolate fast fluctuations (bursts). **d**: Scatterplot showing reduction in burst index computed from autocorrelation functions after removal of slow fluctuations. Each point corresponds to one neuron. Broad spiking neurons (yellow, N=71) are significantly shifted below the line of unity (Wilcoxon signed rank test, p<0.001), indicating a significant reduction in burst rate, after controlling for the effect of slow fluctuations. Narrow spiking neurons (N=47) showed no significant change in bursting.

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