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Life Changes and Symptom Networks of Depression and Anxiety: An Exploratory Network Analysis

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Aim

This exploratory study aims to examine whether the presence of life change events influences the way depressive and anxiety symptoms manifest and interact among individuals with mild to severe symptom levels. Specifically, it investigates whether individuals who have undergone life changes display distinct symptom network structures and differences in the relative importance of individual symptoms compared with those who have not.

Objectives

- To compare the symptom network structures of individuals **with** and **without** life changes.
- To identify the most **central (influential) symptoms** within each network.
- To deepen understanding of how life changes shape the **interplay of depressive and anxiety symptoms.**

Sampling

Design

Cross-sectional, population-based telephone survey. Collected during

Apr - May 2025

Population

Hong Kong residents aged 18+

able to communicate in Cantonese, English, or Mandarin.

Life change classification

Life Change Group

Reported **≥1 major life event** in the past 12 months.

No Change Group

Reported none.

Inclusion for analysis

participants with mild or higher symptoms of depression or anxiety (PHQ-9 ⩾ 5 and/or GAD-7 ⩾ 5).

Measures

Depression — Patient Health Questionnaire-9 (PHQ-9)

Anxiety — Generalised Anxiety Disorder-7 (GAD-7)

Life Changes — Participants were asked about their experience of life changes:

- In the past 12 months, have you experienced any of the following events? (e.g. Death of a Close Relative, Major Financial Difficulty, Break up from a Steady Relationship, etc)

Participants

	Life Change Group (N=292)	No Life Change (N=177)	*p*
Mean Age	**45.4**	**49.8**	<.002
Gender (Female %)	58.90%	59.30%	n.s.
PHQ-9	**8.40**	**6.59**	<.001
GAD-7	**7.21**	**5.51**	<.001

Statistical Analysis

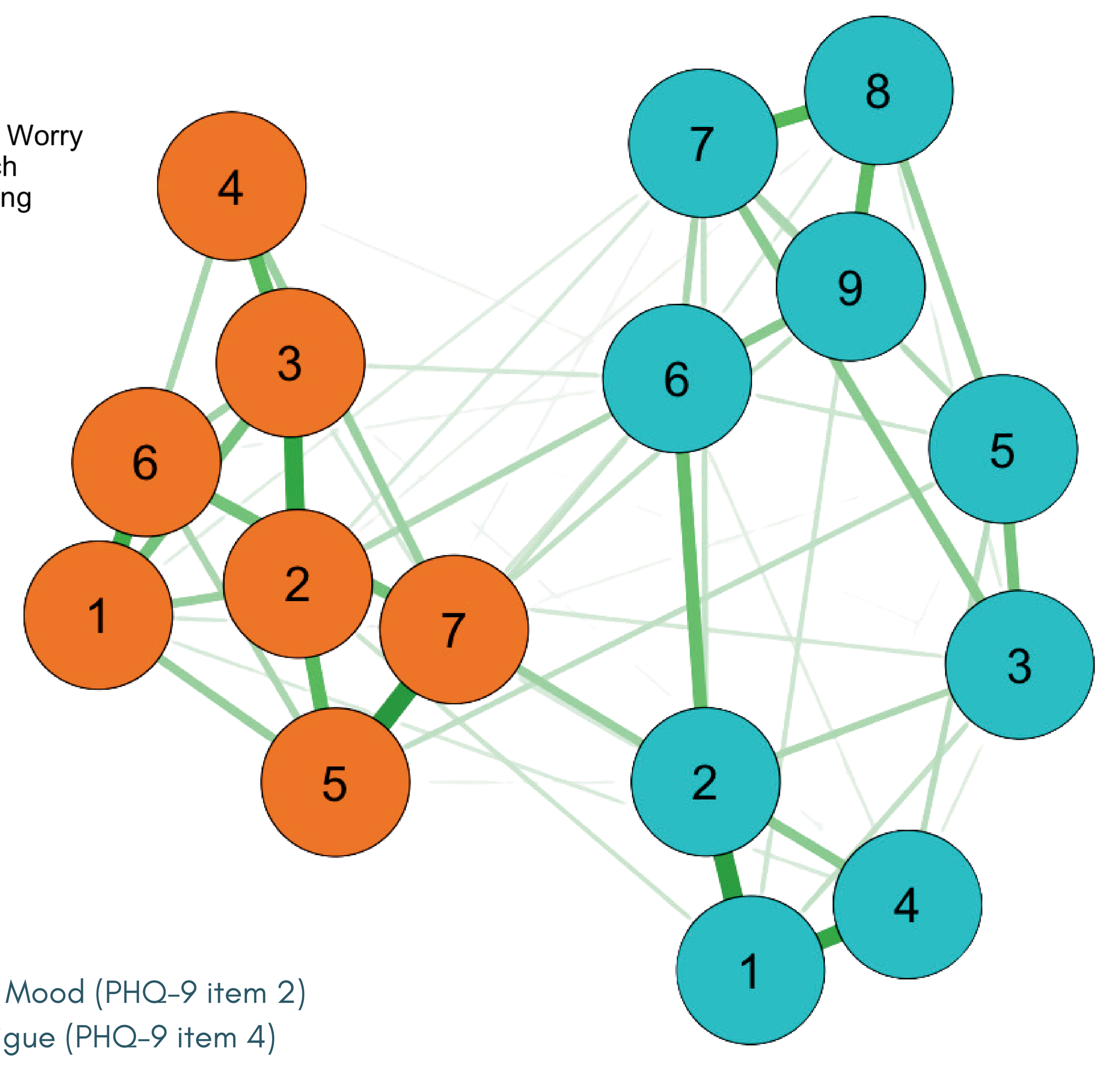
- **Network Estimation:**
  - Symptom networks were estimated using the **EBICglasso** method implemented in the bootnet R package (Epskamp et al., 2016), applied separately to the Life Change and No Change groups.
- **Node Metrics:**
  - We examined **node strength** to identify the most central symptoms within each network.
- **Network Comparison:**
  - The NetworkComparisonTest (NCT) (van Borkulo et al., 2016) was conducted to assess **differences in global strength** and **network structure** between groups.

