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ORIGINAL ARTICLE

Effect of Symptom Burden on Demoralization in Chinese Lung Cancer Patients: The Mediating Roles of Family Function, Resilience, and Coping Behaviors

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ABSTRACT

Objective: This study aimed to elucidate the mechanisms by which symptom burden affects demoralization in Chinese lung cancer patients, with a focus on the roles of family functionality, resilience, and coping strategies. The study also explored differences in these pathways between two distinct demoralization categories.

Methods: A cross-sectional survey was conducted among 567 lung cancer patients who completed questionnaires assessing symptom burden, family functioning, resilience, coping strategies, and demoralization. Data were analyzed using partial least squares structural equation modeling (PLS-SEM), with multigroup structural equation modeling (MG-SEM) employed to compare pathways between the psychological distress-subjective incompetence group (PDSIG) and the low demoralization-emotional disturbance group (LDEDG).

Results: PLS-SEM analysis demonstrated a good model fit. Symptom burden ($\beta = 0.26$), confrontation coping ($\beta = 0.11$), and acceptance-resignation coping ($\beta = 0.41$) had positive direct effects on demoralization, whereas resilience ($\beta = -0.19$) and family function ($\beta = -0.27$) had negative direct effects. Additionally, family function, resilience, and acceptance-resignation coping mediated the relationship between symptom burden and demoralization. MG-SEM revealed that, in the PDSIG, symptom burden ($\beta = 0.47$) and family function ($\beta = -0.46$) had similarly strong impacts on demoralization, with stronger family function associated with lower demoralization. In contrast, resilience ($\beta = -1.02$) was the most significant factor in the LDEDG.

Conclusions: These findings highlight the importance of screening for demoralization, particularly among lung cancer patients with a high symptom burden, maladaptive resignation coping, family dysfunction, and low resilience. Effective strategies should focus on symptom management, family support, resilience building, and fostering positive coping mechanisms. Tailored interventions based on demoralization subtypes are essential to improve psychological well-being in this population.

Chenxing Zhang and Fangfang Wang should be considered joint first authors.

1 | Background

Lung cancer is a leading global cause of cancer-related morbidity and mortality, with over 2.2 million new cases and nearly 1.8 million deaths in 2022, accounting for 12% of new cancer cases and 20% of cancer deaths worldwide [1]. This burden is particularly severe in China, where lung cancer has the highest morbidity and mortality rates among malignant tumors [2]. Patients with lung cancer often experience significant physical and psychological distress, including demoralization syndrome, a condition characterized by feelings of helplessness, hopelessness, meaninglessness, and diminished self-worth [3]. The prevalence of demoralization syndrome is notably higher in lung cancer patients, ranging from 33% to 87.5% [4], compared to 24%–36% in other oncology populations [5], with rates increasing in recent years [6]. This condition is linked to adverse outcomes, including sleep disturbances [6, 7], depression [8], anxiety [8], existential distress [9, 10], and death anxiety [4], and has a strong correlation with suicidal ideation [5, 6], influencing it up to 71.4% [11], compared to 50% for depression [12].

Cancer patients often experience symptom burdens such as pain, dyspnea, and fatigue, which are closely linked to existential psychological distress, including demoralization [10]. Resilience, family functioning, and coping strategies serve as key mediators in this relationship. Liu et al. identified coping strategies as mediators between symptom burden and demoralization [13], while Wang found that family functioning played a similar role in prostate cancer patients [14]. Mixed findings on resilience suggest it partially mediates this relationship in some cases [15, 16]. Hypothesis 1 (H1) proposes that symptom burden in lung cancer patients contributes to demoralization both directly and indirectly through these mediators.

Resilience, a psychological resource, helps patients adapt to adversity, reduce symptom burden, and employ positive coping strategies, thereby mitigating demoralization [16, 17]. Hypothesis 2 (H2) posits that resilience impacts demoralization both directly and indirectly through coping strategies. Functional family systems, which are particularly valued in Chinese culture, enhance resilience and foster mature coping strategies, reducing demoralization [18, 19]. Hypothesis 3 (H3) suggests that family functioning affects demoralization directly or through resilience and coping strategies.

Coping strategies, including confrontation, avoidance, and acceptance, significantly influence psychological outcomes. Positive coping strategies reduce demoralization [13], whereas negative strategies exacerbate it [20]. Hypothesis 4 (H4) asserts that coping strategies directly influence demoralization.

Most prior research has focused on mixed cancer populations or specific groups, such as breast or prostate cancer patients, leaving lung cancer patients underrepresented. This study addresses that gap by using structural equation modeling (SEM) to test hypotheses specific to lung cancer patients, guided by Moos and Schaefer's coping process framework. Lung cancer patients face unique challenges, increasing their vulnerability to demoralization syndrome [21]. In this context, family support (environmental system) and psychological resilience (personal system) act as critical protective factors. These buffers enhance patients' ability to manage stress and, through adaptive coping, reduce the risk of demoralization syndrome.

Notably, existing research often generalizes cancer patients as a uniform group, neglecting individual differences in demoralization. Our prior studies using latent class analysis identified three demoralization profiles among Chinese lung cancer patients: "low demoralization and emotional disturbance," "moderate demoralization and meaninglessness," and "high demoralization and existential despair" [22]. This suggests that symptom burden influences demoralization differently across these groups. Hypothesis 5 (H5) proposes that lung cancer patients in different demoralization categories exhibit distinct pathways through which symptom burden affects demoralization symptoms.

