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Environmental Enrichment Increases Response Strength And Paired-Pulse Depression Of Auditory Cortex Neurons

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A wide variety of sensory gating impairments have been associated with autism. Abnormal brain development may alter patterns of interaction between the child and the environment and hinder the acquisition of critical language skills. After several months of therapy, autistic symptoms may subside as children advance to higher cognitive stages. This study modeled the physiological changes associated with therapy-related gains in children by investigating enrichment-induced plasticity in rat auditory cortex. Evoked potential response strength and paired-pulse depression were enhanced by exposure to an enriched environment and degraded by exposure to a standard environment. While neither exercise nor social stimulation, specifically, resulted in any plasticity, rats that heard the enriched environment from a distance also exhibited enhanced responses. The degree of enrichment-induced plasticity was not reduced by a substantial and persistent cholinergic deficit. The finding that enrichment increases response strength and paired-pulse depression in the auditory cortex of rats is consistent with earlier clinical observations, suggesting that proper sensory development is necessary for higher cognitive processes. In the future we will investigate if clinical gains during and after therapy are associated with increased event-related potential discrimination and hemispheric localization of speech stimuli in children with autism.