Neuron, Volume 62
Supplemental Data
State-dependent variability of neuronal responses to transcranial magnetic stimulation of the visual cortex

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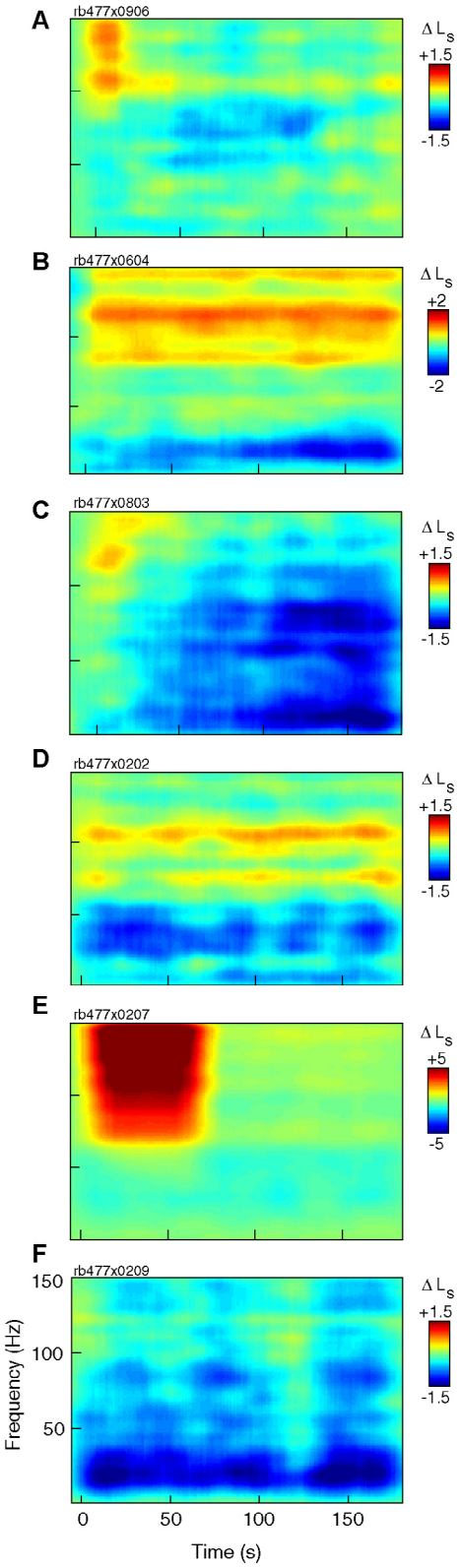
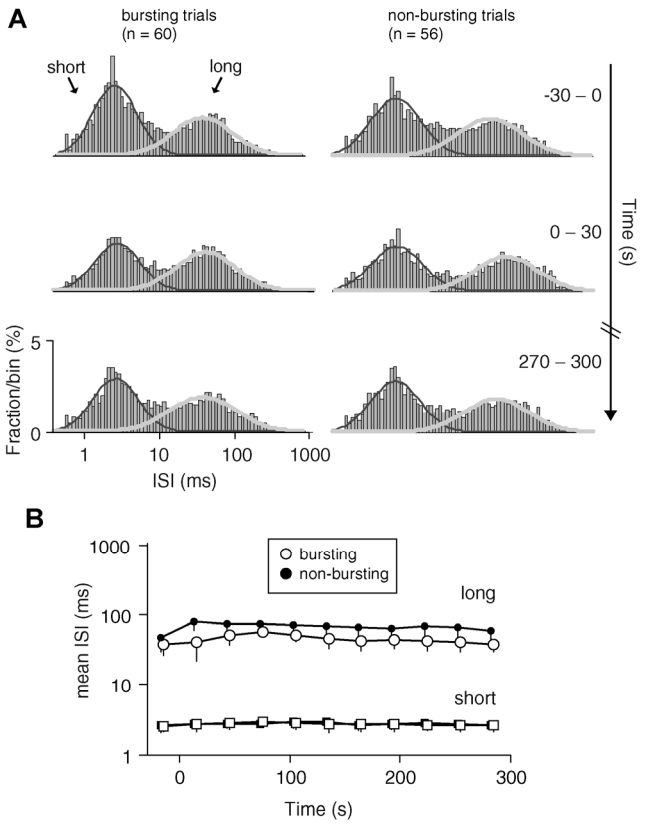
Supplementary Results



Supplementary Fig. 1. LFP recordings obtained in the absence of visual stimulation.
A-E) Spectrograms of TMS-induced changes in spontaneous LFP power (ΔL_s) from six different cortical sites. The majority of our recordings employed an interleaved experiment design (see Fig. 1B) in which a short evoked interval (2s) is followed by a long spontaneous interval (8s). This short stimulus duration and long inter-stimulus interval prevented adaptation effects and permitted us to conduct separate analyses of evoked and spontaneous activity from the same data set. To ensure the relative independence of these activity types, we obtained a limited set of LFP recordings in the absence of visual stimulation. As shown above, TMS had similar effects on spontaneous activity in the absence of visual stimuli (compare to Fig. 5C, Fig. 7B). These trials illustrate the full range of observed response patterns: a sustained decrease in power at lower frequencies (F), a substantial increase in power at higher frequencies (E), and more commonly a combination of both responses (A-D). The TMS parameters used in each trial are as follows: rb477x0906, 4 Hz, 4s; rb477x0604, 8 Hz, 4 s; rb477x0803, 4 Hz, 4s; rb477x0202, 4 Hz, 4s; rb477x0207, 8 Hz, 4 s; and rb477x0209, 4 Hz, 1 s.



Supplementary Fig. 2. No effect of TMS on inter-spike intervals (ISIs) during evoked activity. A) Log ISI histograms of B trials (left) and NB trials (right) constructed from stimulus evoked spikes in 30 s windows. Histograms are displayed for the 30 s prior to TMS (top), the 30 s immediately following TMS (middle) and a 30 s window occurring roughly 5 minutes after TMS. B**)** Locations of ISI peaks at short (squares) and long (circles) intervals for all time periods, as estimated by fitting a mixture of Gaussians. In contrast to spontaneous ISIs (Fig. 4), TMS did not substantially alter the ISI distribution of stimulus-evoked spikes. The evoked ISI distributions for both B and NB trials remain unaltered despite a substantial decrease in evoked response amplitude following TMS (e.g., Fig. 5E). Thus, at a population level, spike timing remains relatively unaffected. All conventions are as described in Figure 4 of the main text.

Stimulus-evoked response variability:
Although the trial-to-trial variability of the post-TMS evoked response was considerably less than that of the post-TMS spontaneous component (see Fig. 2), TMS did alter the variability of the neural response to visual stimuli. We compared the RSD of pre and post-TMS evoked spiking responses and found that the evoked response is significantly more variable following

TMS (pre-TMS RSD = 0.31 < post-TMS RSD = 0.39, $p < 0.05$, signed rank test). This is consistent with the hypothesis that TMS disrupts local processing and that this reduces the precision of subsequent stimulus-evoked responses.

Inter-animal comparison. Neural responses to TMS were qualitatively similar between animals and there was no significant effect of animal identity on the change in evoked spike rate ($F(4, 160) = 2.2$, $p > 0.05$) or spontaneous spike rate ($F(4, 160) = 2.39$, $p > 0.05$).