Results

Life Change Network

Number of Non-Zero Edges: 69/120

Sparsity: 0.425



Top 2 Nodes with Highest strength

1. Feeling Afraid (GAD-7 item 7)
2. Sad Mood (PHQ-9 item 2)

Top 2 Strongest PHQ-9 Edges:

1. Anhedonia (PHQ-9 item 1) ⟵⟶ Sad Mood (PHQ-9 item 2)
2. Anhedonia (PHQ-9 item 1) ⟵⟶ Fatigue (PHQ-9 item 4)

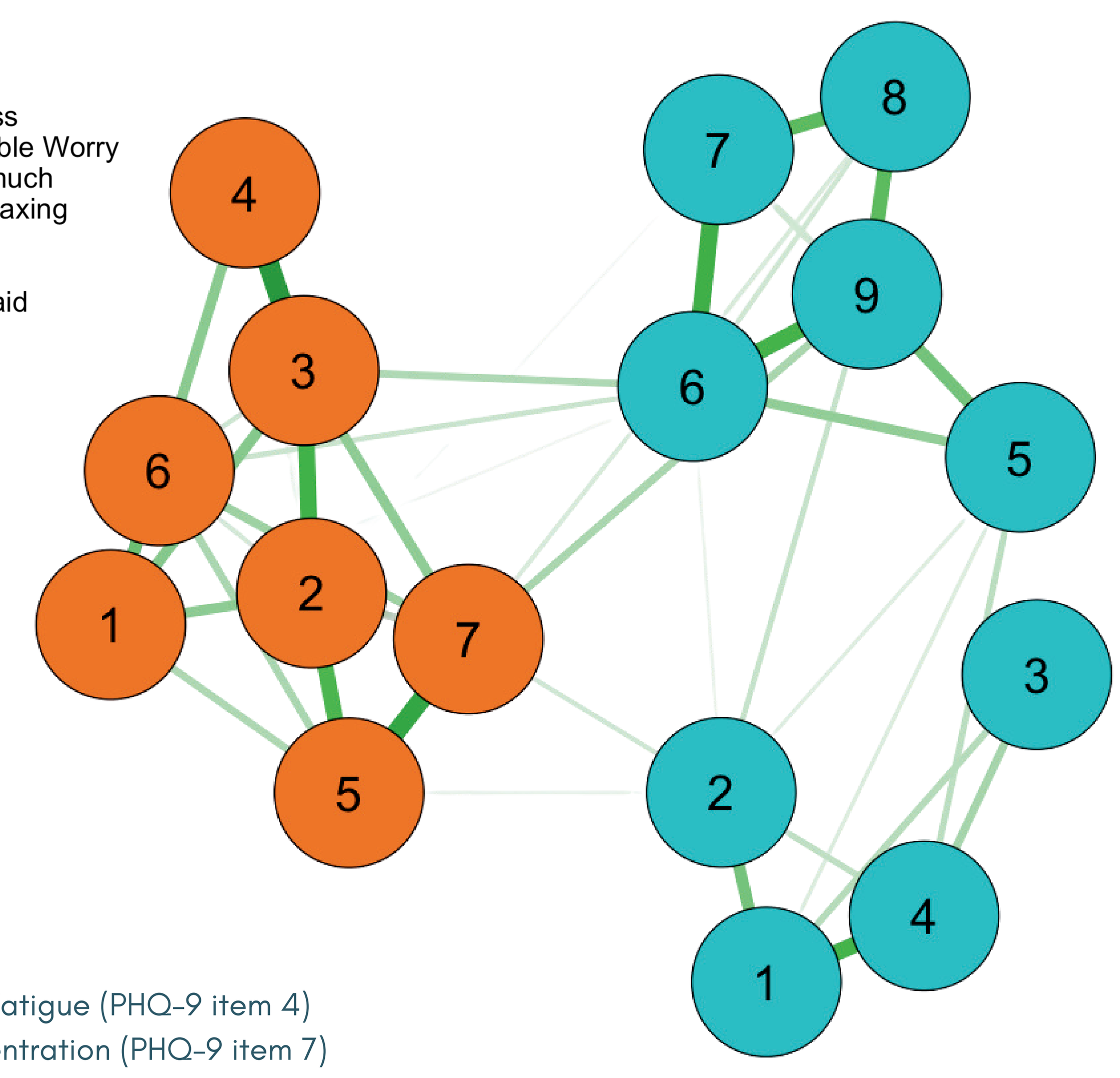
