Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

The association between family resilience and learned helplessness among hospitalized older adults with chronic multimorbidity in Xinjiang, China: A latent profile and computer-simulated network analysis

Wei-Long Wang
[redacted]

Zhengwei Luo
[redacted]

Runjia Zhang
[redacted]

Yongle Pei
[redacted]

Jiaqi Deng
The fourth Affiliated Hospital of Xinjiang Medical University

Xuexia Yang
The fourth Affiliated Hospital of Xinjiang Medical University

Xiaoxuan He
[redacted]

Jingwen Cai
[redacted]

Bo Zhang
[redacted]

Shufeng Ren
[redacted]

Qianqian Jia
[redacted]

Wen Cai
caiwen820602@163.com

[redacted]

Research Article

Keywords: Family resilience, Learned helplessness, Older adults, Computer-simulated network analysis, Latent profile analysis

Posted Date: June 28th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9406189/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License

Additional Declarations: No competing interests reported.

Version of Record: A version of this preprint was published at BMC Geriatrics on October 19th, 2026. See the published version at https://doi.org/10.1186/s12877-026-08432-4.

Abstract

Background

Learned helplessness is common among hospitalized older adults with chronic multimorbidity and is associated with poorer treatment adherence and quality of life. Family resilience may buffer psychological distress, yet the relationship between family resilience and learned helplessness remains poorly understood, particularly in multi-ethnic populations such as those in Xinjiang, China.

Purpose

To identify distinct profiles of family resilience among hospitalized older adults with chronic multimorbidity in Xinjiang, China, and to examine network characteristics of learned helplessness symptoms across different profiles, thereby identifying key intervention targets for each subgroup.

Methods

This cross-sectional study evaluated 427 hospitalized older adults with chronic multimorbidity at three tertiary hospitals in Urumqi, Xinjiang, China, from October 2025 to February 2026. Participants completed the Family Resilience Scale and the Learned Helplessness Scale. Latent profile analysis based on family resilience scores was used for stratification. Ising network analysis estimated symptom networks of learned helplessness for each subgroup, with core and bridge symptoms identified via centrality indices. Network comparison tests and computer-simulated intervention analyses (NodeIdentifyR algorithm) evaluated intergroup differences and identified optimal intervention targets.

Results

Three distinct family resilience profiles were identified: low (29.0%), moderate (43.8%), and high (27.2%). Core symptoms of learned helplessness differed significantly across profiles: anxiety (HL7) dominated in the low and high resilience groups, while confusion (HL10) dominated in the moderate group. Bridge symptoms also varied: suicidal ideation (HP5) in the low resilience group, emotional suppression (HP2) in the moderate group, and social comparison (HP3) in the high resilience group. Computer-simulated interventions identified profile-specific optimal alleviation targets (core symptoms) and aggravation risk indicators (bridge symptoms). Network structures differed significantly between the low and high resilience groups ($p = 0.016$) and between the moderate and high resilience groups ($p = 0.011$).

Conclusion

Family resilience shows substantial heterogeneity among hospitalized older adults with chronic multimorbidity in Xinjiang, with distinct learned helplessness symptom networks across profiles. These findings provide evidence for developing personalized, symptom-specific interventions tailored to family resilience characteristics.

1 Introduction

The prevalence of multimorbidity—the coexistence of two or more chronic conditions—has increased with population aging and rising life expectancy[1]. This trend is particularly pronounced in developing countries, where longer life expectancy often coincides with limited public health resources[2, 3]. In China, data from the China Health and Retirement Longitudinal Study (CHARLS) indicate that 65.6% of adults aged 60 years and older live with multimorbidity[4, 5].

Learned helplessness refers to a psychological state of powerlessness and resignation that develops following repeated exposure to uncontrollable adverse events[6]. This condition has received increasing attention in chronic disease populations, as it not only impairs treatment adherence and self-management but is also closely associated with anxiety, depression, and elevated suicide risk[7, 8].

Family resilience, which refers to a family system's capacity to withstand adversity and adapt to crises, may mitigate psychological distress[9]. According to Walsh's theory, resilient families provide emotional support, effective communication, and collaborative coping[10]. Although family resilience has been negatively associated with depression and anxiety in chronic disease patients, its relationship with learned helplessness among hospitalized older adults with multimorbidity remains unclear[11].

Previous studies have predominantly employed variable-centered approaches, overlooking heterogeneity in family resilience. Latent profile analysis can identify distinct family resilience subgroups, enabling more targeted interventions. Furthermore, network analysis can elucidate symptom-level interrelationships within learned helplessness across subgroups, identifying core symptoms as precise intervention targets[12]. Computer-simulated intervention analysis using the NodeIdentifyR algorithm can further evaluate the potential effects of symptom-specific interventions[13].

Xinjiang is a multi-ethnic region in western China characterized by distinct family structures, strong kinship bonds, and limited mental health resources compared with the more developed coastal provinces[14–16]. These contextual factors may influence the manifestation of family resilience and learned helplessness, yet no study has specifically examined this population.

This study therefore aimed to: (1) identify latent subgroups of family resilience among hospitalized older adults with multimorbidity in the Xinjiang region using latent profile analysis; (2) examine the network structure of learned helplessness symptoms across different subgroups; and (3) determine optimal intervention targets for each subgroup through computer simulation. The findings will inform personalized psychological care for this population.

2 Methods

2.1 Design

This study used a cross-sectional design. The participant population was selected from the geriatrics, cardiology, respiratory, and endocrinology departments of three tertiary hospitals in Urumqi, Xinjiang, China, between October 2025 and February 2026.

The inclusion criteria were as follows: (1) age ≥ 60 years; (2) having two or more chronic conditions, which were determined using the Charlson Comorbidity Index[17], and patients who had two or more conditions were considered to have multimorbidity; and (3) mental alertness and voluntary willingness to participate. The exclusion criteria were as follows: (1) severe cognitive or conscious impairment and (2) refusal to participate.

A total of 450 questionnaires were sent, and 427 valid questionnaires were received, giving a response rate of 94.9%. Before the survey was administered, the researchers clarified the reasons for and importance of the study. Informed consent was obtained from the participants, who then completed the questionnaire in writing, and those who had problems with either vision or writing were given on-site help. All participants provided written informed consent. The study was approved by the Ethics Committee of Xinjiang Medical University (approval number: XJYKDXR20230407001).

2.2 Participants and Sampling

Previous research suggests that latent profile analysis requires a minimum sample size of 300 to achieve reliable and accurate classification[12]. Additionally, for network analysis, the sample size should exceed the number of estimated parameters, including threshold parameters and pairwise correlation parameters. In this study, the learned helplessness scale comprises 18 items, yielding 18 threshold parameters and 153 pairwise correlation parameters; thus, the minimum required sample size was 171[13]. The final sample of 427 participants was therefore considered adequate.

2.3 Instruments

2.3.1 Measurement of resilience

The concept of family resilience, proposed by Walsh[10], focuses on how families with mentally ill members, dysfunctional family dynamics, or other challenges can overcome previous neglect of family resilience and lead meaningful lives. Li et al. developed the Chinese version of the Family Resilience Assessment Scale (FRAS-C) through translation and cultural adaptation[18]. The FRAS-C is a 32-item self-reported scale comprising three dimensions: family communication and problem-solving (FCPS), utilizing social resources (USR), and maintaining a positive outlook (MPO). Items are rated on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Total scores range from 32 to 128, with higher scores indicating greater family resilience. Subscale scores are calculated as the sum of their respective items. Higher FCPS scores represent better family interaction and communication skills,

while higher MPO scores reflect a more optimistic family attitude toward coping with adversity. The scale has demonstrated good reliability and validity in the Chinese population. In this study, Cronbach's α for this scale was 0.884.

