

# Structural basis of empathy and the domain general region in the anterior insular cortex.

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## Abstract

Empathy is key for healthy social functioning and individual differences in empathy have strong implications for manifold domains of social behavior. Empathy comprises of emotional and cognitive components and may also be closely linked to sensorimotor processes, which go along with the motivation and behavior to respond compassionately to another person's feelings. There is growing evidence for local plastic change in the structure of the healthy adult human brain in response to environmental demands or intrinsic factors. Here we have investigated changes in brain structure resulting from or predisposing to empathy. Structural MRI data of 101 healthy adult females was analyzed. Empathy in fictitious as well as real-life situations was assessed using a validated self-evaluation measure. Furthermore, empathy-related structural effects were also put into the context of a functional map of the anterior insular cortex (AIC) determined by activation likelihood estimate (ALE) meta-analysis of previous functional imaging studies. We found that gray matter (GM) density in the left dorsal AIC correlates with empathy and that this area overlaps with the domain general region (DGR) of the anterior insula that is situated in-between functional systems involved in emotion-cognition, pain, and motor tasks as determined by our meta-analysis. Thus, we propose that this insular region where we find structural differences depending on individual empathy may play a crucial role in modulating the efficiency of neural integration underlying emotional, cognitive, and sensorimotor information which is essential for global empathy.

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