Systems level modeling of a neuronal network subserving intrinsic alertness.

Abstract:
Cognitive control of alertness in unwarned situations (intrinsic alertness) relies on a predominantly right hemisphere cortical and subcortical network. In a previous functional activation study, we have demonstrated that this network comprises the anterior cingulate gyrus, the dorsolateral and polar frontal as well as the inferior parietal cortex, the thalamus and ponto-mesencephalic parts of the brain stem. The aim of this study was to study effective connectivity of this network by employing structural equation modeling. Fifteen right-handed male subjects participated in the PET study. The functional network showed stronger connectivity in the right hemisphere. Furthermore, there were strong effective connections between thalamus and brainstem on the one hand and between thalamus and anterior cingulate on the other. Our results suggest that the anterior cingulate functions as the central coordinating structure for the right hemispheric neural network of intrinsic alertness and that the anterior cingulate gyrus is modulated mainly by prefrontal and parietal cortex.