Therefore, we propose a model where symptom burden is the independent variable, with family functioning, resilience, and coping behaviors as mediators, and demoralization symptoms as the dependent variable (see Figure 1). Hypotheses H1–H4 will be tested using partial least squares structural equation modeling

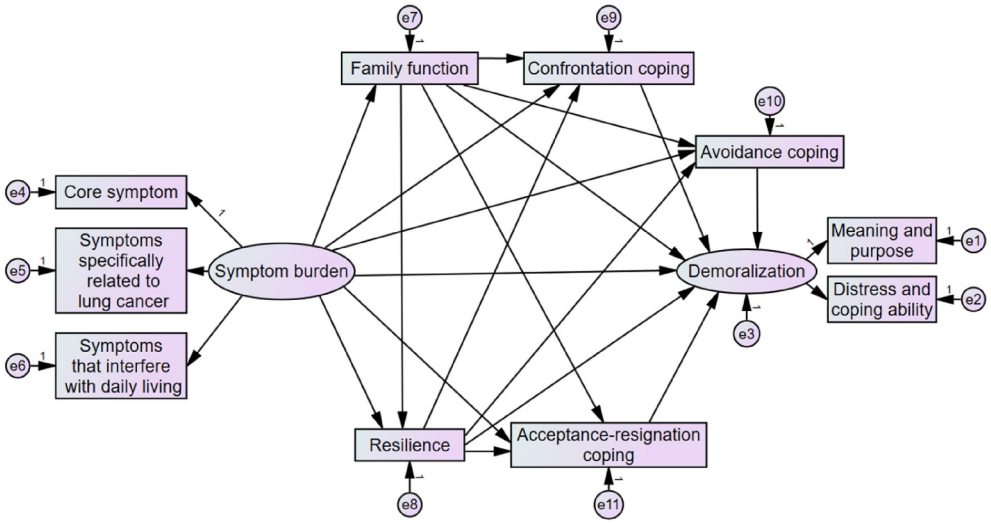

FIGURE 1 | Hypothesized demoralization model of lung cancer patients.

(PLS-SEM) [23], while Hypothesis H5 will be evaluated through multigroup structural equation modeling (MG-SEM) [24], which is ideal for comparing various levels of demoralization among patients.

2 | Methods

2.1 | Design

The present study is a cross-sectional study conducted from January to September 2022 in three tertiary hospitals in Fujian Province, China. The study adhered to the reporting guidelines set forth by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement [25]. The study procedures were approved by the institutional review board of Fujian Medical University (No: FMU2021175).

2.2 | Participants and Setting

Convenience sampling was used to recruit 567 lung cancer patients admitted to the thoracic surgery, oncology, respiratory, and radiotherapy departments of three hospitals in Fujian Province, China. The study inclusion criteria were as follows: (1) diagnosis of lung cancer through pathology, (2) aged 18 years or older, (3) Karnofsky performance status (KPS) score of 60 or higher, (4) voluntary participation in the study, and (5) ability to read and communicate in Chinese. The exclusion criteria were as follows: (1) cognitive impairment, (2) mental disorders, (3) presence of other malignant tumors, (4) severe complications, (5) diagnosis of adenocarcinoma in situ, and (6) the occurrence of other significant events within the past 3 months. Upon obtaining written informed consent, the study questionnaires were promptly distributed and completed by the participants.

Typically, a median sample size of 200 is recommended for SEM analysis [26]. An a priori sample size calculator for SEM was also applied [27] which is especially designed for calculating the sample size of SEM (https://www.danielsoper.com/statcalc/calculator.aspx?id=89). The minimum sample size with a moderate effect (0.3), and a power value of 0.95, including 5 latent and 10 observed variables (all observed indicators and sociodemographic variables), and a value of 0.05 was calculated as 223. On the basis of our previous latent class analysis results [22], which identified three latent categories of demoralization syndrome among lung cancer patients, and considering a 15% inefficiency rate, the SEM of each latent category would require a minimum of 257 samples.

2.3 | Instruments

2.3.1 | Demographic and Clinical Characteristics

An information sheet was used to collect participants' demographic and clinical characteristics. Demographic data gathered included age, gender, place of residence, religion, education level, employment status, marital status, number of children, household type (living alone or with family), primary caregiver, monthly income (in RMB), breadwinner status, and medical insurance coverage. These data were obtained through a self-administered questionnaire.

Clinical characteristics recorded included medical expenses, time since diagnosis, cancer type, cancer stage, treatment modality, medical comorbidities, Karnofsky Performance Scale (KPS), and body mass index (BMI). Clinical details were retrieved from medical records with participants' consent. Comorbidities were assessed using an age-adjusted Charlson Comorbidity Index and a single item for hypertension.

2.3.2 | Demoralization Scale-II-Chinese Version (DS-II-CV)

The DS-II, a measurement tool used to assess participants' demoralization over the past 2 weeks, was originally developed in English by Robinson et al. Lin et al. [28] translated and tested a Chinese version of the DS-II that was used in this study. The DS-II-CV consists of 14-items organized into two dimensions: meaning and purpose or distress and coping ability. Each item was scored on a three-point Likert scale, ranging from 0 to 2 (0 = never, 1 = sometimes, 2 = often). This self-rating scale demonstrated a high level of reliability and validity. In this study, the Cronbach's α coefficient for the DS-II-CV was calculated to be 0.902.

