

Dyadic associations of psychological resilience, positive coping, and psychological distress among patients with decompensated cirrhosis and their family caregivers: a cross-sectional actor–partner interdependence model study

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Research Article

Keywords: decompensated cirrhosis, family caregivers, psychological distress, psychological resilience, positive coping, actor–partner interdependence model, dyadic analysis

Posted Date: October 11th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-11103604/v1>

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Additional Declarations: No competing interests reported.

Abstract

Background

This study examined dyadic associations of psychological resilience and positive coping with psychological distress among patients with decompensated cirrhosis and their family caregivers using the actor–partner interdependence model.

Methods

In this cross-sectional study, 265 matched patient–caregiver dyads were recruited from a tertiary center by convenience sampling. Participants completed a general information questionnaire, the Kessler Psychological Distress Scale, the Connor–Davidson Resilience Scale, and the positive coping dimension of the Simplified Coping Style Questionnaire. Differences between patients and caregivers were analyzed using the Wilcoxon signed-rank test, correlations were examined using Spearman analysis, and dyadic associations were tested using unadjusted actor–partner interdependence models. Bootstrap resampling with 5,000 replications was used to estimate the ratio of partner effects to actor effects.

Results

Patients reported higher psychological distress than caregivers (27.76 ± 8.80 vs. 25.15 ± 7.54) and lower resilience and positive coping scores (all $P < 0.001$). Patient psychological distress was strongly correlated with caregiver psychological distress ($r = 0.814$, $P < 0.001$). Resilience and positive coping in both dyad members were negatively correlated with psychological distress in both members (all $P < 0.001$). Actor–partner interdependence models showed that resilience and positive coping were negatively associated with both one's own distress and the other member's distress. Pattern testing indicated that patient resilience and patient positive coping showed couple patterns, whereas caregiver resilience and caregiver positive coping showed mixed patterns.

Conclusions

These findings suggest that psychological distress and positive psychological resources are interdependent within patient–caregiver dyads affected by decompensated cirrhosis. Dyadic psychosocial assessment and support may be useful in addressing distress and strengthening resilience and coping in this population.

Background

Cirrhosis is a common end-stage consequence of chronic liver disease and a major contributor to liver-related mortality and disability worldwide. A 2023 report indicated that liver disease causes approximately 2 million deaths annually, accounting for 4% of deaths globally, largely because of cirrhosis-related complications and hepatocellular carcinoma [1]. In 2019, cirrhosis-related deaths accounted for approximately 2.4% of global mortality, and its etiologic spectrum has shifted with changes in the burdens of viral hepatitis, metabolic dysfunction–associated steatotic liver disease, and alcohol-related liver disease [2, 3]. Decompensated cirrhosis is characterized by ascites, variceal bleeding, hepatic encephalopathy, infection, renal impairment, and repeated hospitalization, accompanied by symptom fluctuations, functional limitations, treatment-related decision pressure, and prognostic uncertainty [4, 5]. Guidelines from the European Association for the Study of the Liver (EASL), Baveno VII, and the American Association for the Study of Liver Diseases (AASLD) recommend expanding management beyond complication control to address symptom burden, psychosocial needs, family communication, and caregiving support [4–6].

Psychological distress is a key outcome for nursing assessment in this population. Hernaez et al. reported that, among 1,021 patients with cirrhosis, approximately one-sixth had moderate-to-severe or severe depression and nearly half had moderate-to-severe anxiety [7]. A 2026 systematic review and meta-analysis reported pooled proportions of depression and anxiety in patients with cirrhosis of 0.37 and 0.53, respectively, with substantial heterogeneity, suggesting that disease stage,

measurement tools, and study settings influence prevalence estimates [8]. In decompensated disease, symptom burden, functional limitations, and treatment uncertainty may intensify psychological stress and impair quality of life [9]. Disease management relies heavily on family caregivers, who assist with symptom identification, medication supervision, dietary management, medical visits, treatment decision-making, and emotional support [10, 11]. Caregivers often experience caregiving burden, reduced quality of life, and psychological stress, which are associated with hepatic encephalopathy, disease severity, caregiving duration, social support, and financial strain [11–15]. Accordingly, psychological distress in decompensated cirrhosis should be understood within a dyadic caregiving framework shared by patients and family caregivers.

Psychological distress is not determined solely by disease severity; psychological resources and coping styles also shape cognitive appraisal of illness-related stress, emotional responses, and behavioral regulation. Psychological resilience refers to the capacity to maintain adaptation, regain equilibrium, and mobilize resources under stress, adversity, or trauma. The Connor–Davidson Resilience Scale has been widely used in research on chronic illness and stress [16, 17]. Coping style refers to the cognitive and behavioral processes through which individuals manage internal and external demands under stress, including problem solving, emotion regulation, meaning making, and maintenance of positive emotions [18]. Psychological resilience and positive coping are related but distinct: resilience reflects a relatively stable adaptive capacity, whereas positive coping reflects behavioral and cognitive strategies used in stressful contexts. Previous studies have shown that resilience, positive coping, social support, quality of life, and emotional distress are interrelated, and resilience-oriented interventions such as meditation, multicomponent psychoeducation, and creative arts interventions can be implemented with nursing involvement [19–22]. These findings suggest that psychological resilience and positive coping are assessable, interpretable, and modifiable constructs in nursing; however, their joint roles in patient–caregiver dyads require examination using paired data.

Most psychological studies in cirrhosis have used either patients or caregivers as the unit of analysis, making it difficult to address statistical non-independence and psychological interdependence. The theory of dyadic illness management proposes that chronic illness management is shaped through communication, support, task division, and decision-making between patients and caregivers in a shared illness context [23]. Research on self-care in chronic conditions has also incorporated patient self-care and caregiver contributions to patient self-care into a dyadic structure, emphasizing that caregivers are relational members of the disease-management system [24]. The actor–partner interdependence model (APIM) is appropriate for paired data because it simultaneously estimates the actor effect of an individual's predictor on that individual's own outcome and the partner effect of that predictor on the counterpart's outcome [25, 26]. APIM has been applied in studies of patients with cancer, patients with heart failure, and their family caregivers, revealing dyadic pathways involving social support, health literacy, and intention to use mobile health technologies [27, 28]. In a study of 127 dyads of patients with decompensated cirrhosis and their family caregivers, Ufere et al. found that 26% of dyads had clinically meaningful anxiety in both members and 18% had clinically meaningful depression in both members, and caregiver anxiety predicted patient depression [10]. However, current evidence has not clarified the actor and partner associations or relative dyadic roles of resilience and positive coping in this population. Therefore, this study used APIM to analyze associations among psychological resilience, positive coping, and psychological distress in patients with decompensated cirrhosis and their family caregivers, with the aim of informing nurse-led dyadic psychosocial care.

