Cognitive control, with a limited capacity, is a core process in human cognition for the coordination of thoughts and actions. Although the regions involved in cognitive control have been identified as the cognitive control network (CCN), it is still unclear whether a specific region of the CCN serves as a bottleneck limiting the capacity of cognitive control (CCC).

Wu et al., used a perceptual decision-making task with conditions of high cognitive load to challenge the CCN and to assess the CCC in a functional magnetic resonance imaging (fMRI) study. We found that the activation of the right anterior insular cortex (AIC) of the CCN increased monotonically as a function of cognitive load and showed a significant correlation to the CCC. In a subsequent study of patients with unilateral lesions of the AIC, we found that lesions of the AIC were associated with a significant impairment of the CCC. Simulated lesions of the AIC resulted in a reduction of the global efficiency of the CCN in a network analysis. Altogether, these findings suggest that the AIC, as a critical hub in the CCN, is a bottleneck of cognitive control [1].

1)
Wu T, Wang X, Wu Q, Spagna A, Yang J, Yuan C, Wu Y, Gao Z, Hof PR, Fan J. Anterior insular cortex is a bottleneck of cognitive control. Neuroimage. 2019 Feb 21. pii: S1053-8119(19)30138-7. doi: 10.1016/j.neuroimage.2019.02.042. [Epub ahead of print] PubMed PMID: 30798012.