2.3.3 | M.D. Anderson Symptom Inventory-Chinese Version (MDASI-C) and the MDASI Lung Cancer–Specific Module (MDASI-LC)

The MDASI-C, developed by the Texas M.D. Anderson Cancer Center and modified for use in China by Wang et al. [29], is designed to assess symptom burden in cancer patients. It includes 13 core symptom items (e.g., pain, fatigue, nausea) and six items evaluating symptoms that interfere with daily activities (e.g., general activities, work, mood). The MDASI-LC [30], used in this study, focuses on lung cancer symptoms with six items (e.g., cough, expectoration, hemoptysis, chest tightness, constipation, weight loss). Both instruments use an 11-point Likert scale, where 0 indicates no symptoms or interference and 10 indicates the most severe symptoms or highest level of interference. The MDASI-C demonstrated good internal consistency, with a Cronbach's α of 0.877 in this study.

2.3.4 | Medical Coping Modes Questionnaire (MCMQ)

The MCMQ, originally developed by Huang et al. and revised by Shen and Jiang [31] assesses patients' coping strategies related to their illness. It consists of 20 items divided into three subscales: confrontation coping, avoidance coping, and acceptance-resignation coping, with eight items reverse-scored. Scores for each subscale are calculated by summing the items related to that strategy, with higher scores indicating a greater likelihood of using the specific coping strategy. In this study, the Cronbach's α coefficients were 0.800 for confrontation coping, 0.785

for avoidance coping, and 0.798 for acceptance-resignation coping, demonstrating good internal consistency.

2.3.5 | Family APGRA Index (APGRA)

The Family APGAR Scale, developed by Smilkstein and later translated into Chinese by Fan [32], evaluates family functioning across five dimensions: adaptation, partnership, growth, affection, and resolve. It consists of five items rated on a three-point Likert scale (0 = never, 1 = sometimes, 2 = often), with total scores ranging from 0 to 10. Higher scores indicate greater satisfaction with family functioning. The scale categorizes family functionality into three levels: 0–3 for severely dysfunctional, 4–6 for moderately dysfunctional, and 7–10 for highly functional. The Cronbach's α coefficient for the Family APGAR Scale in this study was 0.890, reflecting good internal consistency.

2.3.6 | Connor-Davidson-Resilience Scale-10 (CD-RISC-10)

The CD-RISC-10 was developed by Campbell-Sills and Stein and subsequently translated into Chinese by Wang et al. [33] This shortened version of the Connor-Davidson Resilience Scale consists of 10 items that assess resilience via a five-point Likert-type response scale (0 = never, 5 = always). The total score on the CD-RISC-10 ranges from 0 to 40, with higher scores indicating higher levels of resilience in an individual. This scale has been widely utilized in cancer patients and has demonstrated good reliability. In this study, the Cronbach's α coefficient for the CD-RISC-10 scale was calculated to be 0.950.

2.4 | Statistical Analysis

Data analysis was conducted using SPSS 26.0 (IBM, Chicago, IL, USA) and Mplus 7.0. A two-tailed test with a significance level of 0.05 was used. Multiple imputation techniques were employed to address missing data, with a total of 43 (8.1%) observations missing at least one scale item, while the missingness for each individual item ranged from 2% to 5%. Descriptive statistics were utilized to summarize demographic and clinical characteristics as well as scale scores. Categorical variables are presented as frequencies/percentages, normally distributed data are presented as the mean ± SDs, and skewed data are presented as medians with 25th and 75th percentiles. The variance inflation factor (VIF) obtained from multiple linear regression analysis was used to assess for collinearity. Generally, a VIF value of < 5 indicates no collinearity, a VIF between 5 and 10 indicates acceptable collinearity, and a VIF > 10 indicates significant collinearity [34].

This study builds upon our previous latent class analysis of demoralization syndrome among lung cancer patients, which identified three latent classes: the "high demoralization group" (n = 84, 14.8%), the "moderate demoralization-distress and helplessness group" (n = 211, 37.2%), and the "low demoralization-emotional disturbance group" (n = 272, 48.0%). However, the "high demoralization group" fell short of the minimum sample size requirement of 257 for structural equation modeling. Additionally, both the "high demoralization group" and the "moderate demoralization-distress and helplessness group" exhibited high response probabilities on the demoralization syndrome scale items and shared numerous common characteristics. Consequently, considering these factors, we merged the two groups into a single category and named it the "psychological distress-subjective incompetence group" (PDSIG), while keeping the "low demoralization-emotional disturbance group" (LDEDG) unchanged.

Spearman correlation analysis was employed to explore the relationships of each variable. Given the skewed distribution of scores across multiple scales, PLS-SEM was utilized to assess the fit of the hypothesized models (see Figure 1). This involved bootstrapping with 1000 resampling iterations to establish a 95% confidence interval using repeated samples. Regression coefficients with confidence intervals that did not span zero were considered statistically significant. We evaluated the model fit using the following indices [26]: normed chi-square (χ^2/df, 1.0–3.0, $p > 0.05$), goodness-of-fit index (GFI, > 0.9), normed fit index (NFI, > 0.9), incremental fit index (IFI, > 0.9), comparative fit index (CFI, > 0.9), and root mean squared error of approximation (RMSEA < 0.08). The model was modified on the basis of a combination of modification indices (MIs) and expert knowledge.

