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学位論文題名	Gentle Touch Opens the Gate to the Primary Somatosensory Cortex (優しいタッチは一次体性感覚野のゲートを開く)
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## 【論文の内容の要旨】

### Objective:

Touch is a primary reinforce strongly associated with motivational and affective processes that drive social behavior, and it also plays a critical role in massage therapy. Touch in massage is characterized by gentle touches of the skin involving light pressure effleurage and calm stroking movements intended to increase recipients' pleasure and relaxation. The relationships between basic physical parameters, such as patterns of the hand movements, and their neural bases are important for understanding the effects of gentle touch. However, such studies have not yet been performed. Here, we investigate these relationships and underlying neural mechanisms under two basic movement conditions.

### Methods:

Using functional magnetic resonance imaging (fMRI), we investigate brain activity induced by circular(C) and back-and-forth (BF) massage of participants' left hands with the experimenter's right hand, ensuring that movements were not unpleasant. We assessed subjective feelings, and analyzed fMRI data with principal component analysis (PCA) and correlation analyses to identify associated brain networks.

## Results:

In C compared with BF, participants felt more positive emotions. There was greater activation of the right primary somatosensory cortex (SI) and left cerebellum (CB), but lower activation of the anterior cingulate cortex (ACC) and periaqueductal gray (PAG) in C compared with BF. There was no significant difference in unpleasant feelings between the conditions. Moreover, co-activation of the left mid-lateral orbitofrontal cortex (OFC), CB, and rostral ventromedial medulla (RVM), and the right SI and posterior insula showed high loadings on Factor 1, which was negatively correlated with unnatural feelings. Meanwhile, co-activation of the ACC and PAG showed high loadings on Factor 2, which was positively correlated with unpleasant feelings.

## Conclusion

Our findings suggest somatosensory afferents to the SI are regulated by the descending pain modulatory system under the control of the mid-lateral OFC and ACC, even with mild somatosensory stimulation.