

Childhood Trauma and Non-suicidal Self-Injury: A Network Analysis of Rumination and Psychological Inflexibility

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Abstract

Background: Non-suicidal self-injury (NSSI) has become a serious mental health issue among adolescents, childhood trauma is a significant risk factor for NSSI, the mechanisms of rumination and psychological inflexibility remain underexplored, as well as group-specific variations, hindering the development of tailored and stratified interventions. **Objective:** To explore the network of relationships among childhood trauma (Emotion Abuse, Physical Abuse, Sexual Abuse, Emotion Neglect, Physical Neglect), rumination (Brooding, Reflect), psychological inflexibility (Experiential Avoidance, Cognitive Fusion) and NSSI through analyses of undirected and Bayesian directed networks. This study focuses on identifying core risk factors, bridge nodes, and differences in causal pathways between groups, with the aim of guidance on intervention targets for precision interventions targeting suicidal behavior in adolescents. **Method:** Undirected Gaussian graphical models were estimated using EBICglasso ($\gamma = 0.5$) to explore partial correlations among the 10 nodes (EA, PA, SA, EN, PN, Br, Re, Av, Fu, NSSI). Nodal centrality and bridge nodes were assessed via expected influence (EI) and bridge expected influence (BEI), with predictability computed using the mgm package. A Network Comparison Test (1000 iterations) was applied to compare network structure, global strength, and centrality between the NSSI and non-NSSI groups. The Bayesian directed acyclic graph (DAG) were subsequently constructed using the Hill-Climbing algorithm to infer directed causal pathways, with edge stability evaluated via 1000 bootstrap resamples. Network accuracy and stability were confirmed by bootstrap confidence intervals and CS coefficients exceeding 0.5. **Result:** In the undirected network, a full-sample analysis revealed that the connection between emotional abuse and NSSI was the strongest, and EA had the highest EI, while NSSI was the node with the highest BEI. A comparison of the networks between the self-injury and non-self-injury groups revealed significant differences in the overall structure and global strength of the two networks, with the self-injury group's network being more tightly connected; a comparison of centrality measures showed significant differences in the EI of EA, PA, SA, EN, and NSSI between the groups. DAG indicates that, in the group with self-injury, PA is the most upstream predictor, leading directly or indirectly to NSSI through pathways such as SA or EA; whereas in the group without self-injury, Br serves as the upstream node, influencing PN and NSSI through pathways such as Av or Fu. **Conclusion:** This study reveals the mechanisms underlying between-group differences in how childhood trauma drives NSSI through the mediating pathways of rumination and psychological inflexibility, providing a causal pathway and evidence for targeted interventions.

Keywords

Childhood Trauma, Non-suicidal Self-injury, Rumination, Psychological Inflexibility, Network Analysis

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