Methods

Study design and participants

This was a cross-sectional study of matched patient–caregiver dyads. Patients hospitalized for decompensated cirrhosis in liver disease–related departments of Anhui Public Health Clinical Center between November 2025 and February 2026, together with their primary family caregivers, were recruited by convenience sampling. Each patient and family caregiver constituted one matched dyadic unit. A total of 265 patient–caregiver dyads were included.

Patients were eligible if they met the diagnostic criteria for decompensated cirrhosis, were aged ≥ 18 years, had clear consciousness and basic reading comprehension or verbal communication ability, had a regular family caregiver, and voluntarily participated with written informed consent. Patients were excluded if they had severe cognitive impairment, psychiatric disorder,

or communication disorder; were critically ill and unable to complete the survey; or had another serious disease that could substantially affect psychological assessment.

Family caregivers were eligible if they were identified by the patient as the primary family caregiver, were aged ≥ 18 years, undertook daily caregiving, accompanied the patient to medical visits, or participated in disease-management tasks, had basic reading comprehension or verbal communication ability, and voluntarily participated with written informed consent. Caregivers were excluded if they had severe cognitive impairment, psychiatric disorder, communication disorder, or inability to complete the questionnaire independently.

Measures

General information questionnaire

The general information questionnaire was developed by the researchers based on the literature and the study objectives. Patient variables included age, sex, marital status, residence, occupation, educational level, monthly per capita household income, smoking and alcohol history, etiology, disease duration, pain status, and sleep status. Caregiver variables included age, relationship with the patient, caregiving experience, understanding of the disease, and educational level.

Kessler Psychological Distress Scale

Psychological distress was assessed using the Kessler Psychological Distress Scale. The scale was developed by Kessler et al. [29], and the Chinese version translated by Zhou et al. [30] was used in this study. It assesses the frequency of nonspecific psychological distress symptoms experienced during the past 4 weeks, including fatigue, helplessness, restlessness, depression, nervousness, low perceived competence, and low self-worth. The scale contains 10 items rated on a 5-point Likert scale, with 1 indicating “none of the time” and 5 indicating “all of the time.” Total scores range from 10 to 50, with higher scores indicating more severe psychological distress. Scores of 16–21, 22–29, and 30–50 indicate mild, moderate, and severe psychological distress, respectively. In this study, Cronbach’s α coefficients were 0.870 in patients with decompensated cirrhosis and 0.822 in caregivers.

Psychological resilience scale

Psychological resilience was assessed using the Connor–Davidson Resilience Scale. The scale was developed by Connor and Davidson [16], and the Chinese revised version by Yu et al. [17] was used in this study. It measures an individual’s capacity to cope with stressors. The scale comprises 25 items across three dimensions—optimism, strength, and tenacity—rated on a 5-point Likert scale, where 0 indicates “never” and 4 indicates “always.” Total scores range from 0 to 100, with higher scores indicating greater psychological resilience. In this study, Cronbach’s α coefficients were 0.874 in patients with decompensated cirrhosis and 0.846 in caregivers.

Simplified Coping Style Questionnaire

Positive coping was assessed using the positive coping dimension of the Simplified Coping Style Questionnaire. The scale was developed by Xie [31] to assess coping styles adopted by individuals when facing difficulties. The original scale includes two dimensions, positive coping and negative coping, and comprises 20 items rated on a 4-point Likert scale, with 0 indicating “never” and 3 indicating “often.” Only the positive coping dimension was used as the analytic indicator in this study. Higher scores indicate a stronger tendency toward positive coping. In this study, Cronbach’s α coefficients for this dimension were 0.825 in patients with decompensated cirrhosis and 0.736 in caregivers.

Data collection and quality control

Before data collection, all investigators received standardized training on eligibility criteria, questionnaire administration, completion requirements, and quality-control procedures. Eligible patients and family caregivers completed the questionnaires separately after providing informed consent. For participants with reading difficulties, investigators read each item using standardized instructions and recorded the response without providing leading explanations. Patients and caregivers completed the questionnaires independently to minimize discussion between dyad members.

After collection, questionnaires were checked on site for completeness. Questionnaires with missing responses, patterned answering, or apparent logical inconsistencies were verified. Data entry was independently checked by two researchers, and abnormal values were verified against the original questionnaires. Before statistical analysis, data were organized according to patient–caregiver dyad identification numbers to ensure that each analytic unit included both members of the dyad.

Specification of the actor–partner interdependence model

Patients and family caregivers are interrelated in illness experience, caregiving tasks, and emotional responses; therefore, their data do not meet the traditional assumption of independent observations. In this study, patients and family caregivers were defined as distinguishable dyads, with role identity used to distinguish patients from caregivers. APIM was used to analyze dyadic associations among psychological resilience, positive coping, and psychological distress [25, 26].

In APIM, the actor effect refers to the association between an individual's psychological resilience or positive coping and that individual's own psychological distress, whereas the partner effect refers to the association between an individual's psychological resilience or positive coping and psychological distress in the other member of the dyad. This study separately constructed a psychological resilience–psychological distress model and a positive coping–psychological distress model. In each model, psychological distress in patients and caregivers was specified as the outcome variable, and the corresponding psychological resource variables in patients and caregivers were specified as exogenous variables. Correlations between patient and caregiver exogenous variables and residual correlations between patient and caregiver psychological distress were allowed.

To characterize the relative patterns of actor and partner effects, bootstrap resampling with 5,000 replications was used. The ratio of partner effects to actor effects was calculated using unstandardized path coefficients; this ratio is denoted as k with a 95% confidence interval (CI). When the 95% CI for k included 1, the actor and partner effects were considered to have the same direction and similar magnitude, which was interpreted as a couple pattern. When the 95% CI for k included 0.5, the actor and partner effects were considered to have the same direction but different magnitudes, which was interpreted as a mixed pattern.

Statistical analysis

IBM SPSS Statistics version 26.0 and R version 4.4.2 were used for data management and statistical analysis. Categorical variables are presented as frequencies and percentages. Continuous variables are presented as mean $\pm$ standard deviation or median and interquartile range after normality testing. Between-group comparisons were performed using independent-samples t tests, Mann–Whitney U tests, or chi-square tests according to data type and distribution. Comparisons among three or more groups were conducted using one-way analysis of variance or Welch's test, with post hoc comparisons when necessary. Because psychological resilience, positive coping, and psychological distress scores for patients and caregivers were paired data and some variables were not normally distributed, the Wilcoxon signed-rank test was used to compare scores between patients and caregivers. Spearman rank correlation analysis was used to examine correlations between variables.