In models demonstrating a good fit to the total sample, MG-SEM was used to assess the LDEDG and PDSIG. The structural weights model and unconstrained model were used to determine whether $\Delta\chi^2/\Delta$df was significant, and to determine whether there were significant differences in path coefficients between the two groups of models.

3 | Results

3.1 | Characteristics of Lung Cancer Patients

In the LDEDG and the PDSIG of lung cancer patients, male patients accounted for 72.1% and 69.8%, respectively. Those residing in rural areas accounted for 62.9% and 67.1%, respectively. With regards to educational attainment, individuals with a primary school education or below accounted for 50.2% and 51.5%, respectively. Table 1 displays the demographics, clinical characteristics, and scale scores of these two groups of participants.

3.2 | Bivariate Analysis and Collinearity Diagnostics

The correlation analysis results for symptom burden, coping strategies, psychological resilience, family functioning, and demoralization syndrome in lung patients are presented in Table A1. As shown in Table A2, the results of the multiple linear regression analysis indicate that the VIF for all independent variables is < 5, suggesting that there is no collinearity among the independent variables.

TABLE 1 | Characteristics of lung cancer patients by low demoralization-emotional disturbance group (LDEDG) and psychological distress-subjective incompetence group (PDSIG) classes of demoralization.

Variable	$[n(\%)\ /\bar{x}\ \pm s/\ M(P_{25}, P_{75})]$	
	LDEDG ($n = 272$)	PDSIG ($n = 295$)
Age (years)	61.88 ± 9.36	60.50 ± 9.61
Gender		
Male	196 (72.1%)	206 (69.8%)
Female	76 (27.9%)	89 (30.2%)
Place of residence		
Urban	101 (37.1%)	97 (32.9%)
Rural	171 (62.9%)	198 (67.1%)
Religion		
Yes	130 (47.8%)	138 (46.8%)
No	142 (52.2%)	157 (53.2%)
Education level		
Primary school or below	140 (51.5%)	148 (50.2%)
Middle school	78 (28.7%)	93 (31.5%)
High school/technical school	44 (16.2%)	34 (11.5%)
Bachelor's or higher	10 (3.7%)	20 (6.8%)
Employment status		
Unemployed	99 (36.4%)	116 (39.3%)
Employed	103 (37.9%)	112 (38.0%)
Retired	70 (25.7%)	67 (22.7%)
Marital status		
Married	246 (90.4%)	269 (91.2%)
Unmarried, divorced or widowed	26 (9.6%)	26 (8.8%)
Number of children		
0	4 (1.5%)	6 (2.0%)
1–2	157 (57.7%)	178 (60.3%)
≥ 3	111 (40.8%)	111 (37.6%)
Household type		
Lives alone	20 (7.4%)	17 (5.8%)
Lives with family	252 (92.6%)	278 (94.2%)
Primary caregiver		
Spouse	110 (40.4%)	114 (38.6%)
Children	54 (19.9%)	66 (22.4%)
Spouse and children	84 (30.9%)	96 (32.5%)
Others (e.g., siblings, care workers)	24 (8.8%)	19 (6.4%)
Monthly income (yuan, RMB)		
≤ 1000	17 (6.3%)	36 (12.2%)
1001–3000	122 (44.9%)	130 (44.1%)
3001–5000	85 (31.3%)	77 (26.1%)
≥ 5001	48 (17.6%)	52 (17.6%)
Breadwinner		
Patient only	97 (35.7%)	117 (39.7%)
Whole family	175 (64.3%)	178 (60.3%)

(Continues)

TABLE 1 | (Continued)

Variable	[n(%) /$\bar{x} \pm s$/ $M(P_{25}, P_{75})$]	
	LDEDG (n = 272)	PDSIG (n = 295)
Medical insurance type		
Basic medical insurance for urban and rural residents	230 (84.6%)	242 (82.0%)
Basic medical insurance for urban employee	36 (13.2%)	43 (14.6%)
Other	6 (2.2%)	10 (3.4%)
Self-financed medical expenses (per 10,000 yuan, RMB)	8.00 (4.00, 15.00)	8.00 (4.00, 15.00)
Time since diagnosis (months)	7.00 (2.00, 24.75)	8.00 (2.00, 27.00)
Lung cancer type		
Squamous cell carcinoma	65 (23.9%)	68 (23.1%)
Adenocarcinoma	159 (58.5%)	175 (59.3%)
Small cell lung cancer	26 (9.6%)	41 (13.9%)
Other	22 (8.1%)	11 (3.7%)
Cancer stage		
Stage I	24 (8.8%)	16 (5.4%)
Stage II	24 (8.8%)	20 (6.8%)
Stage III	65 (23.9%)	70 (23.7%)
Stage IV	159 (58.5%)	189 (64.1%)
Treatment modality		
Monotherapy	83 (30.5%)	85 (28.8%)
Combined therapy	173 (63.6%)	190 (64.4%)
None	16 (5.9%)	20 (6.8%)
aCCI	7.36 ± 1.95	7.34 ± 1.86
Hypertension		
Yes	49 (18.0%)	57 (19.3%)
No	223 (82.0%)	238 (80.7%)
KPS	84.42 ± 7.14	82.24 ± 9.79
BMI (kg/m^2)	22.89 ± 3.47	22.18 ± 3.61
ALB (g/L)	38.75 ± 5.81	38.94 ± 6.31
NEUT (10^9/L)	4.54 ± 4.11	5.27 ± 4.26
LY (10^9/L)	1.48 ± 0.80	1.45 ± 1.00
NEUT/LY	3.54 ± 2.90	4.52 ± 4.32
FIB (g/L)	3.66 ± 1.78	3.99 ± 1.63
Core symptom	1.21 ± 0.99	2.33 ± 1.36
Symptom related to lung cancer	1.17 ± 1.12	1.66 ± 1.36
Symptom interferes with daily living	0.91 ± 1.20	2.46 ± 2.12
Confrontation coping	18.76 ± 3.92	17.63 ± 3.68
Avoidance coping	15.90 ± 2.23	15.57 ± 2.66
Acceptance-resignation coping	7.74 ± 1.99	11.37 ± 2.98
Family function	9.20 ± 1.51	7.45 ± 2.43
Resilience	32.25 ± 6.14	25.42 ± 6.90