2.3.2 Measurement of LHS

The Learned Helplessness Scale (LHS) was developed by Chinese scholar Wu Xiao-Yan and comprises two dimensions: helplessness (13 items) and hopelessness (5 items), totaling 18 items. It uses a 5-point Likert scale, with each item scored from 1 ("completely non-compliant") to 5 ("completely compliant"), yielding a total score range of 18–90[19]. Higher scores indicate more severe learned helplessness. The scale demonstrates good reliability, with a split-half reliability of 0.901 and a test-retest reliability of 0.898. The alpha of Cronbach's LHS in this study was 0.874.

2.4 Statistical analysis

Statistical analyses were performed using SPSS 27.0, JASP 0.19.3, and R 4.5.2. First, normality tests indicated that the data were not normally distributed. Therefore, Spearman's correlation analysis was used to examine the relationships between family resilience and learned helplessness, including both the total score and subdimensions. Second, latent profile analysis (LPA) was conducted to identify subgroups with distinct patterns of family resilience. Models with one to five classes were fitted sequentially. To avoid local optima, 5000 random starts were used for the initial stage and 500 for the final stage optimization[20]. Model fit was evaluated using the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), sample-size-adjusted BIC (aBIC), entropy, the Lo-Mendell-Rubin likelihood ratio test (LMR-LRT), and the bootstrap likelihood ratio test (BLRT). Lower AIC, BIC, and aBIC values, along with higher entropy values (typically > 0.8), indicated better model fit[21]. Third, differences in learned helplessness scores across the identified profiles were examined using Bayesian factor analysis and traditional one-way analysis of variance[22]. Fourth, Harman's single-factor test was performed to assess potential common method bias. A single factor accounting for less than 40% of the total variance indicated that common method bias was not a serious concern[23]. Fifth, Ising network analysis was performed on the dichotomized item scores[24]. Specifically, the original 0–5 item scores of the Learned Helplessness Scale were dichotomized as follows: scores of 0–3 were coded as 0 (symptom absent), and scores of 4–5 were coded as 1 (symptom present). This threshold was chosen because scores of 4 or 5 indicate clinically significant levels of learned helplessness. The network was estimated using LASSO-regularized nodewise logistic regression with the extended Bayesian information criterion (EBIC), setting the hyperparameter γ = 0.25[25]. Strength was used as the primary centrality index, representing the sum of the absolute edge weights connected to a node. Bridge strength was calculated to identify symptoms connecting the helplessness and hopelessness communities. Network stability was evaluated using the correlation stability coefficient (CS-C) derived from case-dropping bootstrap (1000 iterations). According to established guidelines, CS-C > 0.25 indicates acceptable stability[25]. Sixth, network comparison tests (NCT) were conducted to examine differences in network structure and global strength between pairs of family resilience profiles[26]. Finally, computer-simulated intervention analysis based on the NodeIdentifyR algorithm (NIRA) was used to identify the most

effective intervention targets. Following standard procedures, we generated 5000 simulated participants based on the estimated Ising model parameters. Alleviating and aggravating interventions were simulated by decreasing or increasing each symptom's threshold by two standard deviations, respectively[27]. The effect of each intervention was quantified as the absolute difference in network sum scores between the original and perturbed networks. Symptoms with the largest absolute differences were considered the most effective intervention targets.

3 Results

3.1 Demographic and clinical characteristics

A total of 427 participants were included, with a mean age of 64.2 ± 3.9 years; 52.7% were male and 81.3% were married. The majority (80.2%) had a primary caregiver, with 39.6% cared for by a spouse and 40.3% by children. The mean total score for family resilience was 80.18 ± 16.62, and the mean total score for learned helplessness was 54.27 ± 16.91. Detailed demographic and clinical characteristics are presented in Table 1.

Table 1
Demographic and clinical characteristics of participants (N = 427)

Variables	LHS total score (M ± SD)	n (%)
Age (years)		
60–65	52.57 ± 16.11	169 (39.6)
≥ 65	55.39 ± 17.35	258 (60.4)
Gender		
Female	56.86 ± 16.46	202 (47.3)
Male	51.95 ± 17.00	225 (52.7)
Education level		
Junior high or below	55.27 ± 16.48	156 (36.5)
Senior high	56.47 ± 16.75	133 (31.1)
College or above	51.04 ± 17.17	138 (32.3)
Monthly income (yuan)		
< 3000	57.49 ± 17.28	154 (36.1)
3000–5000	52.59 ± 16.35	153 (35.8)
> 5000	52.28 ± 16.65	120 (28.1)
Comorbidity count		
2	51.75 ± 16.05	133 (31.1)
3	53.04 ± 16.33	159 (37.2)
≥ 4	58.21 ± 17.80	135 (31.6)
Disease duration (years)		
< 5	50.15 ± 16.72	157 (36.8)
5–10	57.40 ± 16.24	152 (35.6)
> 10	55.73 ± 17.04	118 (27.6)
Primary caregiver		
Spouse	50.38 ± 16.70	169 (39.6)
Children	55.84 ± 15.57	172 (40.3)
Others	58.80 ± 18.38	86 (20.1)

Variables	LHS total score (M ± SD)	n (%)
Age (years)		
Marital status		
Married	54.22 ± 17.07	347 (81.3)
Others	54.50 ± 16.29	80 (18.7)
Medical insurance		
None	49.68 ± 17.75	50 (11.7)
Commercial	55.60 ± 17.46	50 (11.7)
Social	54.82 ± 16.64	327 (76.6)
Family resilience profiles		
Low family resilience	61.41 ± 15.97	124 (29.0)
Moderate family resilience	54.52 ± 16.39	187 (43.8)
High family resilience	46.24 ± 15.22	116 (27.2)

3.2 Common method bias and correlation analysis

Harman's single-factor test was performed to examine potential common method bias. The unrotated factor solution indicated that the first factor accounted for 29.605% of the total variance, below the 40% threshold, suggesting that common method bias was not a significant concern in this study. Given that the normality test revealed skewed distributions for all variables ($P < 0.05$), Spearman's rank correlation analysis was conducted. The results showed a significant negative correlation between the total score of family resilience and the total score of learned helplessness (r = -0.368, $P < 0.001$). Additionally, all dimensions of family resilience were significantly negatively correlated with all dimensions of learned helplessness, with correlation coefficients ranging from − 0.268 to -0.370 ($P < 0.001$). Specifically, within family resilience, "communication and problem solving" (FR-USR) correlated with the hopelessness and helplessness dimensions of learned helplessness at -0.337 and − 0.345, respectively; "family support and understanding" (FR-MPO) correlated with these two dimensions at -0.268 and − 0.307, respectively; and "family optimism and mastery" correlated with these two dimensions at -0.298 and − 0.316, respectively. Detailed correlation results are presented in Fig. 1.

3.3 LPA of family resilience

As illustrated in Fig. 2A, latent profile analysis was conducted to identify heterogeneous subgroups of family resilience by sequentially fitting models with one to five profiles. As the number of profiles increased, the AIC, BIC, and aBIC values gradually decreased. Based on statistical indices and theoretical interpretability, the three-profile model was selected as the optimal solution. This model demonstrated

relatively low information criteria values (AIC = 39961.699, BIC = 40489.081, aBIC = 40076.541), an entropy value of 0.847, and significant Lo–Mendell–Rubin likelihood ratio test (LMRT, $P = 0.005$) and bootstrap likelihood ratio test (BLRT, $P < 0.001$). Additionally, each profile comprised more than 5% of the total sample. Based on the dimension scores of family resilience across the three profiles, they were respectively labeled as: the low family resilience group (n = 124, 29.0%, with the lowest scores across all dimensions), the moderate family resilience group (n = 187, 43.8%, with moderate scores across all dimensions), and the high family resilience group (n = 116, 27.2%, with the highest scores across all dimensions). The characteristic distribution of the three profiles is presented in Fig. 2B.

