Cortical Sensory Physiology

Last updated: April 21, 2019

N.B. cortex is *not necessary* for conscious perception of **basic senses**, but *necessary* for **discriminative senses**!

**Cortical Plasticity**

* extensive neuronal connections in sensory areas can be changed relatively rapidly to **reflect use of represented area**.
* cortical connections of sensory units have extensive convergence / divergence - connections can become *weak* with **disuse** and *strong* with **use**.
* these plastic processes occur ***during development*** and ***in adulthood***.
* these plastic processes occur in ***all types of sensory cortices*** (cutaneous sensations, auditory, visual).
* plasticity also occurs in *motor cortex*.

Examples:

* if digit is amputated, cortical representation of neighboring digits spreads into cortical area that was formerly occupied by amputated digit.
* if cortical area representing digit is removed, somatosensory map of digit moves to surrounding cortex.
* extensive, long-term deafferentation of limbs (or amputations) → dramatic shifts in somatosensory representation in cortex (e.g. limb cortical area responds to touching face, i.e. face touching causes sensations projected to missing limb).
* if monkey is trained to make fine discriminations with one digit, cortical representation of digit expands.

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| D:\Viktoro\Neuroscience\A. Neuroscience Basics\A144-157. Cerebrum (cortex)\00. Pictures\Cortical Plasticity.jpg | * receptive fields of single neurons in finger part in sensory cortex are on single digit; if monkey is trained to carry out task that involves contact with only distal portions of I-III digits, single neurons acquire receptive fields on all three digits:

**Left:** Normal receptive field of single cortical neuron on side of II finger.**Middle:** Training monkey to do task involving stimulation of distal portions of I-III fingers.**Right:** Resulting receptive field in cortical neuron. |

* during development, experimentally routing visual input to auditory cortex creates visual receptive fields in auditory system.
* tactile and auditory stimuli increase metabolic activity in visual cortex in *blind individuals*.
* *deaf individuals* respond faster and more accurately to moving stimuli in visual periphery.

The same type of plasticity is observed in **motor cortex**!

Bibliography for ch. “Cerebrum” → follow this [link >>](http://www.neurosurgeryresident.net/A.%20Neuroscience%20Basics%5CA.%20Bibliography.pdf)

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