Abbreviations: aCCI, age-adjusted Charlson Comorbidity Index; ALB, albumin; BMI, body mass index; FIB, fibrinogen; KPS, Karnofsky performance status; LY, lymphocyte; NEUT, neutrophil.

3.3 | PLS-SEM of the Overall Sample

The data presented in Table 2 shows that the following five path coefficients were not statistically significant ($p > 0.05$): confrontation coping ← symptom burden, avoidance coping ← symptom burden, avoidance coping ← family function, confrontation coping ← family function, and demoralization ← avoidance coping. The final model indicated a better fit (χ^2/df = 4.128, $p < 0.001$, RMSEA = 0.074, CFI = 0.961, NFI = 0.950). The coefficients for all paths are shown in Figure 2.

Table 3 summarizes the standardized direct, indirect, and total estimates of the model paths. According to the model, confrontation coping ($\beta = 0.11$), acceptance-resignation coping ($\beta = 0.41$) and symptom burdens ($\beta = 0.26$) had positive direct effects on demoralization, whereas resilience ($\beta = -0.19$) and family functioning ($\beta = -0.27$) had negative direct effects on demoralization. Furthermore, the relationship between symptom burden and demoralization was also mediated by family functioning, resilience and acceptance-resignation coping ($p < 0.05$).

TABLE 2 | Results of path coefficient hypothesis testing for the model of the overall sample.

Path			Beta	SE	CR	*p* value
Family function	←	Symptom burden	−0.223	0.093	−4.753	**< 0.001**
Resilience	←	Symptom burden	−0.360	0.276	−8.561	**< 0.001**
Resilience	←	Family function	0.379	0.120	10.455	**< 0.001**
Confrontation coping	←	Symptom burden	−0.012	0.167	−0.245	0.806
Avoidance coping	←	Symptom burden	−0.064	0.116	−1.217	0.224
Acceptance-resignation coping	←	Symptom burden	0.442	0.133	9.279	**< 0.001**
Acceptance-resignation coping	←	Family function	−0.216	0.053	−5.706	**< 0.001**
Avoidance coping	←	Family function	−0.072	0.052	−1.536	0.125
Confrontation coping	←	Family function	0.053	0.075	1.220	0.222
Confrontation coping	←	Resilience	0.352	0.025	7.246	**< 0.001**
Avoidance coping	←	Resilience	0.106	0.017	2.024	**0.043**
Acceptance-resignation coping	←	Resilience	−0.162	0.018	−3.814	**< 0.001**
Demoralization	←	Symptom burden	0.267	0.078	6.006	**< 0.001**
Demoralization	←	Family function	−0.256	0.030	−7.500	**< 0.001**
Demoralization	←	Confrontation coping	0.101	0.016	3.151	**0.002**
Demoralization	←	Avoidance coping	0.037	0.024	1.270	0.204
Demoralization	←	Acceptance-resignation coping	0.402	0.025	9.932	**< 0.001**
Demoralization	←	Resilience	−0.196	0.010	−5.151	**< 0.001**

Note: Bolded values indicate a statistical difference.
Abbreviations: CR, composite reliability; SE, standard error.

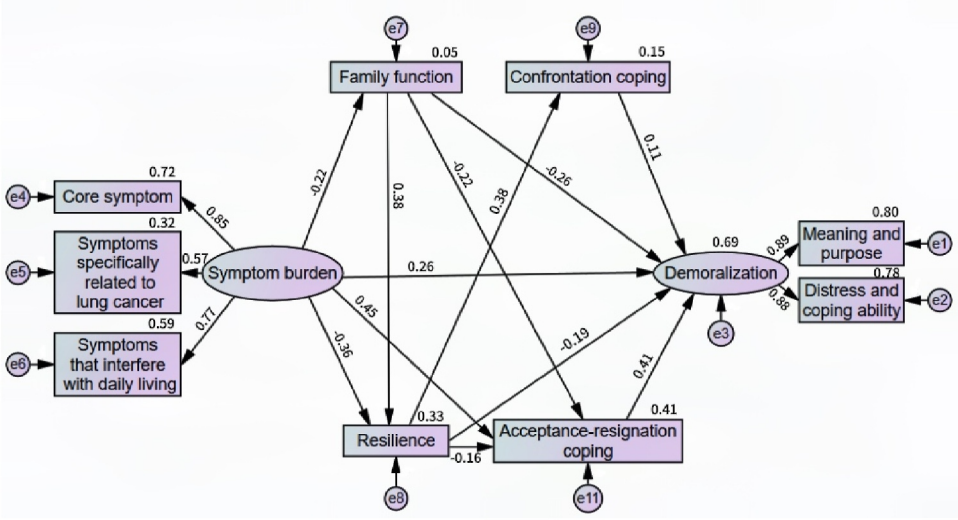

FIGURE 2 | The model standardized path coefficient diagram of the overall sample.