3.4 Differences in learned helplessness across family resilience profiles

Due to the non-normal distribution of the data and the violation of homogeneity of variance, Welch's ANOVA was employed for group comparisons. The results revealed statistically significant differences in total learned helplessness scores among the three family resilience profiles ($F = 28.439$, $P < 0.001$). Details are presented in Fig. 2C. To further verify the robustness of these between-group differences, Bayesian factor post-hoc comparisons were conducted. The results showed extremely strong evidence supporting differences between the low and moderate family resilience groups (Cohen's $d = 0.425$, $BF_{10} = 70.536$), between the low and high family resilience groups (Cohen's $d = 0.972$, $BF_{10} = 6.021 \times 10^9$), and between the moderate and high family resilience groups (Cohen's $d = 0.519$, $BF_{10} = 1036.362$). These findings indicate that lower levels of family resilience are associated with higher levels of learned helplessness, and this negative association demonstrates robust statistical reliability and clinical significance across different subgroups. As shown in Fig. 2D,E.

3.5 Networking characteristics of learned helplessness across different family resilience profiles

The symptom networks of learned helplessness were visualized as shown in Fig. 3, with networks constructed for the total sample and each of the three family resilience profiles. In the total sample, HL6 ("I feel I cannot solve many difficulties") exhibited the highest strength centrality (strength = 1.964) (Fig. 4A), while HP3 ("I feel that no matter how hard I try, I cannot measure up to others") demonstrated the highest bridge strength (bridge strength = 4.501) (Fig. 4E). Across the three profiles, HL7 ("I have been feeling anxious and uneasy recently") emerged as the most central symptom for both Profile 1 (strength = 1.258) (Fig. 4B) and Profile 3 (strength = 1.975) (Fig. 4D), whereas HL10 ("I feel very confused") was identified as the core symptom for Profile 2 (strength = 1.666) (Fig. 4C). Regarding bridge symptoms, notable differences were observed across profiles. The most prominent bridge symptom was HP5 ("I have thought about ways to end my life") for Profile 1 (bridge strength = 3.195) (Fig. 4F), HP2 ("I really want to cry out loud") for Profile 2 (bridge strength = 4.747) (Fig. 4G), and HP3 for Profile 3 (bridge strength = 6.189) (Fig. 4H).

As shown in Fig. 5, the network comparison test revealed no significant differences in network structure (P = 0.656) or global strength (P = 0.817) between profile 1 and profile 2. A significant difference in network structure was found between profile 1 and profile 3 (P = 0.016), although no significant difference was observed in global strength (P = 0.611). Similarly, a significant difference in network structure was identified between profile 2 and profile 3 (P = 0.011), while global strength did not differ significantly (P = 0.285).

3.6 Computer-simulated intervention analysis

The results of the computer-simulated intervention are presented in Fig. 6. The analysis revealed that the impact of symptom-specific interventions on network dynamics varied across different profile network models for both alleviating and aggravating interventions. For the total sample, HL6, identified as the core symptom, also served as the optimal aggravating target, increasing the predicted sum score from 3.88 to 5.56, whereas HL7 emerged as the optimal alleviating target, reducing the sum score from 3.88 to 2.79. For profile 1, HL7, identified as the core symptom, was also the optimal alleviating target, decreasing the predicted sum score from 6.81 to 5.47, while HL3 demonstrated the strongest aggravating effect, increasing the sum score from 6.81 to 8.39. For profile 2, HL10, identified as the core symptom, was also the optimal alleviating target, reducing the predicted sum score from 3.13 to 2.38, whereas HL3 exhibited the most pronounced aggravating effect, raising the sum score from 3.13 to 4.60. For profile 3, HL7, identified as the core symptom, was also the optimal alleviating target, decreasing the predicted sum score from 2.65 to 2.11, while HP3, identified as the bridge symptom, demonstrated the strongest aggravating effect, increasing the sum score from 2.65 to 3.58. Notably, across the total sample and all three profiles, core symptoms were highly consistent with optimal alleviating targets, further highlighting the clinical significance of these symptoms as priority intervention targets.

4 Discussion

This study introduced the perspective of family resilience into research on learned helplessness among older adult inpatients with chronic comorbidities. Using latent profile analysis, it identified heterogeneous subgroups of family resilience. Furthermore, network analysis and computer-simulated interventions revealed the symptom networks of learned helplessness and precise intervention targets within these different subgroups. The findings offer a new perspective for understanding the mechanisms linking family resilience and learned helplessness, and provide empirical evidence for personalized psychological care for older adult inpatients with chronic comorbidities in the Xinjiang region.

4.1 Heterogeneity in family resilience

This study identified three distinct subgroups of family resilience among older hospitalized adults with chronic comorbidities, revealing the heterogeneous nature of this construct in this population. This finding aligns with previous research[28]. Notably, nearly one-third of the patients were classified into the

low family resilience group, characterized by the lowest scores across all dimensions, indicating limited capacity for resource mobilization within the family system when facing health-related stress[29]. The moderate family resilience group comprised the largest proportion, suggesting that most families demonstrate moderate functioning with some adaptive capacity while still requiring external support. Although the high family resilience group represented the smallest proportion, it reflects families with strong resilience that effectively mobilize internal resources to cope with illness-related challenges[30]. Compared with previous studies, the distribution of family resilience in this research may be associated with the socio-cultural context of Xinjiang, which is characterized by multi-ethnic communities and strong family traditions.

4.2 Symptom network characteristics of learned helplessness across family resilience profiles

This study employed network analysis to examine the symptom network structures of learned helplessness across different family resilience profiles, revealing significant variations in central and bridge symptoms among subgroups.

In the overall sample, HL6 emerged as the central symptom, indicating that "powerlessness" represents the core manifestation of learned helplessness among chronically comorbid hospitalized older adults. This finding aligns closely with learned helplessness theory: when individuals chronically encounter uncontrollable negative events, they gradually develop negative self-perceptions regarding their capabilities, believing they cannot alter their circumstances[31]. For patients with chronic comorbidities, the persistent nature of illness, treatment complexity, and recurrent hospitalization experiences continuously reinforce this sense of uncontrollability, establishing "powerlessness" as the central node of the entire symptom network[32]. However, in both low and high family resilience groups, HL7 served as the central symptom, whereas HL10 became central in the medium family resilience group. This pattern suggests that for patients with low family resilience, the absence of family support systems means they must confront disease-related challenges alone; this state of isolation naturally generates intense anxiety. For patients with high family resilience, although family support is adequate, these patients may hold higher expectations and engage in more extensive deliberation regarding disease prognosis, treatment options, and future life arrangements; when such deliberation fails to yield clear answers, it transforms into cognitive confusion. In other words, anxiety in low-resilience patients stems from the practical predicament of "having no one to rely upon," whereas confusion in high-resilience patients originates from cognitive conflict between "expectation and uncertainty." The predominance of confusion in the medium-resilience group indicates that while these patients possess some family support, it remains insufficient to buffer cognitive distress[30, 33].