APIM was constructed in R version 4.4.2 using the lavaan package, with patients and caregivers specified as distinguishable dyads. APIM-estimated actor and partner paths linking psychological resilience and positive coping with psychological distress in both dyad members were examined separately. In each model, psychological distress in patients and caregivers was treated as the outcome variable, and the corresponding psychological resource variables in patients and caregivers were treated as exogenous variables. Correlations between exogenous variables within dyads and residual correlations between psychological distress outcomes were allowed. The APIMs constructed in this study were unadjusted saturated models and were used primarily to describe statistical associations between psychological resources and psychological distress within patient–

caregiver dyads, rather than to identify independent predictors or causal effects. Because saturated models have 0 degrees of freedom, overall model fit indices were not applicable for evaluating model quality. Bootstrap resampling was performed using custom R scripts, and percentile bootstrap confidence intervals were calculated with 5,000 replications to obtain unstandardized path coefficients, standard errors, 95% CIs, and P values. The k ratio and its 95% CI were calculated from the unstandardized path coefficients. All tests were two-sided, and $P < 0.05$ was considered statistically significant.

Ethical considerations

This study was approved by the Ethics Committee of Anhui Public Health Clinical Center (approval number: PJ-YX2025-072; approval date: October 28, 2025). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Before data collection, patients and family caregivers were informed of the study purpose, survey content, confidentiality procedures, voluntary participation, and their right to withdraw at any time. Participants were enrolled after providing written informed consent.

Results

General characteristics and univariate analysis of psychological distress

A total of 265 patient–caregiver dyads were included. Univariate analysis showed that patient psychological distress scores differed significantly by occupation, educational level, monthly per capita household income, disease duration, pain status, sleep status, and caregiver understanding of the disease ($P < 0.05$). Higher psychological distress scores were observed among patients who were not employed, had lower educational levels, had lower monthly per capita household income, had a disease duration > 5 years, reported pain, slept < 6 hours, or had caregivers with no understanding of the disease. Patient psychological distress scores did not differ significantly by patient age, marital status, residence, smoking and alcohol history, etiology, caregiver age, relationship with the patient, caregiving experience, or caregiver educational level ($P > 0.05$).

When caregiver psychological distress was used as the outcome, caregiver distress scores differed significantly by patient educational level, monthly per capita household income, disease duration, pain status, sleep status, caregiver understanding of the disease, and caregiver educational level ($P < 0.05$). Caregiver psychological distress scores did not differ significantly by patient age, marital status, residence, occupation, smoking and alcohol history, etiology, caregiver age, relationship with the patient, or caregiving experience ($P > 0.05$). See Table 1.

Table 1
Participant characteristics and univariate analyses of psychological distress

Characteristic	Category	n (%)	Patient psychological distress score (mean $\pm$ SD)	Test statistic	P	Caregiver psychological distress score (mean $\pm$ SD)	Test statistic	P
Patients								
Age (years)	18–44	36 (13.6)	26.67 $\pm$ 8.15	0.450 ^a	0.638	25.69 $\pm$ 7.42	0.889 ^a	0.889
	45–59	114 (43.0)	27.22 $\pm$ 8.62			24.99 $\pm$ 7.33		
	≥ 60	115 (43.4)	28.32 $\pm$ 9.19			25.15 $\pm$ 7.84		
Marital status	Married	239 (90.2)	27.56 $\pm$ 8.91	0.677 ^a	0.509	25.00 $\pm$ 7.58	0.616 ^a	0.541
	Never married	7 (2.6)	28.57 $\pm$ 5.53			27.57 $\pm$ 8.10		
	Divorced/widowed	19 (7.2)	29.95 $\pm$ 8.36			26.26 $\pm$ 6.94		
Residence	Rural	128 (48.3)	27.39 $\pm$ 8.90	-0.657 ^c	0.512	24.98 $\pm$ 7.61	-0.355 ^c	0.723
	Urban	137 (51.7)	28.10 $\pm$ 8.72			25.31 $\pm$ 7.50		
Occupation	Employed	118 (44.5)	25.92 $\pm$ 8.97	4.898 ^a	0.008	24.40 $\pm$ 7.70	1.830 ^a	0.162
	Retired	100 (37.7)	29.03 $\pm$ 8.62			25.24 $\pm$ 7.54		
	Not employed	47 (17.7)	29.68 $\pm$ 7.97			26.87 $\pm$ 6.98		
Educational level	Primary school or below	134 (50.6)	29.60 $\pm$ 8.46	12.042 ^a	< 0.001	26.21 $\pm$ 7.82	9.037 ^b	< 0.001
	Junior/senior high school	103 (38.9)	27.16 $\pm$ 8.78			24.94 $\pm$ 7.27		
	College or above	28 (10.6)	21.14 $\pm$ 7.00			20.89 $\pm$ 5.56		
Monthly per capita household income (CNY)	< 3,000	127 (47.9)	30.38 $\pm$ 8.40	14.607 ^a	< 0.001	27.14 $\pm$ 7.54	14.251 ^b	< 0.001
	3,000–5,000	112 (42.3)	26.14 $\pm$ 8.69			23.93 $\pm$ 7.32		
	> 5,000	26 (9.8)	21.92 $\pm$ 6.66			20.73 $\pm$ 5.37		
Smoking/alcohol history	Yes	107 (40.4)	27.66 $\pm$ 9.18	-0.144 ^c	0.885	25.44 $\pm$ 7.80	0.505 ^c	0.614
	No	158 (59.6)	27.82 $\pm$ 8.55			24.96 $\pm$ 7.38		

Note: Psychological distress scores are presented as mean $\pm$ standard deviation (SD). ^a F value; ^b Welch test; ^c t value. Univariate analysis describes preliminary differences in psychological distress scores across categories and should not be interpreted as evidence of independent predictors or causal relationships.

Characteristic	Category	n (%)	Patient psychological distress score (mean ± SD)	Test statistic	P	Caregiver psychological distress score (mean ± SD)	Test statistic	P
Patients								
Etiology	Viral	157 (59.2)	27.72 ± 8.86	0.592 ^a	0.669	24.89 ± 7.67	1.555 ^a	0.187
	Alcohol-related		26.60 ± 8.86			24.77 ± 7.47		
	Cholestatic	35 (13.2)	30.00 ± 7.62			28.40 ± 7.64		
	Autoimmune	15 (5.7)	30.50 ± 6.00			29.63 ± 5.15		
	Other	8 (3.0)	27.58 ± 9.34			24.58 ± 7.28		
		50 (18.9)						
Disease duration (years)	< 1	125 (47.2)	25.50 ± 9.25	14.858 ^b	< 0.001	23.18 ± 7.48	13.726 ^a	< 0.001
	1–5		27.31 ± 7.93			24.81 ± 6.66		
	> 5	62 (23.4)	31.74 ± 7.30			28.60 ± 7.15		
		78 (29.4)						
Pain status	Yes	81 (30.6)	30.16 ± 8.96	2.994 ^c	0.003	27.73 ± 8.03	3.592 ^b	< 0.001
	No	184 (69.4)	26.70 ± 8.53			24.02 ± 7.05		
Sleep status	< 6 hours	169 (63.8)	31.51 ± 7.22	11.182 ^c	< 0.001	27.60 ± 6.90	7.760 ^c	< 0.001
	≥ 6 hours	96 (36.2)	21.15 ± 7.31			20.84 ± 6.66		
Caregivers								
Age (years)	18–44	61 (23.0)	26.84 ± 9.46	1.723 ^a	0.180	23.59 ± 8.19	2.097 ^a	0.125
	45–59		27.02 ± 8.78			25.15 ± 7.34		
	≥ 60	99 (37.4)	28.99 ± 8.35			26.07 ± 7.25		
		105 (39.6)						
Relationship with patient	Parent	31 (11.7)	27.10 ± 8.46	0.628 ^a	0.598	26.45 ± 8.24	0.944 ^b	0.437
	Child		27.00 ± 9.74			23.41 ± 8.71		
	Spouse	49 (18.5)	28.20 ± 8.62			25.43 ± 7.00		
	Other	179 (67.5)	24.33 ± 8.50			24.50 ± 8.87		
		6 (2.3)						