TABLE 3 | Effect coefficients by model type.

Endogenous variable	Predicting variable	Model of overall sample			Model of low demoralization-emotional disturbance group			Model of psychological distress-subjective incompetence group		
		Standardized direct effect β	Standardized indirect effect β	Standardized total effect β	Standardized direct effect β	Standardized indirect effect β	Standardized total effect β	Standardized direct effect β	Standardized indirect effect β	Standardized total effect β
Demoralization	Symptom burden	0.261	0.355	0.615	—	0.591	0.591	0.299	0.165	0.465
	Family function	−0.256	−0.169	−0.426	—	−0.170	−0.170	−0.327	−0.129	−0.456
	Resilience	−0.192	−0.025	−0.217	−1.018	—	−1.018	−0.122	−0.048	−0.170
	Acceptance-resignation coping	0.406	—	0.406	0.887	—	0.887	0.300	—	0.300
	Confrontation coping	0.105	—	0.105	—	—	—	—	—	—

3.4 | Multigroup Analysis on the Basis of Demoralization Latent Categories

To control for potential confounding effects of sociodemographic and clinical variables between groups, we included variables such as gender, age, marital status, education, and disease stage as covariates in the model. The multigroup analysis revealed a difference in the path coefficient of the structural equation model between the LDEDG and the PDSIG ($\Delta\chi^2 = 163.72$, $\Delta df = 16$, $p < 0.001$). The coefficients of all paths in the LDEDG and PDSIG are shown in Figures 3 and 4.

As shown in Table 3, in the PDSIG, symptom burden ($\beta = 0.47$) had the largest effect coefficient, whereas acceptance-resignation coping ($\beta = 0.89$) had the largest effect coefficient in the LDEDG. In the PDSIG, symptom burden not only directly enhanced demoralization ($\beta = 0.30$) in lung cancer patients, but also exerted indirect effects ($\beta = 0.17$) through resilience and acceptance-resignation coping. However, in the LDEDG, symptom burden ($\beta = 0.59$) only exerted an indirect effect on demoralization. In addition, compared with the PDSIG, family functioning played a completely mediating role ($\beta = -0.17$) in the LDEDG, and resilience ($\beta = -1.02$) directly reduced the degree of demoralization syndrome. In both groups, acceptance-resignation coping ($\beta = 0.89$, $\beta = 0.30$) had negative direct effects on demoralization.

4 | Discussion

On the basis of Moos and Schaefer's coping process framework, this study integrated a positive psychological perspective to explore the paths between demoralization syndrome and factors such as symptom burden, family functioning, psychological resilience, and coping strategies. Overall, the hypotheses were either supported or partially supported. Specifically, lung cancer patients with lower levels of symptom burden, higher family functioning and resilience, and effective coping behaviors tend to exhibit reduced levels of demoralization. Furthermore, by adopting an individual-centered perspective, we identified different pathways for each category of demoralization syndrome, namely the LDEDG and the PDSIG. These findings not only deepen our understanding of the potential factors influencing reductions in demoralization but also facilitate the development of more tailored and precise psychological nursing interventions for lung cancer patients.

Hypothesis 1 (H1) was partially supported: symptom burden had the most significant effect on demoralization, both directly and indirectly through family functioning, resilience, and acceptance-resignation coping. These findings align with those of previous studies that revealed a positive correlation between symptom burden and demoralization [14, 17]. These findings suggest that the severe symptom burden experienced by lung cancer patients may reduce their sense of accomplishment, increase frustration, diminish social engagement, and weaken their perception of relationships and support, ultimately leading to helplessness, emotional distress, and demoralization.

Moreover, this study found that 57.5% of the impact of symptom burden on demoralization is mediated by family functioning,

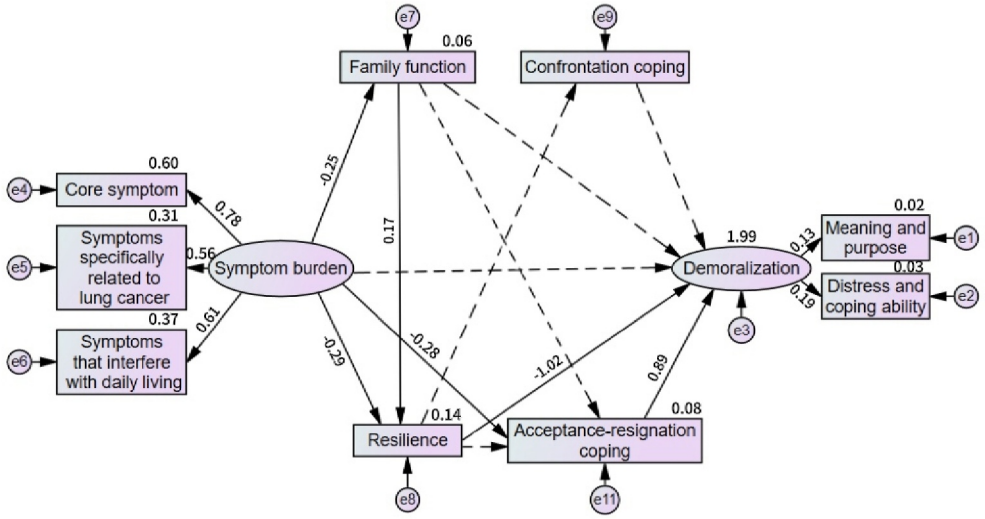

FIGURE 3 | The model standardized path coefficient diagram of the low demoralization-emotional disturbance group. The dashed line indicates that the path was not statistically significant. Sociodemographic and clinical variables were included as covariates in the model.