Analysis of bridge symptoms further illuminated the connecting mechanisms between symptom clusters, with differences carrying significant clinical implications. In the overall sample, HP3 functioned as the critical bridge linking helplessness and hopelessness. This finding suggests that social comparison, as a cognitive mediator, may play a key role in the transformation process from

helplessness (“I cannot solve problems”) to hopelessness (“No matter how hard I try, I cannot match others”). Notably, bridge symptoms differed substantially across profiles: in the low family resilience group, the bridge symptom was HP5—an extremely alarming signal[34]. This indicates that clinical practitioners should exercise particular vigilance with these patients, and psychological assessments must incorporate suicide risk screening. In the medium family resilience group, the bridge symptom was HP2, reflecting emotional suppression as the critical issue for this population. These individuals possess some family support, yet insufficient for effective emotional ventilation, resulting in internal accumulation. Clinical interventions for this group should emphasize psychological counseling while enhancing communication and collaboration among family members[35]. In the high family resilience group, the bridge symptom was HP3; such families place greater emphasis on social achievement and others' evaluations, inadvertently intensifying patients' social comparison tendencies. These findings corroborate previous qualitative research, with both approaches yielding mutually consistent results[33, 34].

Network comparison tests revealed no significant difference in network structure between the low and moderate family resilience groups, whereas both differed significantly from the high resilience group. This indicates that the low and moderate groups share similar symptom connectivity patterns, while the high resilience group exhibits distinct network characteristics. These findings suggest that for patients with low and moderate family resilience, existing theoretical frameworks and intervention strategies may be applicable for clinical guidance. In contrast, for patients with high family resilience, tailored interventions addressing their unique network characteristics should be developed.

4.3 Consistency between core symptoms and simulated intervention targets

Computer-simulated interventions further elucidated the relationship between core symptoms and optimal intervention targets[24]. In both the low and high family resilience groups, the core symptom HL7 was also identified as the optimal alleviating target; similarly, in the moderate resilience group, the core symptom HL10 served as the optimal alleviating target. This consistency is not coincidental. From a clinical perspective, anxiety in patients with low family resilience likely stems from isolation due to inadequate family support; confusion in the moderate resilience group reflects the ambivalence of partial but insufficient support; and anxiety in the high resilience group may arise from heightened expectations and uncertainty regarding disease prognosis. Targeting these symptoms may maximize the reduction of overall symptom burden[36, 37].

However, bridge symptoms were not consistently identified as optimal intervention targets[38]. Although HP5 in the low resilience group and HP2 in the moderate resilience group served as key bridges connecting helplessness and hopelessness, they did not emerge as primary alleviating or aggravating targets in the simulations. Therefore, in clinical practice, core symptoms should be prioritized as direct intervention targets, while bridge symptoms warrant close monitoring as indicators of potential

symptom deterioration[36]. This differentiated intervention strategy may facilitate optimal allocation of limited healthcare resources[36–38].

5 Limitations and outlook

This study has several limitations that should be considered. First, due to its cross-sectional design, the data cannot support inferences regarding the temporal stability of the symptom networks or the causal direction of the observed associations between family resilience and learned helplessness. Second, reliance on self-report measures may introduce recall bias and social desirability bias; objective indicators (e.g., behavioral observations, clinician ratings, or biomarkers) were not included. Third, the sample was recruited only from selected areas of Xinjiang, China, which limits the generalizability of the findings to other populations, including those in different regions or cultural contexts. Fourth, the Ising model-based network analysis required dichotomization of the original 0–5 item scores. While this ensures clinical differentiation (presence/absence of symptoms) and aligns with the native Ising framework of the NodeIdentifyR algorithm, it may have resulted in some loss of information. Fifth, the sample sizes of the three identified family resilience subgroups were relatively small, leading to suboptimal stability of the centrality estimates. Therefore, the core and bridge symptoms identified for these subgroups should be interpreted with caution. To address these limitations, future studies should adopt longitudinal designs to test the causal effects of interventions targeting core symptoms, incorporate comprehensive objective assessments (e.g., clinical evaluations, biomarkers) to improve model validity, extend recruitment to diverse geographic and ethnic populations to enhance generalizability, apply polytomous network models (e.g., mixed graphical models) to the original ordinal data as a sensitivity analysis, and conduct multi-center studies involving multiple clinical centers to further increase sample sizes, thereby obtaining more stable network estimates and validating the present findings.

6 Conclusion

This study is the first to examine the heterogeneous characteristics and symptom network structures of learned helplessness among hospitalized older adults with chronic multimorbidity in Xinjiang from the perspective of family resilience. The findings indicate that the low family resilience group is characterized by anxiety and suicidal ideation, the moderate resilience group by confusion and emotional suppression, and the high resilience group by anxiety and social comparison. These findings provide empirical evidence for personalized psychological care for hospitalized older adults with chronic multimorbidity in Xinjiang.

Declarations

Ethics approval and consent to participate

This study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the Ethics Committee of Xinjiang Medical University (approval number: XJYKDXR20230407001). Written informed consent was obtained from all participants.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Funding

This study was supported by the Social Science Foundation of Xinjiang Uygur Autonomous Region (Project No. 22BRK049). The funder had no role in the study design, data collection, analysis, interpretation, manuscript writing, or the decision to submit for publication.

Author Contribution

WWL created the study protocol, performed the data collection, statistical analysis, and wrote the first draft. LZW, ZRJ and PYL assisted with the study design and data collection. DJQ, YXX and HXX conflated the data and assisted with the statistical analyses. CJW, ZB, RSF and JQQ were involved in the interpretation of the data and revision of the manuscript. CW, as the senior author, reviewed and edited all versions of the manuscript. All the authors read and approved the final manuscript.

Acknowledgements

We extend our sincere and profound gratitude to all hospitalized older adults with multimorbidity and their families who participated in this study. The authors also thank Professor Wu Xiaoyan for granting permission to use the Learned Helplessness Scale.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

1. Malkiely G, Paran M, Elgabsi M, Kessel B. Chronic comorbidities and failure of non-operative management in adhesive small bowel obstruction: results of analysis of national inpatient data from the United States. J Clin Med. 2025;14(17):5989. 10.3390/jcm14175989.
2. Liu J, Liu W, Wang L, et al. Association of visceral adiposity index and handgrip strength with cardiometabolic multimorbidity among middle-aged and older adults: findings from charls 2011–2020. Nutrients. 2024;16(14):2277. 10.3390/nu16142277.
3. Luo Y, Chen Y, Wang K, et al. Associations between multimorbidity and frailty transitions among older americans. J Cachexia Sarcopenia Muscle. 2023;14(2):1075–82. 10.1002/jcsm.13197.
4. S W, Y C, L X, et al. Multimorbidity measures associated with cognitive function among community-dwelling older chinese adults. Alzheimer's dement: j Alzheimer's Assoc. 2024;20(9). 10.1002/alz.14117
5. Wang Y, Xu W, Jin C, et al. Influenza vaccination and short-term risk of stroke among elderly patients with chronic comorbidities in a population-based cohort study. J Clin Hypertens (Greenwich). 2025;27(8):e70044. 10.1111/jch.70044.
6. Arslan G, Uzun K. Learned helplessness and meaning in life in emerging adults: the serial mediating role of free will and agency. Scand J Psychol. 2026;67(1):100–14. 10.1111/sjop.70018.
7. Li X, Guo Z, Jiao Y, et al. The developmental trajectory of learned helplessness in breast cancer chemotherapy patients: a longitudinal study based on latent growth models. Patient Prefer Adherence. 2026;20:577150. 10.2147/PPA.S577150.
8. Cai S, Tao H, Li C, et al. Latent profile analysis and influencing factors of learned helplessness in maintenance hemodialysis patients: a cross-sectional study. Asian Nurs Res. 2025;19(5):442–52. 10.1016/j.anr.2025.07.004.
9. Duangjina T, Fink AM, Gruss V. Resilience in family caregivers of Asian older adults with dementia: a concept analysis. ANS Adv nurs sci. 2023;46(4):E145–60. 10.1097/ANS.0000000000000471.
10. Walsh F. Family resilience: a framework for clinical practice. Fam Process. 2003;42(1):1–18. 10.1111/j.1545-5300.2003.00001.x.
11. Walsh F. The concept of family resilience: crisis and challenge. Fam Process. 1996;35(3):261–81. 10.1111/j.1545-5300.1996.00261.x.
12. Nylund-Gibson K, Garber AC, Carter DB, et al. Ten frequently asked questions about latent transition analysis. Psychol Methods. 2023;28(2):284–300. 10.1037/met0000486.
13. Ei SE. A tutorial on regularized partial correlation networks. Psychol Methods. 2018;23(4). 10.1037/met0000167.
14. Abudireyimu A, Su Y, Hu C, Li Y, Yao H. Chronic disease prevention literacy and its influence on behavior and lifestyle: a cross-sectional study in xinjiang, china. BMC Public Health. 2023;23(1):1980. 10.1186/s12889-023-16884-1.
15. Maimaitiwusiman Z, Wumaier A, Xiao W, et al. Ethnic and geographic variations in multiple chronic conditions among community-dwelling older people in xinjiang: a cross-sectional study. BMC Geriatr. 2023;23(1):455. 10.1186/s12877-023-04159-8.