Note: Psychological distress scores are presented as mean $\pm$ standard deviation (SD). ^a F value; ^b Welch test; ^c t value. Univariate analysis describes preliminary differences in psychological distress scores across categories and should not be interpreted as evidence of independent predictors or causal relationships.

Characteristic	Category	n (%)	Patient psychological distress score (mean ± SD)	Test statistic	P	Caregiver psychological distress score (mean ± SD)	Test statistic	P
Patients								
Caregiving experience	Yes	190 (71.7)	27.59 ± 8.93	-0.482 ^c	0.630	25.06 ± 7.46	-0.332 ^c	0.740
	No	75 (28.3)	28.17 ± 8.49			25.40 ± 7.79		
Understanding of the disease	Understand	144 (54.3)	25.38 ± 9.05	12.923 ^b	< 0.001	23.90 ± 8.22	12.923 ^b	< 0.001
	Partly understand	110 (41.5)	30.45 ± 7.62			26.33 ± 6.34		
	Do not understand	11 (4.2)	32.00 ± 7.54			29.82 ± 6.05		
Educational level	Primary school or below	117 (44.2)	28.51 ± 8.44	1.395 ^a	0.250	26.37 ± 7.43	3.739 ^a	0.025
			27.61 ± 8.62			24.67 ± 7.35		
	Junior/senior high school	113 (42.6)	25.71 ± 10.34			22.66 ± 7.93		
	College or above	35 (13.2)						
Note: Psychological distress scores are presented as mean ± standard deviation (SD). ^a F value; ^b Welch test; ^c t value. Univariate analysis describes preliminary differences in psychological distress scores across categories and should not be interpreted as evidence of independent predictors or causal relationships.								

Comparison of psychological resilience, positive coping, and psychological distress

Patients had lower resilience scores than caregivers (41.55 $\pm$ 14.31 vs. 44.68 $\pm$ 12.76; Z = 4.523, P < 0.001) and lower positive coping scores (14.45 $\pm$ 7.03 vs. 16.14 $\pm$ 5.73; Z = 4.672, P < 0.001). Psychological distress was higher in patients than in caregivers (27.76 $\pm$ 8.80 vs. 25.15 $\pm$ 7.54; Z = 7.465, P < 0.001). See Table 2.

Table 2
Patient–caregiver comparisons of resilience, positive coping, and psychological distress

Group	n	Psychological resilience	Positive coping	Psychological distress
Patients	265	41.55 $\pm$ 14.31	14.45 $\pm$ 7.03	27.76 $\pm$ 8.80
Caregivers	265	44.68 $\pm$ 12.76	16.14 $\pm$ 5.73	25.15 $\pm$ 7.54
Z		4.523	4.672	7.465
P		< 0.001	< 0.001	< 0.001
Note: Psychological resilience, positive coping, and psychological distress are presented as mean $\pm$ SD. Scores between patients and caregivers were compared using the Wilcoxon signed-rank test; Z values represent signed-rank test statistics.				

Correlation analysis of psychological resilience, positive coping, and psychological distress

Correlation analysis showed that patient psychological distress was positively correlated with caregiver psychological distress (r = 0.814, P < 0.001), indicating strong dyadic synchrony in distress. Patient psychological resilience was positively correlated

with caregiver psychological resilience ($r = 0.627$, $P < 0.001$), and patient positive coping was positively correlated with caregiver positive coping ($r = 0.535$, $P < 0.001$). Psychological resilience and positive coping in both patients and caregivers were negatively correlated with psychological distress in both members of the dyad ($P < 0.001$). Specifically, patient psychological distress correlated with patient psychological resilience, caregiver psychological resilience, patient positive coping, and caregiver positive coping at -0.753 , -0.661 , -0.637 , and -0.602 , respectively. The corresponding coefficients for caregiver psychological distress were -0.640 , -0.700 , -0.406 , and -0.575 , respectively. See Table 3.

Table 3
Correlations among resilience, positive coping, and psychological distress

Variable	Patient resilience	Caregiver resilience	Patient positive coping	Caregiver positive coping	Patient psychological distress	Caregiver psychological distress
Patient resilience	1.000	—	—	—	—	—
Caregiver resilience	0.627	1.000	—	—	—	—
Patient positive coping	0.618	0.499	1.000	—	—	—
Caregiver positive coping	0.548	0.614	0.535	1.000	—	—
Patient psychological distress	-0.753	-0.661	-0.637	-0.602	1.000	—
Caregiver psychological distress	-0.640	-0.700	-0.406	-0.575	0.814	1.000

Note: All correlation coefficients shown in the table were statistically significant at $P < 0.001$.

Actor–partner interdependence model analysis

An unadjusted APIM was constructed with patient and caregiver psychological resilience as exogenous variables and psychological distress in both members as outcome variables. The model was saturated. Patient resilience showed a negative actor association with patient psychological distress ($B = -0.340$), and caregiver resilience showed a negative actor association with caregiver psychological distress ($B = -0.297$). For partner effects, caregiver resilience was negatively associated with patient psychological distress ($B = -0.218$), and patient resilience was negatively associated with caregiver psychological distress ($B = -0.170$). These findings indicate that resilience in both patients and caregivers was associated not only with their own distress but also with distress in the other member of the dyad. The model paths are shown in Fig. 1.

An unadjusted APIM was constructed with patient and caregiver positive coping as exogenous variables and psychological distress in both members as outcome variables. This model was also saturated. Patient positive coping showed a negative actor association with patient psychological distress ($B = -0.551$), and caregiver positive coping showed a negative actor association with caregiver psychological distress ($B = -0.661$). For partner effects, caregiver positive coping was negatively associated with patient psychological distress ($B = -0.563$), and patient positive coping was negatively associated with caregiver psychological distress ($B = -0.147$). These findings suggest bidirectional associations linking positive coping with psychological distress in both patients and caregivers, with the caregiver-to-patient partner association being more pronounced. See Table 4. The model paths are shown in Fig. 2.