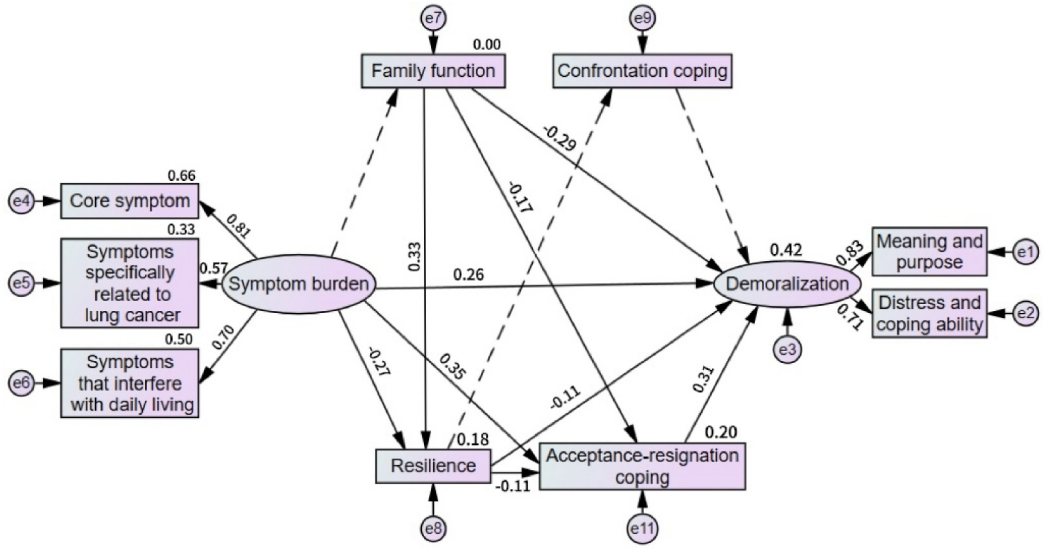

FIGURE 4 | The model standardized path coefficient diagram of the psychological distress-subjective incompetence group. The dashed line indicates that the path was not statistically significant. Sociodemographic and clinical variables were included as covariates in the model.

resilience, and acceptance-resignation coping. Healthy family dynamics and resilience act as emotional buffers, reducing adversity's effects and promoting growth, reflecting traditional Chinese values of family support in overcoming challenges. In contrast, acceptance-resignation coping, a negative emotion-focused strategy, increases stress and negative emotions. The findings suggest that a mind-body integrative intervention—encompassing symptom management, family support, resilience-building, and positive coping strategies—should be considered to reduce demoralization in lung cancer patients.

Hypothesis 2 (H2) was partially supported. Resilience directly reduced demoralization syndrome, which aligns with previous research. Individuals with higher resilience tend to adopt a positive attitude toward cancer, reducing negative emotions such as demoralization. Resilience also indirectly influences demoralization through acceptance-resignation coping, as noted by Gu et al. [35]. According to stress interaction theory, resilience affects how stressors are evaluated, whereas coping strategies are chosen on the basis of this evaluation. Those with low resilience often adopt negative coping strategies, such as avoiding discussions about cancer and suppressing emotions, leading to increased demoralization.

Hypothesis 3 (H3) was partially supported. Consistent with previous research, positive family functioning acts as a protective factor against demoralization. Effective family functioning enhances patients' integration of family resources—economic, human, and material—which supports treatment and recovery, thereby reducing negative emotions such as demoralization.

Additionally, family functioning enhances resilience, indirectly lowering demoralization. This aligns with He's studies [36] and the buffering model of social support, which suggests that a highly functional family fosters positive emotions and stable psychological resources, mitigating demoralization.

Additionally, family functioning can indirectly reduce demoralization by supporting proactive coping strategies. Lakey and Orehek study on gynecological cancer patients shows that higher family functionality is linked to more effective coping [37]. Good family support helps manage stress and lessens the impact of negative events. However, reliance on acceptance-resignation coping can lead to hopelessness and withdrawal, diminishing the benefits of family support and increasing demoralization [38]. Thus, the interplay between family functioning and coping strategies significantly affects demoralization in lung cancer patients.

Hypothesis 4 (H4) was partially supported. Consistent with previous research, our study confirmed a positive correlation between resignation and demoralization. However, this study did not provide evidence supporting the importance of avoidance coping strategies. According to Lazarus' transactional theory of stress and coping, maladaptive coping strategies such as resignation may lead individuals to avoid treatment and medical advice, potentially resulting in greater long-term negative consequences, including increased demoralization.

Unlike previous studies, our study revealed a positive correlation between confrontation coping and demoralization. This could be because confrontation coping functions as a double-edged sword. Typically, this problem-focused strategy helps patients assess their situation, seek social support, or make decisions, which generally alleviates demoralization. However, in our study, lung cancer patients who confronted their illness may have become more acutely aware of the severity of their condition, given the high mortality, recurrence, and metastasis rates of lung cancer. This increased awareness may intensify levels of psychological distress, trapping patients in a self-perpetuating cycle of negative emotions [39] and potentially leading to demoralization syndrome.