16. Wang Z, Fan J, Fan J, Jing M. Risk prediction of cardiometabolic diseases with depression in the community of xinjiang production and construction corps. BMC Public Health. 2025;25(1):3722. 10.1186/s12889-025-24777-8.
17. Drosdowsky A, Gough K. The charlson comorbidity index: problems with use in epidemiological research. J Clin Epidemiol. 2022;148:174–7. 10.1016/j.jclinepi.2022.03.022.
18. M L, R M, S Z, et al. Reliability and validity of the chinese version of the family resilience questionnaire (FaRE questionnaire) in patients with breast cancer: a cross-sectional study. BMJ open. 2022;12(4). 10.1136/bmjopen-2021-051093
19. Wu XY, Zeng H, Ma SH, et al. Development of learned helplessness scale and its relationship with personality. J Sun Yat-sen Univ. 2009;30(3):357–60. 10.3321/j.issn:1672-3554.2009.03.026.
20. Tein JY, Coxe S, Cham H. Statistical power to detect the correct number of classes in latent profile analysis. Struct Equ Model: Multidiscip J. 2013;20(4):640–57. 10.1080/10705511.2013.824781.
21. Vrieze SI. Model selection and psychological theory: a discussion of the differences between the akaike information criterion (AIC) and the bayesian information criterion (BIC). Psychol Methods. 2012;17(2):228–43. 10.1037/a0027127.
22. Quintana DS, Williams DR. Bayesian alternatives for common null-hypothesis significance tests in psychiatry: a non-technical guide using JASP. BMC Psychiatry. 2018;18(1):178. 10.1186/s12888-018-1761-4.
23. Jiang Y, Li H, Xiong Y, et al. Association between fear of cancer recurrence and emotional distress in breast cancer: a latent profile and moderation analysis. Front Psychiatry. 2025;16:1521555. 10.3389/fpsyt.2025.1521555.
24. Epskamp S, Fried EI. A tutorial on regularized partial correlation networks. Psychol Methods. 2018;23(4):617–34. 10.1037/met0000167.
25. Epskamp S, Borsboom D, Fried EI. Estimating psychological networks and their accuracy: a tutorial paper. Behav Res Methods. 2018;50(1):195–212. 10.3758/s13428-017-0862-1.
26. van Borkulo CD, van Bork R, Boschloo L, et al. Comparing network structures on three aspects: a permutation test. Psychol Methods. 2023;28(6):1273–85. 10.1037/met0000476.
27. Cd van GLJN, C B. Intervening on psychopathology networks: evaluating intervention targets through simulations. Methods (San Diego Calif). 2022;204. 10.1016/j.ymeth.2021.11.006.
28. Li R, Li Y, Henry CS, et al. Anxiety, depression and family resilience: a three-level meta-analysis. J Affect Disord. 2026;392:120163. 10.1016/j.jad.2025.120163.
29. Kuang Y, Wang M, Yu NX, et al. Family resilience of patients requiring long-term care: a meta-synthesis of qualitative studies. J Clin Nurs. 2023;32(13–14):4159–75. 10.1111/jocn.16500.
30. McKinley CE. we have to … work for wholeness no matter what: family and culture promoting wellness, resilience, and transcendence. Transcult Psychiatry. 2024;61(3):519–30. 10.1177/13634615241227690.

31. Yessick LR, Salomons TV. The chronic disease helplessness survey: developing and validating a better measure of helplessness for chronic conditions. Pain Rep. 2022;7(2):e991. 10.1097/PR9.0000000000000991.
32. Wang J, Xiang J, Han X, Liang J, Shang X. Propofol alleviates depression-like behavior and cognitive disorder in learned helplessness model mice via regulating synaptic function. J Neurosci Res. 2025;103(12):e70096. 10.1002/jnr.70096.
33. Cai S, Li C, Du Z, et al. this is fate! Nothing we can do to change it: triggers of learned helplessness among patients in maintenance hemodialysis - a qualitative study. Qual Health Res. 2025;35(13):1494–507. 10.1177/10497323241301296.
34. Iversen C, Kevoe-Feldman H. The subjective and objective side of helplessness: navigating between reassurance and risk management when people seek help for suicidal others. Br J Soc Psychol. 2024;63(4):1608–24. 10.1111/bjso.12741.
35. Cano MÁ, Castro FG, De La Rosa M, et al. Depressive symptoms and resilience among hispanic emerging adults: examining the moderating effects of mindfulness, distress tolerance, emotion regulation, family cohesion, and social support. Behav Med. 2020;46(3–4):245–57. 10.1080/08964289.2020.1712646.
36. He H, Chen Y, Liu J, Yan X. Quality of life in older adults with urinary incontinence and its impact on the stigma-care needs network: latent profile and network analysis. BMC Geriatr Published online March. 2026;10. 10.1186/s12877-026-07170-x.
37. Wei L, Chong MC, Gunarathne NS. Nutrition literacy and nutrition self-efficacy among rural older adults in China: a latent profile and computer-simulated network analysis. Geriatr Nur (Lond). 2026;68:103841. 10.1016/j.gerinurse.2026.103841.
38. Chen F, Xiong Y, Li S, et al. Association between psychological flexibility and self-perceived burden in patients with cervical cancer: a computer-simulated network analysis. Eur J Oncol Nurs: Off J Eur Oncol Nurs Soc. 2025;74:102822. 10.1016/j.ejon.2025.102822.

