Cortical Sensory Physiology

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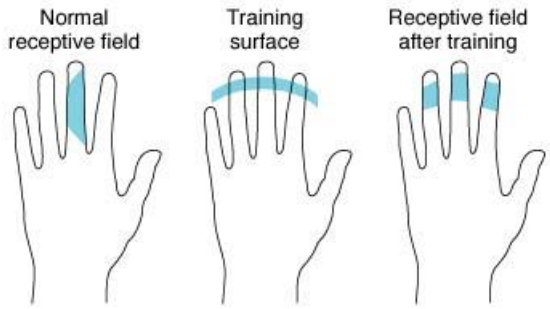
N.B. cortex is *not necessary* for conscious perception of **basic senses**, but *necessary* for **discriminative senses**!

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.



- 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 >>