Another key finding of this study was the partial support and clarification of Hypothesis 5, which highlighted differences in the impact of symptom burden on demoralization between the LDEDG and the PDSIG. The main distinction was in the pathway of symptom burden-family function-demoralization. In the PDSIG, both symptom burden and family functioning had similarly strong influences on demoralization, likely due to the severe symptom burden leading to feelings of helplessness and failure. However, stronger family functioning was linked to lower demoralization levels in this group. Conversely, resilience emerged as the most significant factor in the LDEDG, suggesting that these patients used resilience to buffer the negative effects of symptom burden, maintaining emotional stability and reducing demoralization.

4.1 | Implications

The findings of this study have significant clinical implications for healthcare providers involved in the prevention and care of demoralization in lung cancer patients. First, the study underscores the urgent need to screen for demoralization and identify patients with high symptom burden, maladaptive resignation coping, family dysfunction, and low resilience, as they are particularly susceptible to this specific form of existential suffering. Second, the results provided a theoretical foundation for developing interventions to mitigate demoralization in lung cancer patients. For these targeted patients, implementing a mind-body integrative intervention, for example, encompassing symptom management, family functioning, resilience building, and positive coping strategies, should be considered. For example, the Brief-COPE, stress management and resilience training, and problem-solving therapy could be utilized. Third, our findings emphasize the need for tailored psychological interventions to relieve demoralization in lung cancer patients. Specifically, for patients characterized by psychological distress-subjective incompetence, integrating symptom management and enhancing family functioning should be prioritized. In contrast, for patients characterized by low-demoralization-emotional disturbance, building resilience should be the primary focus.

In summary, our findings contribute to the existing body of knowledge by demonstrating that symptom burden, family functioning, resilience, and coping strategies are critical focal points for reducing demoralization, and by offering further insights into the intricate relationships between these constructs.

4.2 | Limitations

This study has several limitations. First, its cross-sectional design provides only a snapshot of factors associated with demoralization, lacking insights into how they change over time. Future research should adopt a longitudinal approach. Second, the use of convenience sampling and a small sample size, particularly in the high demoralization group, limits generalizability and statistical analysis. Larger, multicenter studies are needed. Third, reliance on self-reported data may introduce bias, so future studies should incorporate objective measures. Fourth, patients with mental disorders, severe complications (associated with higher symptom burden), and other comorbid stressors were excluded from this study. This exclusion might have resulted in an incomplete understanding of the overall picture of demoralization, as these groups may have unique contributions or interactions relevant to the phenomenon under investigation. Lastly, while this study focused on symptom burden from a stress-coping perspective, other factors influencing demoralization warrant further exploration.

5 | Conclusions

The findings provide a theoretical foundation for targeted interventions to reduce demoralization in lung cancer patients. Effective strategies should integrate symptom management, family support, resilience building, and positive coping strategies.

Author Contributions

Feifei Huang contributed to the study's conception and design, as well as agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are

appropriately investigated and resolved. Data acquisition was performed by Yuting Hong. Chenxing Zhang and Zhixuan Kang analyzed and interpreted data for this study. Chenxing Zhang and Fangfang Wang drafted the manuscript and revised it critically. Wei-Ti Chen, Rachel Arbing and Feifei Huang provided critical revisions of the manuscript for important intellectual content. Feifei Huang and Wei-Ti Chen proofread the paper and final approval of the version to be published. All authors read and gave final approval of the version to be published.

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Disclosure

The authors have nothing to report.

Ethics Statement

All study participants provided written informed consent, and the study design was approved by the ethics committee at Fujian Medical University (No: FMU2021175).

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

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

Statistics Statement

The authors have checked to make sure that our submission conforms as applicable to the Journal's statistical guidelines.

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Appendix A

TABLE A1 | Spearman correlation analysis among demoralization and symptom burden, coping styles, resilience, and family functioning ($n = 567$).

	Core symptom	Symptom related to lung cancer	Symptom interferes with daily living	Confrontation coping	Avoidance coping	Acceptance-resignation coping	Resilience	Family function	Demoralization
Core symptom	1								
Symptom related to lung cancer	0.517**	1							
Symptom interferes with daily living	0.638**	0.427**	1						
Confrontation coping	−0.159**	−0.076	−0.090*	1					
Avoidance coping	−0.126**	−0.103*	−0.011	0.155**	1				
Acceptance-resignation coping	0.463**	0.231**	0.500**	−0.304**	0.038	1			
Resilience	−0.377**	−0.217**	−0.359**	0.381**	0.101*	−0.457**	1		
Family function	−0.176**	−0.056	−0.227**	0.217**	−0.009	−0.389**	0.459**	1	
Demoralization	0.487**	0.240**	0.474**	−0.168**	0.016	0.650**	−0.533**	−0.493**	1

**$p < 0.001$ (two-tailed), *$p < 0.05$ (two-tailed).

Appendix B

TABLE A2 | Multiple linear regression analysis among demoralization and symptom burden, coping styles, resilience, and family functioning ($n = 567$).

	Tolerance	VIF
Core symptom	2.095	0.477
Symptom related to lung cancer	1.409	0.710
Symptom interferes with daily living	1.948	0.513
Confrontation coping	1.248	0.801
Avoidance coping	1.070	0.934
Acceptance-resignation coping	1.722	0.581
Resilience	1.648	0.607
Family function	1.353	0.739

Abbreviation: VIF, variance inflation factor.