Brain Modularity Mediates the Relation between Task Complexity and Performance FENGDAN YE, QIUHAI YUE, RANDI MARTIN, SIMON FISCHER-BAUM, AURORA RAMOS-NUEZ, MICHAEL DEEM, Rice University — Recent work in cognitive neuroscience has focused on analyzing the brain as a network, rather than a collection of independent regions. Prior studies taking this approach have found that individual differences in the degree of modularity of the brain network relate to performance on cognitive tasks. However, inconsistent results concerning the direction of this relationship have been obtained, with some tasks showing better performance as modularity increases, and other tasks showing worse performance. A recent theoretical model suggests that these inconsistencies may be explained on the grounds that high-modularity networks favor performance on simple tasks whereas low-modularity networks favor performance on complex tasks. The current study tests these predictions by relating modularity from resting-state fMRI to performance on a set of behavioral tasks. Complex and simple tasks were defined on the basis of whether they drew on executive attention. Consistent with predictions, we found a negative correlation between individuals modularity and their performance on the complex tasks but a positive correlation with performance on the simple tasks. The results presented here provide a framework for linking measures of whole brain organization to cognitive processing.

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