Top 2 Strongest GAD-7 Edges

1. Restless (GAD-7 item 5) ⟵⟶ Feeling Afraid (GAD-7 item 7)
2. Worry too much (GAD-7 item 3) ⟵⟶ Uncontrollable Worry (GAD-7 item 2)

No Life Change Network

Number of Non-Zero Edges: 47/120

Sparsity: 0.608



Top 2 Nodes with highest strength

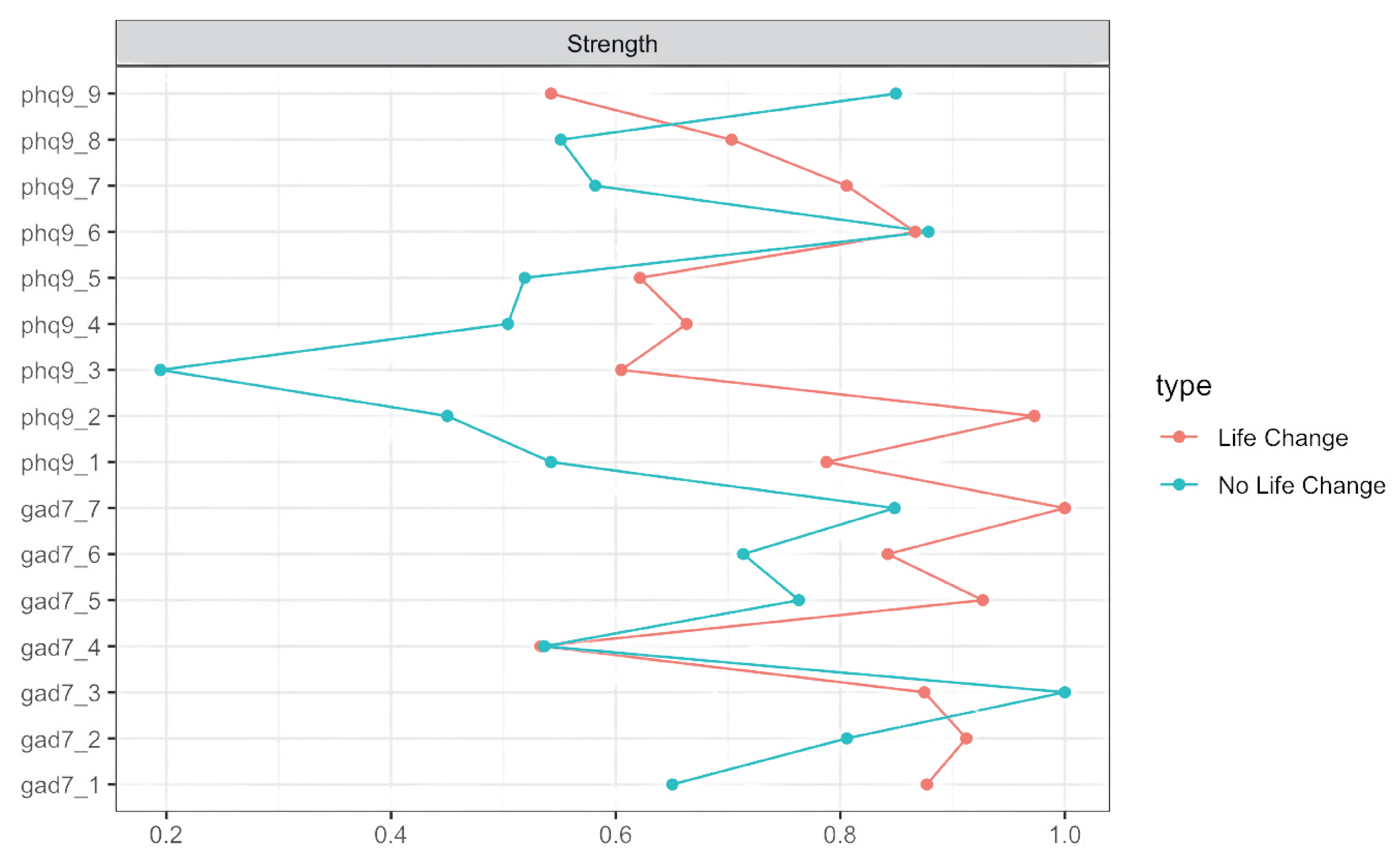
1. Worry too Much (GAD-7 item 3)
2. Guilt (PHQ-9 item 6)

