Elevated correlations in neuronal ensembles of mouse auditory cortex following parturition.

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Abstract:

The auditory cortex is malleable by experience. Previous studies of auditory plasticity have described experience-dependent changes in response profiles of single neurons or changes in global tonotopic organization. However, experience-dependent changes in the dynamics of local neural populations have remained unexplored. In this study, we examined the influence of a dramatic yet natural experience in the life of female mice, giving birth and becoming a mother on single neurons and neuronal ensembles in the primary auditory cortex (A1). Using in vivo two-photon calcium imaging and electrophysiological recordings from layer 2/3 in A1 of mothers and age-matched virgin mice, we monitored changes in the responses to a set of artificial and natural sounds. Population dynamics underwent large changes as measured by pairwise and higher-order correlations, with noise correlations increasing as much as twofold in lactating mothers. Concomitantly, changes in response properties of single neurons were modest and selective. Remarkably, despite the large changes in correlations, information about stimulus identity remained essentially the same in the two groups. Our results demonstrate changes in the correlation structure of neuronal activity as a result of a natural life event.

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