

## Effects of acupuncture on human brain function: a review of Japanese literature

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Scientific investigation of the effect of acupuncture on human brain function is very important not only to evaluate acupuncture therapy for intracranial diseases but also to clarify the mechanism by which information regarding acupuncture stimulation is processed in the central nervous system. In this presentation, we review Japanese research reports about the effects of acupuncture stimulation on human brain function.

**1) Electrophysiological study:** Studies of the effect of acupuncture on electroencephalography (spontaneous EEG) have been reported from the 1970s. Acupuncture stimulation induces slowing of the frequency of basic (alpha) waves, more diffuse topographic patterns, increased theta band activity, and changes in the re-appearance time of alpha activity (alpha-ReAT). Acupuncture effects on evoked potentials (EPs) following somatosensory, pain and auditory stimulation were investigated and reported. Furthermore, evoked responses by acupuncture or electro-acupuncture (EA) stimulation were also studied and it was revealed that the response patterns by acupuncture or EA stimulation were different from conventional somatosensory EPs. Recently, a magnetoencephalographic (MEG) study has shown that the activated area in SI by EA stimulation is different from that of transcutaneous electrical stimulation.

**2) Studies of metabolic / blood flow changes:** In the early years of the 1990s, pioneering studies on cerebral metabolic and blood flow changes following EA stimulation were reported using positron emission tomography (PET). In recent years, functional magnetic resonance imaging (fMRI) studies revealed that the sensori-motor cortices, insula, gyrus cinguli and some other areas were activated by EA or acupoint pressure (De-Qi) stimulation.

Non-invasive measurement techniques of human brain function have advanced rapidly in recent years, particularly with regard to improvements in time/space resolution. It is anticipated that a greater understanding of the effects of acupuncture will be reached and further developments in this field achieved following the utilization of these new techniques.