Table 4
APIM path coefficients for resilience, positive coping, and psychological distress

Model	Path	Path type	B	Direction
Psychological resilience model	Patient resilience → patient psychological distress	Patient actor effect	-0.340	Negative
Psychological resilience model	Caregiver resilience → caregiver psychological distress	Caregiver actor effect	-0.297	Negative
Psychological resilience model	Caregiver resilience → patient psychological distress	Caregiver-to-patient partner effect	-0.218	Negative
Psychological resilience model	Patient resilience → caregiver psychological distress	Patient-to-caregiver partner effect	-0.170	Negative
Positive coping model	Patient positive coping → patient psychological distress	Patient actor effect	-0.551	Negative
Positive coping model	Caregiver positive coping → caregiver psychological distress	Caregiver actor effect	-0.661	Negative
Positive coping model	Caregiver positive coping → patient psychological distress	Caregiver-to-patient partner effect	-0.563	Negative
Positive coping model	Patient positive coping → caregiver psychological distress	Patient-to-caregiver partner effect	-0.147	Negative
Note: B values are unstandardized path coefficients. The models in this study were saturated models with 0 degrees of freedom; therefore, overall fit indices were not reported. Path results are unadjusted associations and should not be interpreted as independent predictors or causal effects.				

Dyadic pattern testing of actor and partner associations

Bootstrap resampling with 5,000 replications was used to calculate the ratio of partner effects to actor effects based on unstandardized path coefficients. In the psychological resilience model, the k value for patients was 0.640, with a 95% CI of 0.383–1.003. Because the CI included 1, the association pattern between patient resilience and psychological distress was considered a couple pattern, indicating comparable actor and partner associations. The k value for caregivers was 0.573, with a 95% CI of 0.326–0.958. Because the CI included 0.5, the association pattern for caregiver resilience was considered a mixed pattern, indicating actor and partner associations in the same direction but with different magnitudes.

In the positive coping model, the k value for patients was 1.020, with a 95% CI of 0.532–1.854. Because the CI included 1, the association pattern between patient positive coping and psychological distress was considered a couple pattern, indicating comparable actor and partner associations. The k value for caregivers was 0.223, with a 95% CI of 0.006–0.597. Because the CI included 0.5, the association pattern for caregiver positive coping was considered a mixed pattern. These findings indicate that patient psychological resources showed more balanced associations with distress in both members of the dyad, whereas caregiver psychological resources showed coexisting actor and partner associations with unequal magnitudes. See Table 5.

Table 5
Dyadic patterns of actor and partner associations

Predictor	Role	k value	95% CI	Dyadic pattern	Interpretation
Psychological resilience	Patient	0.640	0.383–1.003	Couple pattern	Actor and partner associations were in the same direction and of similar magnitude
Psychological resilience	Caregiver	0.573	0.326–0.958	Mixed pattern	Actor and partner associations were in the same direction but differed in magnitude
Positive coping	Patient	1.020	0.532–1.854	Couple pattern	Actor and partner associations were in the same direction and of similar magnitude
Positive coping	Caregiver	0.223	0.006–0.597	Mixed pattern	Actor and partner associations were in the same direction but differed in magnitude
Note: The k value represents the ratio of the partner effect to the actor effect.					

Discussion

Principal findings

This study used APIM to analyze dyadic associations among psychological resilience, positive coping, and psychological distress in patients with decompensated cirrhosis and their family caregivers. Four key findings emerged. First, patients had higher psychological distress than caregivers, whereas caregivers had higher resilience and positive coping than patients, indicating greater psychological risk among patients within the illness-caregiving dyad. Second, psychological distress in patients and caregivers was highly positively correlated, and resilience and positive coping in both members were negatively correlated with distress, suggesting synchronous psychological variation between patients and caregivers. Third, the unadjusted APIM showed that resilience and positive coping were negatively associated with both one's own distress and distress in the other member of the dyad. Fourth, k-value testing indicated that associations between patient psychological resources and distress in both patients and caregivers were closer to a couple pattern, whereas caregiver psychological resources followed a mixed pattern with coexisting actor and partner associations of unequal magnitude. These findings support understanding psychological distress in decompensated cirrhosis within a dyadic caregiving framework, rather than interpreting distress solely at the individual patient level.

Psychological distress in patients and related factors

Patients with decompensated cirrhosis had higher psychological distress than caregivers. This finding is clinically plausible. Decompensated cirrhosis is often accompanied by ascites, variceal bleeding, hepatic encephalopathy, infection, and renal impairment. Patients face persistent symptom fluctuations, repeated hospitalization, treatment uncertainty, and prognostic pressure. EASL guidelines and the Baveno VII consensus emphasize that decompensating events represent turning points in the course of cirrhosis and that portal hypertension–related complications alter clinical management pathways [4, 5]. The AASLD practice guidance highlights the need to incorporate symptom burden, psychosocial needs, and caregiving support into disease management [6]. Previous studies have shown that anxiety, depression, and impaired quality of life are common among patients with cirrhosis. Hernaez et al. reported that, among 1,021 patients with cirrhosis, approximately one-sixth had moderate-to-severe or severe depression and nearly half had moderate-to-severe anxiety [7]. A 2026 systematic review and meta-analysis showed pooled proportions of depression and anxiety of 0.37 and 0.53, respectively, among patients with cirrhosis, with high between-study heterogeneity [8]. Therefore, the relatively high level of psychological distress among patients in this study may reflect the direct, persistent, and unpredictable illness experience of decompensated cirrhosis.

Univariate analysis showed that occupation, educational level, monthly per capita household income, disease duration, pain, sleep status, and caregiver understanding of the disease were associated with patient psychological distress, suggesting that distress is shaped by symptom burden, resource accessibility, illness cognition, and life circumstances. A systematic review of symptoms in end-stage liver disease showed that pain, dyspnea, muscle cramps, sleep disturbance, depression, and anxiety are

common and that patients' health-related quality of life is lower than that of healthy individuals and patients with compensated cirrhosis [32]. Hansen et al. noted that the frequency and distress of multiple symptoms in patients with decompensated cirrhosis may be underestimated in clinical practice; a narrow focus on liver function indices and complications may overlook patients' actual symptom and psychological burdens [33]. Sleep disturbance is common in chronic liver disease and cirrhosis and is associated with circadian rhythm changes, hepatic encephalopathy, pruritus, muscle cramps, emotional symptoms, and reduced quality of life [34]. Pain is also prominent. Among patients with cirrhosis undergoing liver transplant evaluation, the prevalence of pain exceeds 70%, and anxiety, depression, and pain are interrelated and jointly affect quality of life [35]. Philips also proposed that pain, sleep disturbance, pruritus, muscle cramps, and emotional symptoms should be included in comprehensive symptom management [36]. In the present study, patients with pain and insufficient sleep had higher psychological distress, consistent with previous evidence and indicating that nursing assessment should jointly screen for pain, sleep, emotional status, and illness cognition.

