INPLASY PROTOCOL

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None declared.

Network model of depressive and anxiety symptoms: a systematic review and meta-analysis

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Review question / Objective: **We investigated the symptom characteristics of published network studies of depressive and anxiety symptoms, specifying 1) the characteristics of depressive and anxiety network studies and 2) the most recurrent centrality, bridge centrality and robust edge indices of networks involving depressive and anxiety symptoms.**
Condition being studied: **The same two investigators independently screened studies based on the PICOS acronym as follows: Participants (P): not available (NA); Intervention (I): NA; Control (C): NA; Outcomes (O): depressive and anxiety symptoms; Study design (S): network analysis based on cross-sectional study design that included both depressive and anxiety symptoms. If more than one paper was published based on the same dataset, only the one with the largest sample size was included.**

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 14 December 2022 and was last updated on 14 December 2022 (registration number INPLASY2022120055).

INTRODUCTION

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METHODS

Participant or population: NA.

Intervention: NA.

Comparator: NA.

Study designs to be included: network analysis based on cross-sectional study design.

Eligibility criteria: network analysis based on cross-sectional study design that included both depressive and anxiety symptoms.

Information sources: Two investigators (HC and MYC) independently searched the literature in PubMed, PsycINFO, Web of Science, and EMBASE, from their inception to 25 May 2022, using the following terms: (network analysis OR network approach OR network model OR network structure OR network modeling OR network theory) AND (depress* OR depression [MeSH]) AND (Anxiety[MeSH]).

Main outcome(s): Depressive and anxiety symptoms.

Data management: R software.

Quality assessment / Risk of bias analysis: None.

Strategy of data synthesis: Centrality and bridge centrality rankings were examined to determine the most important central and bridge symptoms of depression and anxiety models across studies. Higher centrality indicates symptoms with stronger associations with other symptoms in the network, which in turn is associated with driving stronger changes in other nodes over time (Robinaugh et al., 2016). The analysis on central symptoms focused on Strength, EI and Weighted Degree, given the poor stability of Betweenness and Closeness in symptoms networks (Bringmann et al., 2019). Bridge centrality was widely used in evaluating bridge function in network analysis (Jones et al., 2021). We examined relative centrality and bridge centrality propensities of depressive and anxiety symptoms by comparing the tendencies of symptoms that are among the more or less important across the examined studies. More specifically, centrality and bridge centrality ranking information (i.e., most to least important symptoms in the network) for depressive and anxiety symptoms was collected in frequency tables from each study. As depressive and anxiety symptoms were not included in all studies concurrently, rankings were then min-max normalized and ordered based on their median centrality rank, and then visualized using the R package "ggplot2" (Wickham, 2016). After determining the most central symptoms and bridge symptoms across network models, differences in symptom centrality across studies was examined using liner logistic regression in R. The analyzed study characteristics included sample size, mean age and type of participants.

2.3.2. Robust edges of depressive and anxiety symptoms

To determine the most interconnected symptoms, we examined recurring robust edges across studies. Edges represent the level of statistical association between two symptoms (Borsboom and Cramer, 2013). However, some edges are not reliably different from each other in a network model, as the estimated network model only approximates the true network. Bootstrapped difference testing was designed as a solution to identify which edges are significantly different from one another. For this analysis, we gathered data exclusively from studies that presented edge weight difference tests. We only included robust significant edges that were defined as being significantly different from at least two-thirds of the total edges in the network in bootstrapped comparison tests (Birkeland et al., 2020). We also limited our

analysis to positive robust connections, to study activation patterns between depressive and anxiety symptoms. Robust symptoms connections were then used to create a summary network graph of the most frequent edges. In the summary network edge list, the weight of a connection was determined as the proportion of the edge that appeared robust across the studies. Specifically, the edge weight between two symptoms (e.g., Mood-Weight) was defined as the number of times that said edge appeared robust, divided by the number of networks containing the two symptoms (e.g., number of networks from studies that assessed both Mood and Weight), adjusted by the total number of reviewed networks.

Subgroup analysis: None.

Sensitivity analysis: None.

Country(ies) involved: China.

Keywords: depression, anxiety, network analysis, meta-analysis.

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