Figures

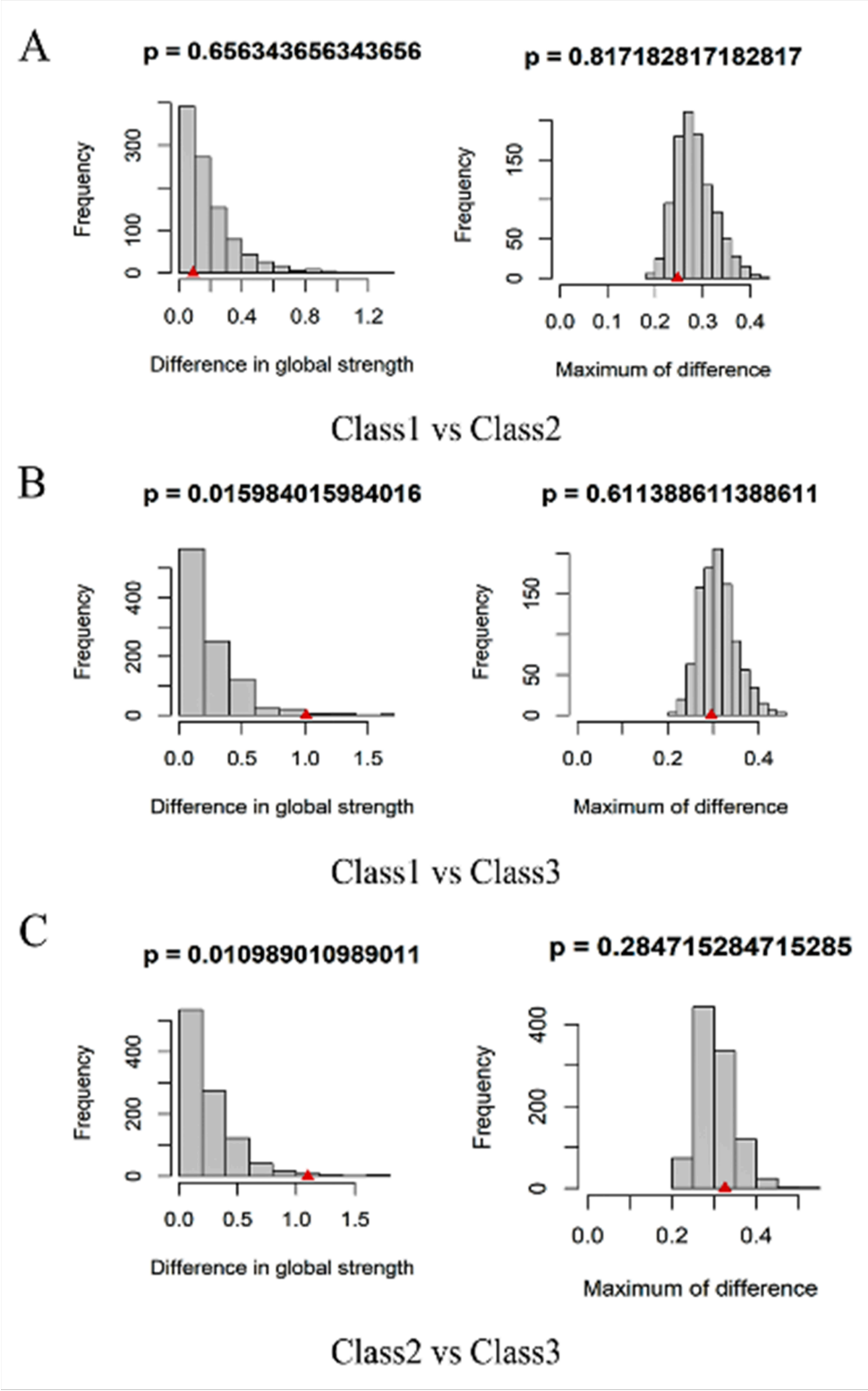


Figure 1

Network comparison tests between family resilience profiles. A. Class 1 vs. Class 2. B. Class 1 vs. Class 3. C. Class 2 vs. Class 3.

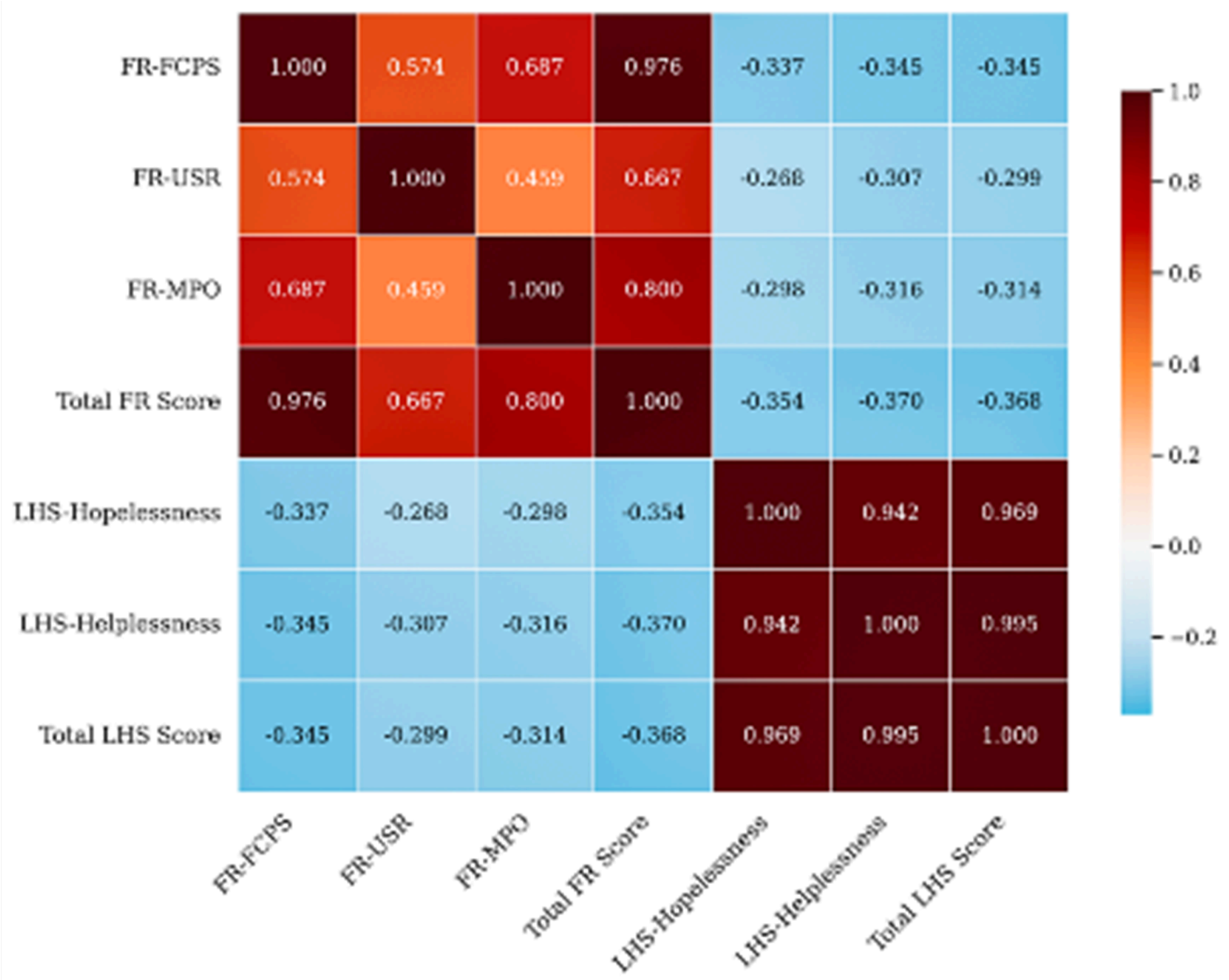


Figure 2

Correlation heatmap of family resilience and learned helplessness dimensions.