Patients with lower monthly per capita household income had higher psychological distress, consistent with evidence on the financial burden of chronic liver disease. A scoping review by Ufere et al. showed that patients with chronic liver disease and their family caregivers commonly experience medical expenses, income loss, and financial stress. Financial burden is associated with lower quality of life, greater health care utilization, caregiver burden, anxiety, and depression [37]. Treatment for decompensated cirrhosis is prolonged, follow-up is frequent, and management of complications is complex. Financial stress may aggravate psychological distress by increasing treatment uncertainty, weakening perceived control over disease, and limiting access to resources. Educational level and caregiver understanding of the disease were also associated with psychological distress, suggesting that health information comprehension and disease-management capacity influence how patients interpret symptoms, treatment, and prognosis. Donlan et al. found that patients with decompensated cirrhosis value prognostic communication and perceive it as helpful for treatment decision-making, maintaining hope, and coping with disease; however, most patients had not discussed end-of-life care preferences with physicians, and insufficient prognostic information was associated with greater symptom burden, anxiety, depression, and poorer quality of life [38]. These findings highlight the need for risk-stratified psychosocial support, particularly for patients with lower educational attainment, lower income, longer disease duration, pain, or insufficient sleep.

Dyadic interdependence of psychological distress

Psychological distress in patients and caregivers was strongly positively correlated, suggesting that the two members form an interdependent dyadic unit within a shared illness context and caregiving relationship. Management of decompensated cirrhosis depends on family caregivers' participation in symptom monitoring, medication supervision, dietary management, medical visits, complication recognition, and emotional support. Patients' symptom fluctuations, reduced treatment adherence, disease-related worries, and negative emotions may increase caregiver stress. Conversely, caregiver anxiety, fatigue, low caregiving confidence, and poor communication may weaken patients' sense of safety, perceived disease control, and psychological adaptation. The theory of dyadic illness management proposes that chronic illness management is shaped through communication, support, task division, and decision-making between patients and caregivers in a shared illness context [23]. Research on self-care in chronic conditions indicates that patient self-care and caregiver contributions to patient self-care jointly constitute a dyadic structure, with caregivers serving as relational members of the disease-management system [24]. The correlation findings of this study therefore provide empirical support for the use of APIM.

Dyadic psychological research in cirrhosis remains limited. In an APIM study of 127 dyads of patients with decompensated cirrhosis and their caregivers, Ufere et al. found that 26% of dyads had clinically meaningful anxiety in both members and 18% had clinically meaningful depression in both members, and caregiver anxiety predicted patient depression [10]. These results are consistent with the present finding that patient and caregiver psychological distress were highly correlated, supporting dyadic interdependence of psychological distress in decompensated cirrhosis. APIM studies in cancer and heart failure have shown that patient and caregiver social support, health literacy, self-care, and intention to use mobile health technologies may influence health-related outcomes in both members through actor and partner pathways [27, 28]. Applying APIM to patients with decompensated cirrhosis and family caregivers helps address the limitations of single-informant analyses in this field.

Caregiver psychological distress should be incorporated into clinical management. Volk noted that cirrhosis imposes multidimensional burdens on patients and caregivers, and that disease progression and the complexity of caregiving tasks affect family life, emotional well-being, and financial status [11]. Shrestha et al. found that caregiver psychological burden is associated with patient disease status, caregiver resources, social support, and understanding of the disease [12]. A systematic review by Woodrell et al. showed that caregivers of individuals with advanced liver disease experience caregiving burden, reduced quality of life, and palliative care needs, whereas evidence on supportive interventions remains insufficient [13]. A qualitative study by Saleh et al. suggested that caregivers experience emotional stress, role conflict, social restriction, and future uncertainty in cirrhosis care [14]. Li et al. showed that caregivers of patients with decompensated cirrhosis play a critical support role while experiencing psychological distress and caregiving burden; prognostic understanding is associated with caregiving burden and psychological distress [39]. Based on this evidence, nurses should assess both patients and primary caregivers during hospitalization and post-discharge follow-up rather than using patient symptoms as the sole entry point for intervention.

Dyadic protective associations between psychological resilience and psychological distress

Psychological resilience in both patients and caregivers showed negative actor associations with their own distress and negative partner associations with distress in the other member of the dyad. Resilience may serve not only as an individual adaptation resource but also as a relational protective resource in patient–caregiver interactions. Patients with higher resilience may be more likely to accept their illness status, maintain confidence in treatment, reduce catastrophic interpretations, and remain emotionally stable during symptom fluctuations, thereby experiencing lower psychological distress. Their relatively stable emotional status may also be associated with reduced caregiver worries about disease worsening, treatment failure, and loss of caregiving control. Caregivers with higher resilience may be more able to organize caregiving tasks, regulate negative emotions, maintain continuity of care, and provide stable support to patients; these capacities may be associated with lower distress in caregivers and less helplessness in patients.

Evidence supports resilience as a protective resource in chronic illness care. Connor and Davidson defined resilience as the capacity for stress adaptation and developed the Connor–Davidson Resilience Scale [16]. Studies of caregivers have shown that resilience is associated with quality of life, social support, caregiving burden, and emotional symptoms [19], and is influenced by personal resources, caregiving context, social relationships, and service support [20]. In liver disease research, Lieber et al. found that active coping, resilience, post-traumatic growth, and psychiatric symptoms are interrelated among liver transplant survivors, suggesting that psychological resources are involved in long-term adaptation to liver disease [21]. Although evidence on resilience interventions for patients with decompensated cirrhosis and their caregivers is limited, a systematic review of resilience-enhancing interventions for family caregivers showed that psychoeducation, mindfulness, and cognitive behavioral interventions may improve caregiver resilience [40]. The actor and partner associations observed in this study suggest that resilience training can be extended from the individual level to a dyadic level involving both patients and caregivers.

In nursing practice, resilience interventions should be tailored to the illness context of decompensated cirrhosis rather than limited to general encouragement. Patient-focused components may address symptom interpretation, warning signs of complications, clarification of treatment goals, emotion regulation, and self-efficacy enhancement to reduce illness uncertainty and helplessness. Caregiver-focused components may address caregiving role clarification, breaking down caregiving tasks, stress recognition, support seeking, and family communication to reduce the psychological impact of caregiving burden. The AASLD practice guidance recommends integrating symptom management, prognostic communication, caregiver support, and palliative care resources into the care of decompensated cirrhosis [6], which is consistent with the dyadic resilience support proposed in this study.

