Brain mechanisms for skin stroking processing in healthy subjects and anorexia nervosa patients

Akademisk avhandling

Som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentligen försvaras i hörsal Arvid Carlsson, Academicum, Medicinaregatan 3, den 19 december, klockan 13:00.

av Monika Davidovic

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Avhandlingen baseras på följande delarbeten

I. Davidovic M, Jönsson E, Olausson H, Björnsdotter M. Posterior superior temporal sulcus responses predict perceived pleasantness of skin stroking. *Frontiers in Human Neuroscience* 2016: 10; 432


Abstract
Functional magnetic resonance imaging (fMRI) allows us to study brain processing of inputs from sensory neurons both at the level of single brain areas but also at the level of larger brain networks. In this thesis we present results from two experiments, in which brain processing of gentle skin stroking in healthy subjects and patients with anorexia nervosa was investigated with this technique. The first experiment investigated differences in brain processing of skin stroking, a caress-like stimulus that is perceived as pleasant, and skin vibration, an emotionally neutral stimulus not associated with social communication between humans. In Paper I we present results that show correlation between perceived pleasantness of skin stroking and neural processing in posterior superior temporal sulcus, an area previously associated with processing of biological motion in the visual domain. In Paper II we investigated more closely processing of stroking and vibration stimuli in insula. Insula is a paralimbic brain area previously associated with the emotional component of skin stroking and its effect on our well-being. Our results show that insula is activated both by gentle skin stroking and vibration. We performed functional connectivity analysis of these responses and proposed two paths for processing of somatosensory stimuli in insula, important for emotional and exteroceptive evaluations of touch. In the second experiment we investigated differences in brain processing of gentle skin stroking between patients with anorexia nervosa (AN) and healthy participants. In Paper III we present results that show alterations in dorsal striatum and lateral occipital cortex (LOC) while skin stroking is processed in AN. Both areas have previously been implicated in the pathophysiology of AN: dorsal striatum is associated with altered eating behavior and LOC in visual processing of images of bodies. In Paper IV we investigated resting state functional connectivity between LOC and other parts of brain and found a coupling with medial prefrontal cortex in AN but not in healthy participants. We suggest that this coupling can be one of the brain mechanisms behind body image disturbance in AN, a finding that might be useful in the design of new therapeutic approaches.

Keywords: touch, fMRI, resting state, anorexia nervosa, posterior superior temporal sulcus, insula, lateral occipital cortex, dorsal striatum