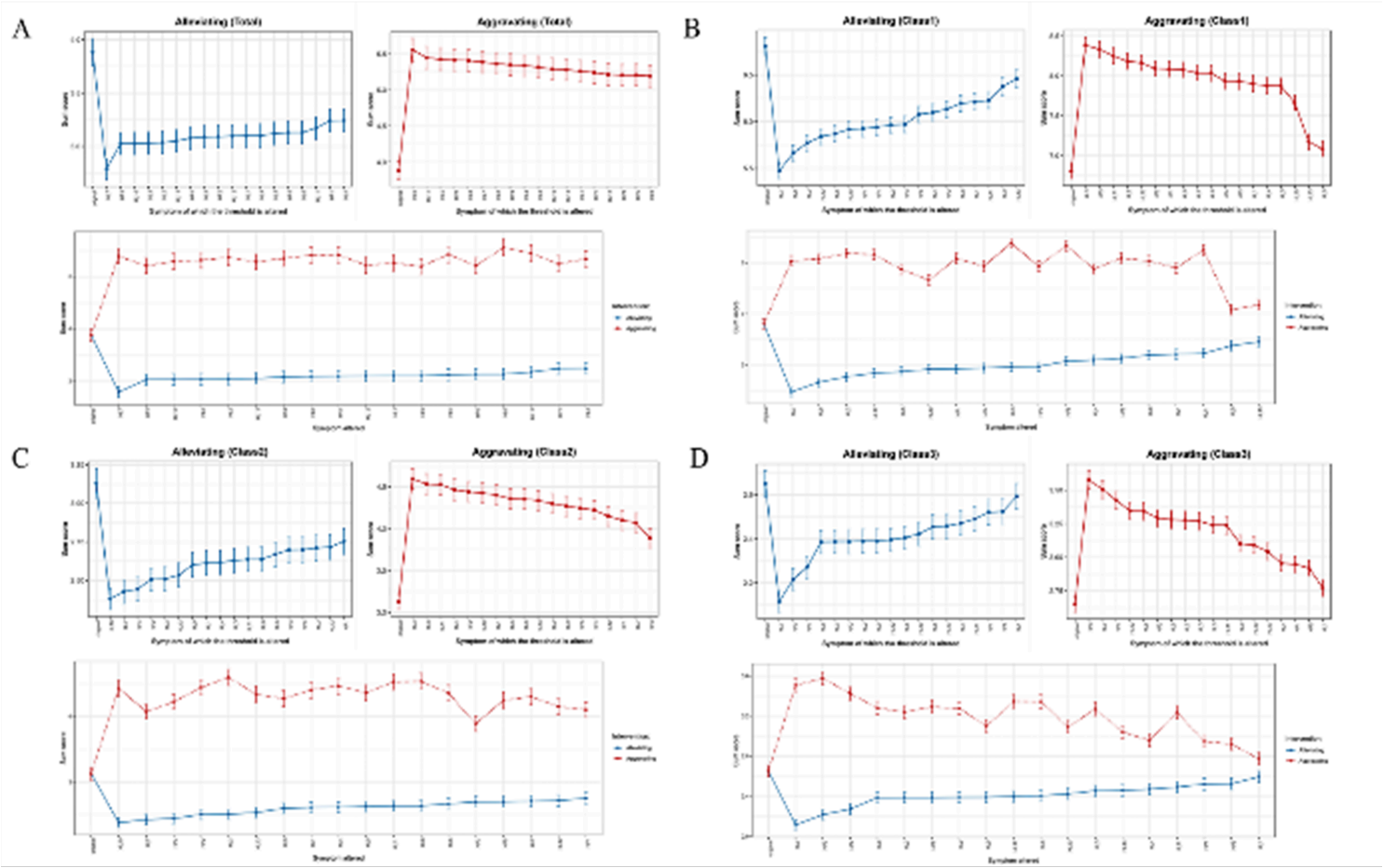


Figure 3

Intervention targets: A. Targeted symptoms for the overall sample. B. Targeted symptoms for Class 1. C. Targeted symptoms for Class 2. D. Targeted symptoms for Class 3.

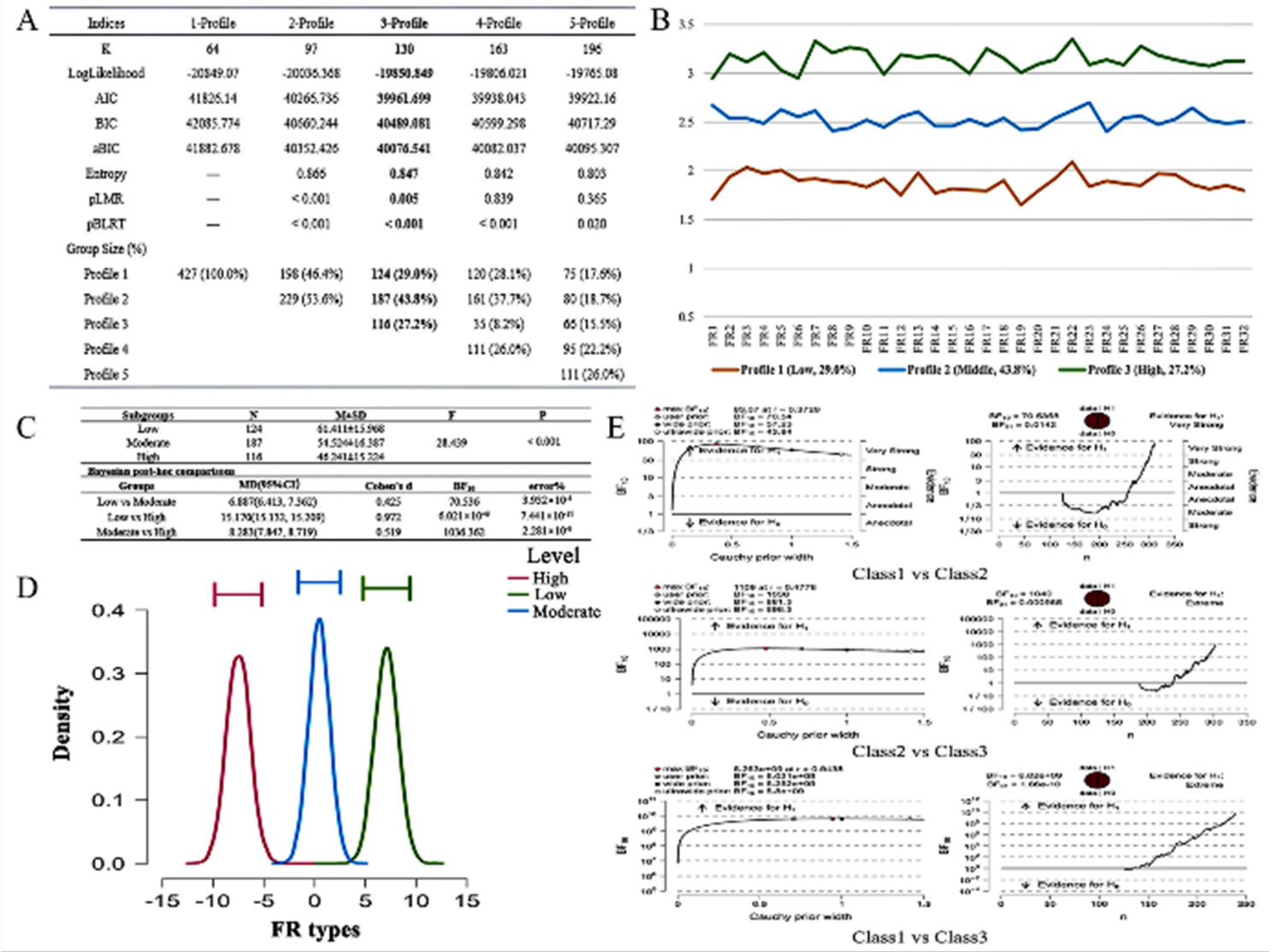


Figure 4

Latent Profile and Bayesian Factor Analysis. A. Fit indices for the latent profile models. B. Curves illustrating model fit. C. Bayesian factor analysis of LHS score differences across LPA profiles. D. Posterior distribution of ANOVA means. E. Bayesian factor analysis inference plot.

