Effects of behavioral context on responses to interaural phase disparity in macaque primary auditory cortex.

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Physiological recordings from auditory cortex in awake animals are not hampered by the depressive effects of anesthesia, but behavioral state may influence cortical responses. Awake animals can be trained to perform a task that involves discrimination of the stimulus parameter under study, but this approach limits the range of stimuli that can be tested; the animal may be trained merely to sit passively during recording, but this approach fails to control attention. We examined responses from single cells in auditory cortex of the awake adult rhesus macaque, recorded in response to identical stimuli under two behavioral conditions: "passive" (animal sitting passively), and "behaving" (active lateralization of dynamic interaural phase disparity, IPD, randomized in extent and direction). In addition, we presented a wide range of other stimuli in the passive state. To assess the validity of these data collected without attentional control, we compared the magnitude and selectivity of neural responses to IPD under passive and behaving conditions. Overall firing rate was elevated under the behaving condition in a majority of cells; of these, some increased their overall firing rate regardless of IPD, whereas others extended their dynamic range through an IPD-specific enhancement of firing rate (though without an apparent shift in tuning for IPD). The remaining cells showed no effect, or (rarely) a decrease in firing rate under the behaving condition. Increased spike rates had no consistent effect on IPD discriminability as measured by a neurometric (receiver operating characteristic) method. Although extended recordings from awake macaques may not be possible without proper training and behavioral control, the active engagement of the animal in a task involving the stimulus parameter under study may not be necessary for the collection of valid physiological data.