Default mode network

In neuroscience, the default mode network (DMN), (also default network, or default state network), is a network of interacting brain regions known to have activity highly correlated with each other and distinct from other networks in the brain.

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The default mode network is most commonly shown to be active when a person is not focused on the outside world and the brain is at wakeful rest, such as during daydreaming and mind-wandering, but it is also active when the individual is thinking about others, thinking about themselves, remembering the past, and planning for the future.

The network activates "by default" when a person is not involved in a task. Though the DMN was originally noticed to be deactivated in certain goal-oriented tasks and is sometimes referred to as the task-negative network, it can be active in other goal-oriented tasks such as social working memory or autobiographical tasks.

The DMN has been shown to be negatively correlated with other networks in the brain such as attention networks.

Evidence has pointed to disruptions in the DMN with people with Alzheimer's and autism spectrum disorder.

It is unclear whether the pathophysiology of idiopathic normal pressure hydrocephalus (iNPH) is associated with alterations in the default mode network (DMN).

Khoo et al investigated alterations in the DMN of patients with iNPH and sought to determine whether a relationship exists between the resting-state functional connectivity of the DMN and a patient's clinical symptoms.

Resting state functional magnetic resonance imaging (rs-fMRI) was performed in 16 preoperative patients with iNPH and 15 neurologically healthy control subjects of a similar age. Independent component and dual-regression analyses were used to quantify DMN connectivity. The patients' clinical symptoms were rated according to the iNPH scale (iNPHGS). Each of their specific clinical symptoms were rated according to the cognitive, gait, and urinary continence domains of iNPHGS, and neurocognitive status was assessed using the Mini Mental State Examination, Frontal Assessment Battery (FAB), and Trail Making Test Part A. The strength of DMN connectivity was compared between patients and controls, and the correlation between DMN connectivity and iNPHGS was examined using both region of interest (ROI)-based analysis and voxel-based analysis. The correlation between DMN connectivity and each of the specific clinical symptoms, as well as neurocognitive status, was examined using voxel-based analysis.

Both ROI-based and voxel-based analyses revealed reduced DMN connectivity in patients with iNPH. ROI-based analysis showed increased DMN connectivity with worsening clinical symptoms of iNPH. Consistently, voxel-based analyses revealed that DMN connectivity correlated positively with the iNPHGS score, as well as the cognitive and urinary continence domain scores, and negatively with the FAB score. The significant peak in correlation in each case was localized to the precuneus.

This is the first study to establish alterations in the DMN of patients with iNPH. DMN connectivity may be a useful indicator of the severity of clinical symptoms in patients with iNPH ¹.

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Khoo HM, Kishima H, Tani N, Oshino S, Maruo T, Hosomi K, Yanagisawa T, Kazui H, Watanabe Y, Shimokawa T, Aso T, Kawaguchi A, Yamashita F, Saitoh Y, Yoshimine T. Default mode network connectivity in patients with idiopathic normal pressure hydrocephalus. J Neurosurg. 2016 Feb;124(2):350-358. Epub 2015 Aug 21. PubMed PMID: 26295919.

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