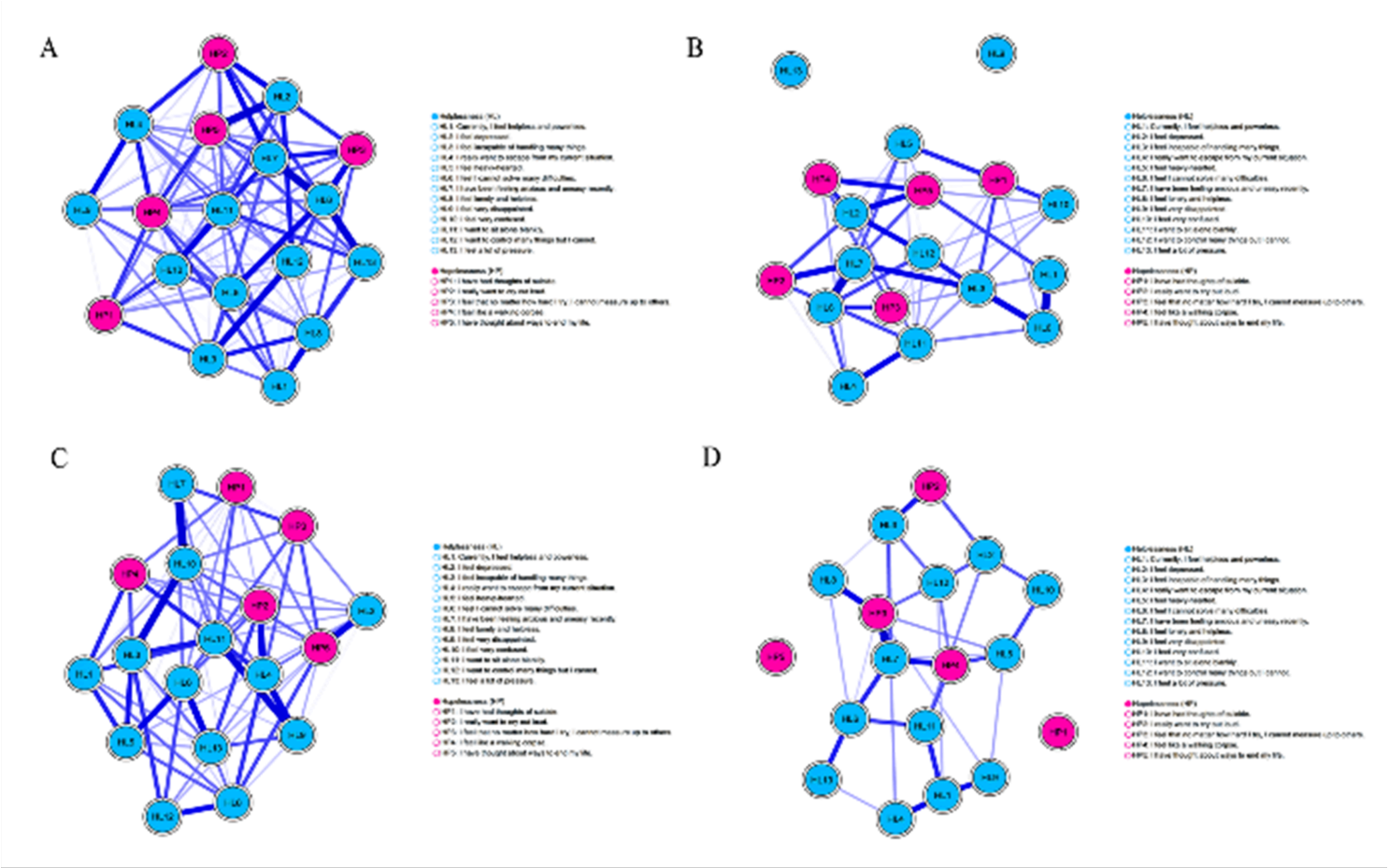


Figure 5

Network structures of learned helplessness symptoms across family resilience profiles. A. Overall sample network. B. Low family resilience group network. C. Moderate family resilience group network. D. High family resilience group network.

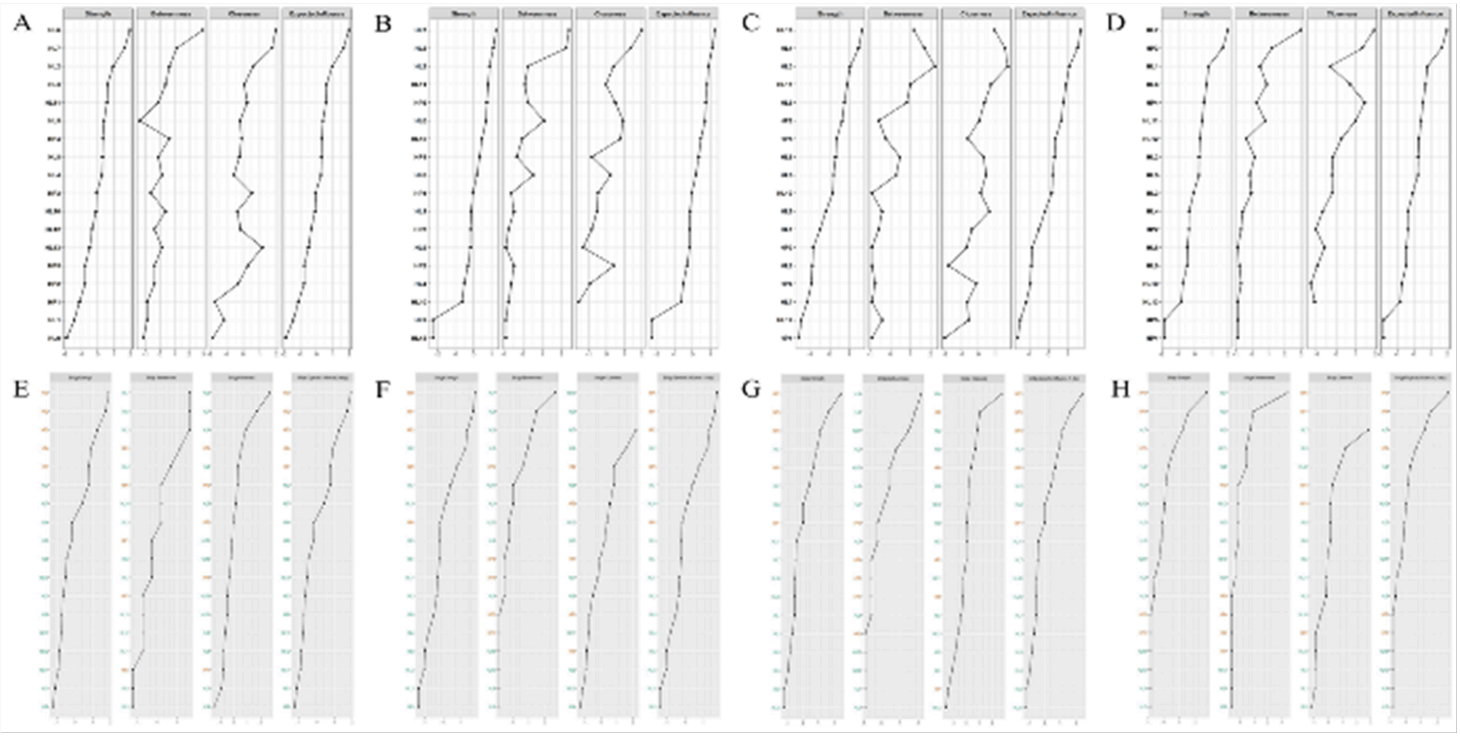


Figure 6

Central and bridge symptoms of learned helplessness across family resilience profiles. A. Core symptoms in the overall sample. B. Core symptoms in the low family resilience group. C. Core symptoms in the moderate family resilience group. D. Core symptoms in the high family resilience group. E. Bridge symptoms in the overall sample. F. Bridge symptoms in the low family resilience group. G. Bridge symptoms in the moderate family resilience group. H. Bridge symptoms in the high family resilience group.