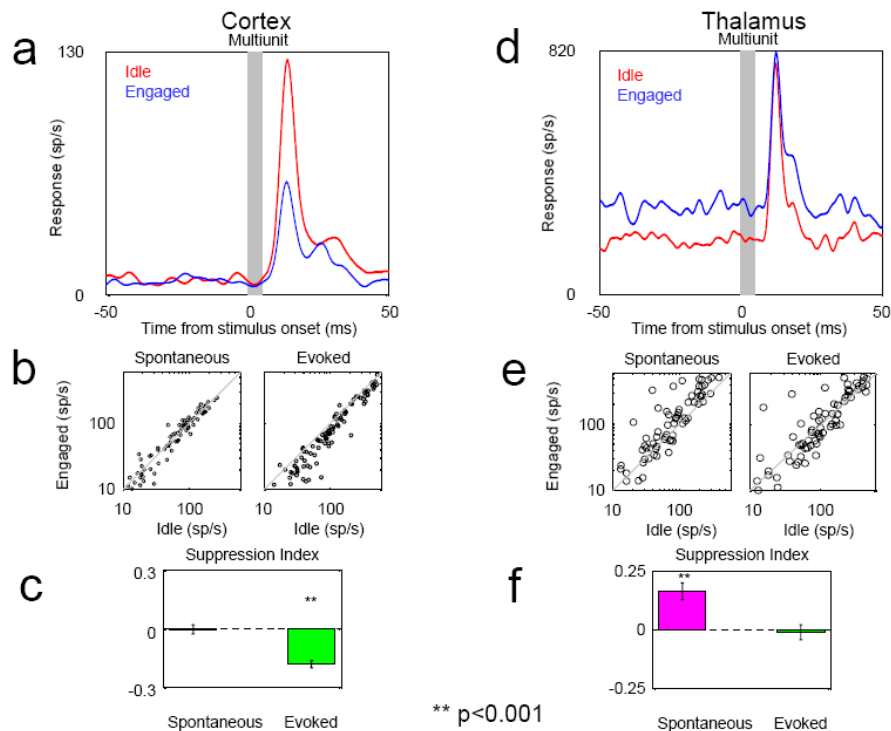


Task-dependent suppression of evoked responses in auditory cortex

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Attention is a cognitive process in which a subset of sensory input relevant to behavior is subjected to further processing. Neural correlates of attention in both auditory and visual cortex typically take the form of an enhancement of neural activity to the attended stimulus. Here we have compared neural activity elicited by sounds while rats performed a two-alternative choice auditory task (“engaged” condition) with those elicited by identical stimuli while subjects were awake but not performing a task (“idle” condition). Surprisingly, we found that cortical responses were consistently suppressed rather than enhanced in the engaged condition (see fig **a,b,c**). To probe the mechanisms underlying this cortical suppression, we recorded in the auditory thalamus, which provides input to the cortex. We found that although thalamic evoked responses were identical in the two conditions, spontaneous rates in the thalamus were higher in the engaged condition (see fig **d,e,f**), consistent with a mechanism involving synaptic depression at the thalamocortical inputs. These results demonstrate that in the auditory cortex, engaging in an auditory task can induce a powerful and robust suppression distinct from, and with the opposite sign as, previously characterized forms of auditory attentional modulation, the function of which may be to reduce activity in neurons projecting to targets not involved in this task. Our results represent a first step toward understanding the synaptic and circuit mechanisms by which this suppression occurs.



a. Example PSTH of multiunit cortical activity showing suppressed responses in the engaged condition compared to the idle condition. **b.** Most of the recorded sites (2 animals, 111 sites) showed suppressed responses during the task, without changes in the spontaneous activity. **c.** Quantification using suppression index showed suppression of evoked responses without changes in spontaneous activity. **d-f.** Similar figures for auditory thalamus (2 animals, 91 sites) showing an increase of spontaneous activity, without changes in the evoked activity