Comorbidity

Bridge Centrality: A Network Approach to Understanding Comorbidity

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Volume
56
Issue
2
Page
353-367
DOI
10.1080/00273171.2019.1614898
Published
MAR 4 2021
Indexed
2021-06-20
Document Type
Article

Abstract

Recently, researchers in clinical psychology have endeavored to create network models of the relationships between symptoms, both within and across mental disorders. Symptoms that connect two mental disorders are called "bridge symptoms." Unfortunately, no formal quantitative methods for identifying these bridge symptoms exist. Accordingly, we developed four network statistics to identify bridge symptoms: bridge strength, bridge betweenness, bridge closeness, and bridge expected influence. These statistics are nonspecific to the type of network estimated, making them potentially useful in individual-level psychometric networks, group-level psychometric networks, and networks outside the field of psychopathology such as social networks. We first tested the fidelity of our statistics in predicting bridge nodes in a series of simulations. Averaged across all conditions, the statistics achieved a sensitivity of 92.7% and a specificity of 84.9%. By simulating datasets of varying sample sizes, we tested the robustness of our statistics, confirming their suitability for network psychometrics. Furthermore, we simulated the contagion of one mental disorder to another, showing that deactivating bridge nodes prevents the spread of comorbidity (i.e., one disorder activating another). Eliminating nodes based on bridge statistics was more effective than eliminating nodes high on traditional centrality statistics in preventing comorbidity. Finally, we applied our algorithms to 18 group-level empirical comorbidity networks from published studies and discussed the implications of this analysis.

Keywords
Author Keywords
Graph theorynetwork analysispsychopathologybridge nodesnode centrality linear modelscomorbidity

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Keywords Plus

OBSESSIVE-COMPULSIVE DISORDERANXIETY DISORDERDEPRESSIONSYMPTOMSPSYCHOPATHOLOGY