Positive coping as a modifiable dyadic protective factor

Positive coping showed both actor and partner associations with psychological distress in patients and caregivers. Compared with resilience, positive coping is closer to concrete cognitive and behavioral strategies and therefore has clearer translational value for nursing interventions. Patients with higher positive coping may be more likely to actively learn about their disease,

cooperate with treatment, participate in dietary and medication management, identify symptom changes, and express caregiving needs. These behaviors may increase perceived control over disease and reduce patients' own psychological distress, and they may also be associated with reduced caregiver concerns about adherence, disease changes, and caregiving failure. Caregivers with higher positive coping may be more likely to seek information, arrange caregiving tasks, solve caregiving problems, and regulate stress, thereby experiencing lower distress themselves. The partner association suggests that caregiver coping style may relate to patient psychological status through caregiving behavior, communication quality, and emotional support.

Coping theory proposes that coping styles are the cognitive and behavioral efforts used by individuals to manage internal and external demands under stress, including problem solving, emotion regulation, and meaning making [18]. In dyadic care for chronic illness, coping is not merely an internal individual process but also extends to the relational level through communication, support, and joint problem solving. A systematic review by Weitkamp et al. on dyadic coping in couples facing chronic physical illness showed that dyadic coping is associated with physical health, psychological well-being, and relationship satisfaction [41]. In chronic illness management, shared appraisal of disease-related stress, task division, and collaborative coping between patients and caregivers may influence adaptation in both members. An APIM study in heart failure showed that health literacy and psychosocial factors in patients and caregivers may influence care-related outcomes, such as intention to use mobile health technologies, through actor and partner pathways [28]. These findings support the interpretation of positive coping as a dyadic construct in this study.

In the present study, the partner association between caregiver positive coping and patient psychological distress was relatively prominent, suggesting that caregivers' positive coping may be linked to patient psychological status through concrete caregiving behaviors. Patients with decompensated cirrhosis often face recurrent symptoms and treatment uncertainty. When caregivers can identify worsening ascites, early manifestations of hepatic encephalopathy, risk of gastrointestinal bleeding, and signs of infection, and can provide organized support for medical visits, medication use, and dietary management, patients may experience a stronger sense of safety and perceived control over treatment. Donlan et al. showed that patients have needs for prognostic communication and disease information, and insufficient information is associated with higher psychological distress and lower quality of life [38]. In this study, caregiver understanding of the disease was associated with psychological distress in both patients and caregivers, suggesting that comprehension of disease information and caregiving knowledge is an important entry point for dyadic psychosocial intervention. Positive coping interventions should therefore avoid simply increasing caregiver tasks. Instead, structured health education, joint problem-solving training, symptom-management checklists, communication training, and resource referral should be used to improve the shared coping capacity of patients and caregivers.

Implications of actor–partner dyadic patterns for dyadic interventions

This study used k values to examine relative patterns of actor and partner associations. Patient resilience and patient positive coping both followed a couple pattern, indicating that patient psychological resources were associated with psychological distress in both patients and caregivers in the same direction and with relatively similar magnitudes. This finding suggests that patients may occupy a central position in synchronous psychological variation within the decompensated cirrhosis caregiving dyad. When patients have stronger illness adaptation capacity and more active coping, this may be associated not only with lower distress in themselves but also with lower psychological pressure in caregivers through less expression of negative emotions, better treatment cooperation, greater involvement in self-management, and reduced caregiver uncertainty.

Caregiver resilience and positive coping both followed a mixed pattern, indicating that caregiver psychological resources were associated with psychological distress in both caregivers and patients, but actor and partner associations were not equal in magnitude. This finding suggests that caregiver psychological resources are closely related first to caregivers' own distress, whereas their association with patient distress may be expressed through caregiving behavior, emotional support, communication quality, and support perceived by the patient. In other words, caregiver psychological resources do not automatically translate into psychological benefits for patients. Nurses therefore need to help caregivers transform positive coping and resilience into forms of support that patients can perceive and accept.

APIM methodological research indicates that k values can be used to identify relative patterns of actor and partner effects, including actor-only, partner-only, couple, and contrast patterns [42, 43]. Yang et al. compared methods for detecting dyadic patterns in APIM and noted that the parameter k method, direct estimation method, and difference testing method can all be used to identify dyadic patterns, but interpretation should be cautious and based on confidence intervals and theoretical reasoning [42]. Therefore, the couple and mixed patterns identified in this study should not be interpreted as fixed causal relationships; rather, they should be viewed as statistical descriptions of the association strengths between psychological resources and psychological distress in the current cross-sectional data. The nursing implication is that intervention priorities should differ between patients and caregivers. Patient-focused components should emphasize illness adaptation, confidence in symptom management, active communication, and participation in self-management. Caregiver-focused components should emphasize caregiving competence, stress regulation, information comprehension, and the ability to express support. Dyadic interventions should include both shared tasks and role-specific tasks, avoiding the assumption that patients and caregivers are homogeneous intervention recipients.

Limitations and future directions

This study has several limitations. First, the cross-sectional design precludes conclusions about causal directions among psychological resilience, positive coping, and psychological distress. Higher psychological distress may weaken resilience and positive coping, or psychological distress may co-occur with insufficient resilience and lower positive coping; these relationships require further verification through longitudinal designs. Second, participants were recruited from hospitalized patients and their primary family caregivers at a single center. Sample representativeness may have been influenced by regional health care resources, family caregiving culture, and the distribution of disease severity. The sample size was mainly constrained by the study period and the number of eligible paired samples, and an a priori sample size calculation based on the expected effect size was not conducted. Future multicenter studies should use more formal sample size planning. Third, psychological variables were collected using self-report scales, which may introduce recall bias and social desirability bias. Subsequent studies may combine clinical indicators, caregiving burden scales, family function scales, and interview data to build a more comprehensive dyadic psychological assessment framework. Fourth, this study constructed separate models for resilience and positive coping and did not include potential covariates such as disease severity, caregiving duration, social support, and family function. Therefore, the path coefficients should be interpreted as unadjusted dyadic associations rather than independent predictors or causal effects. This study also did not test whether positive coping mediates the relationship between resilience and psychological distress. Future research can use longitudinal APIM or actor-partner interdependence mediation models to analyze dynamic changes in psychological resources, coping styles, and psychological distress in patients and caregivers and to identify key intervention windows at different disease stages. High-quality trial evidence for dyadic psychosocial interventions in decompensated cirrhosis remains insufficient. Future studies can develop nurse-led interventions centered on joint participation of patients and caregivers based on the findings of this study and evaluate their effects on psychological distress, symptom management, caregiving burden, and quality of life through randomized controlled trials.