Top 2 Strongest PHQ-9 Edges:

1. Anhedonia (PHQ-9 item 1) ⟵⟶ Fatigue (PHQ-9 item 4)
2. Guilt (PHQ-9 item 6) ⟵⟶ Concentration (PHQ-9 item 7)

Top 2 Strongest GAD-7 Edges:

1. Worry too Much (GAD-7 item 3) ⟵⟶ Trouble Relaxing (GAD-7 item 4)
2. Restless (GAD-7 item 5) ⟵⟶ Feeling Afraid (GAD-7 item 7)



Network Comparison Test

Node Strength Invariance Test

Sad Mood (PHQ-9 item 2): C=0.605 p=.016

Sleep Problems (PHQ-9 item 3): C=0.466 p=.048

Network Strength Invariance Test:

Life Change = 6.96; No Change = 5.48; S = 148, p = .004

Network Structure Invariance Test:

M= 0.187, p= .789

Edge Invariance Test:

No edge was significantly different between the two networks

Discussion

The current study revealed substantial differences in depressive and anxiety symptomatology between individuals with and without life changes. Those who experienced life changes reported poorer mental health outcomes and exhibited a more interconnected depression-anxiety symptom network. Notably, the higher global strength (the overall connection between the nodes) in the Life Change network suggests that, among individuals experiencing life transitions, the activation of one symptom is **more likely to trigger or reinforce other symptoms within the network**. However, the non-significant structure invariance test indicated that the **overall configuration of symptom relationships did not differ significantly** between the two groups, implying that the general presentation of depression and anxiety symptoms may be similar across both.

Centrality analysis further showed that "**Feeling Afraid**" and "**Sadness**" played the most prominent roles in the Life Change network, suggesting these symptoms could be **potential first-line treatment targets for individuals undergoing life transitions**. In contrast, "**Worry a lot**" and "**Guilt**" emerged as the most influential symptoms among those who did not experience life changes.

Overall, this exploratory study provides preliminary insight into the **structure of depressive and anxiety symptoms among individuals facing life transitions**. Future research should investigate whether different types of life changes (e.g., bereavement, financial hardship, relationship changes) lead to distinct symptom networks and whether these patterns can inform more tailored and context-specific interventions.

References

Epskamp, S., Borsboom, D., & Fried, E. I. (2016). Estimating psychological networks and their accuracy: a tutorial paper. arXiv preprint, arXiv:1604.08462.

van Borkulo, C. D., Boschloo, Kossakowski, J., Tio, P., L., Schoevers, R.A., Borsboom, D., & , Waldorp, L. J. (2016). Comparing network structures on three aspects: A permutation test. doi:10.13140/RG.2.2.29455.38569