Conclusions

Using APIM, this study analyzed dyadic associations among psychological resilience, positive coping, and psychological distress in patients with decompensated cirrhosis and their family caregivers. Patients had higher psychological distress than caregivers, whereas their resilience and positive coping levels were lower, indicating greater psychological stress during the decompensated stage of disease. Psychological distress was highly positively correlated between patients and caregivers, and resilience and positive coping in both members were negatively correlated with distress, indicating interdependence of psychological distress and psychological resources within patient-caregiver dyads. APIM further showed that resilience and positive coping were associated not only with one's own distress but also with distress in the other member of the dyad, suggesting that patients' and caregivers' psychological states are not independent. Dyadic pattern testing showed that associations between patient psychological resources and distress in both patients and caregivers were closer to a couple pattern, whereas caregiver psychological resources followed a mixed pattern, suggesting that future dyadic psychosocial assessment and support strategies should consider both shared associations and role-specific differences. These findings support viewing patients and their primary family caregivers as a joint psychosocial assessment unit and may inform the

development of support strategies that address psychological distress, resilience, positive coping, symptom-management education, and caregiving communication in decompensated cirrhosis.

Abbreviations

AASLD

American Association for the Study of Liver Diseases

APIM

Actor–partner interdependence model

CI

Confidence interval

CNY

Chinese yuan

EASL

European Association for the Study of the Liver

SD

Standard deviation

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Committee of Anhui Public Health Clinical Center (approval number: PJ-YX2025-072; approval date: October 28, 2025). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. All patients and family caregivers were informed of the study purpose, survey content, confidentiality procedures, voluntary participation, and their right to withdraw at any time. Written informed consent to participate was obtained from all participants before data collection.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available because they contain sensitive patient–caregiver psychological and clinical information and are subject to institutional ethical restrictions, but de-identified data are available from the corresponding author on reasonable request and subject to approval by the Ethics Committee of Anhui Public Health Clinical Center.

Competing interests

The authors declare that they have no competing interests.

Funding

No funding was received for this study.

Authors' contributions

AR contributed to conceptualization, investigation, data curation, formal analysis, writing—original draft, and writing—review and editing. ZW contributed to conceptualization, methodology, software, formal analysis, visualization, writing—original draft, and writing—review and editing. XW contributed to investigation, data curation, formal analysis, writing—original draft, and writing—review and editing. JC contributed to investigation, resources, and writing—review and editing. YJ contributed to investigation,

resources, and writing—review and editing. HL contributed to investigation, resources, and writing—review and editing. JW contributed to conceptualization, supervision, project administration, resources, and writing—review and editing. HZ contributed to conceptualization, methodology, supervision, project administration, resources, and writing—review and editing. All authors read and approved the final manuscript. AR, ZW, and XW contributed equally to this work and share first authorship.

Acknowledgements

The authors would like to thank Anhui Public Health Clinical Center for providing the research platform and support for this study. We are also grateful to all patients with decompensated cirrhosis and their family caregivers who participated in the survey and completed the questionnaires. Their cooperation and support made this study possible.

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Figures

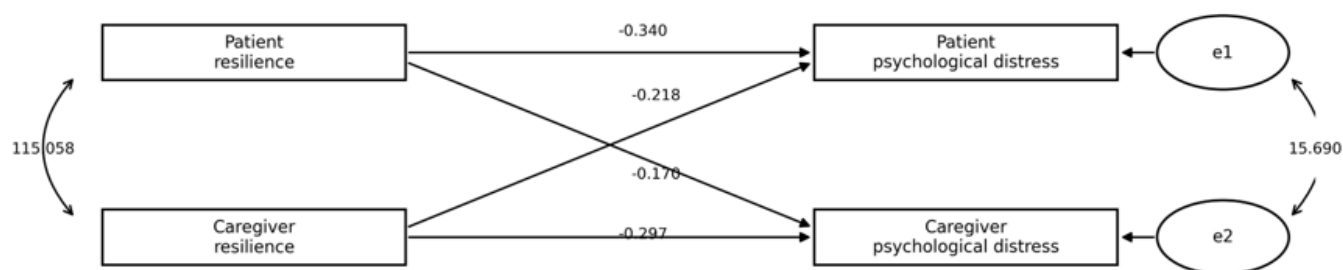


Figure 1

APIM of resilience and psychological distress in patient–caregiver dyads

Note: This is an unadjusted actor–partner interdependence model. Single-headed arrows indicate actor or partner paths, and values beside arrows are unstandardized path coefficients (B). Curved double-headed arrows indicate covariance between variables within dyads. e1 and e2 represent residuals for patient psychological distress and caregiver psychological distress, respectively. Actor effects refer to associations between an individual’s psychological resilience and that individual’s own psychological distress; partner effects refer to associations between an individual’s psychological resilience and distress in the other member of the dyad. The model is saturated with 0 degrees of freedom; therefore, overall fit indices are not reported. Path results indicate statistical associations and should not be interpreted as causal effects.

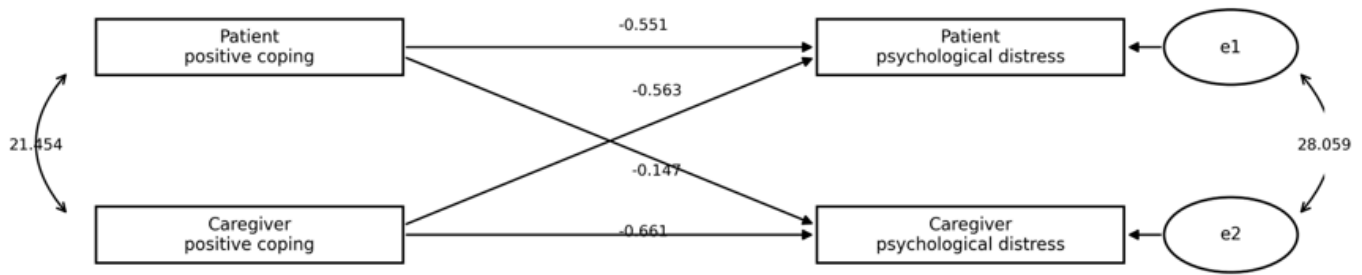


Figure 2

APIM of positive coping and psychological distress in patient–caregiver dyads

Note: This is an unadjusted actor–partner interdependence model. Single-headed arrows indicate actor or partner paths, and values beside arrows are unstandardized path coefficients (B). Curved double-headed arrows indicate covariance between variables within dyads. e1 and e2 represent residuals for patient psychological distress and caregiver psychological distress, respectively. Actor effects refer to associations between an individual’s positive coping and that individual’s own psychological distress; partner effects refer to associations between an individual’s positive coping and distress in the other member of the dyad. The model is saturated with 0 degrees of freedom; therefore, overall fit indices are not reported. Path results indicate statistical associations and should not be interpreted as causal effects.