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Article

How social support affects psychological well-being in colorectal cancer ostomates: A moderated mediating effect model

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Abstract: The present study aims to explore the influence of social support on the psychological well-being (PWB) of colorectal cancer (CRC) ostomates. It specifically examines how depression mediates the relationship between social support and PWB and explores if body image disturbances moderate this process. This study utilized convenience sampling to conduct a questionnaire survey on 319 CRC ostomates, employing the perceived social support scale, body image self-rating scale, depression self-rating scale and PWB scale. The results showed that the total scores of social support, body image disturbance, depression and PWB were 63.596 ± 12.081, 32.423 ± 17.057, 57.477 ± 14.867 and 69.828 ± 17.331, respectively. Social support had a positive impact on PWB ($B = 0.790$, $t = 11.703$, $p < 0.01$). Depression had a mediating effect of 0.078 between social support and PWB, accounting for 9.0% of the total effect. The direct predictive effect of social support on PWB and the mediating effect of depression between the two were both moderated by body image disturbance ($p < 0.01$). This study highlights the mediating role of depression in the relationship between social support and PWB and the moderating role of body image disturbance in CRC ostomates, indicating that enhancing social support can further improve PWB by reducing depressive symptoms, while improving body image disturbance can help heighten the patient's overall PWB.

Keywords: colorectal cancer; body image disturbance; depression; moderation effect

1. Introduction

According to GLOBOCAN 2020, there were 1.93 million new colorectal cancer (CRC) globally, constituting 10% of all new cancer diagnoses and 9.4% of all cancer-related deaths [1]. Surgical intervention stands as the primary option for CRC patients. In cases where patients exhibit intestinal wall edema, frail physical conditions, or present complex low-lying tumors unsuitable for anus preservation, the common approach is to undertake temporary or permanent enterostomy [2]. However, enterostomy changes the patient's normal physiological defecation, and external stoma placement can also cause disorder of the patient's self-image, leading to maladaptive physical, psychological, and social functions, which deeply influences patients' physical and psychological state [3,4]. In this complex and sensitive context, social support plays an important role in CRC ostomates as a key psychosocial resource.

Social support is the expression of mutual help and protection in relationships, which encompasses interactions between family, friends, and other people [5]. This support is particularly important for CRC patients, especially when they face various stressors in their life circumstances, such as stress caused by the CRC diagnosis, disturbed body image due to enterostomy, and stress in their sexual life [6,7]. Research in diverse cultural contexts, including European, American and Asian countries, indicates the universal importance of social support for cancer patients. For instance, a quantitative study in the U.S. with a large sample size of 300 CRC survivors found that high social support significantly improved emotional well-being [8]. Similarly, a smaller qualitative study of 45 CRC ostomates in China identified that family-based support was critical in coping with body image changes and improving quality of life [9]. Evidence also suggests that effective social support relieves psychological stress, promotes sexual well-being, and improves the quality of life among CRC ostomates [7,10]. Despite these findings, there is little empirical work in this area of how social support affects psychological well-being (PWB) related to CRC ostomates, which is known as a person's ability to develop positive relationships with others, cope with social pressures, have goals, and develop the own abilities [11]. Therefore, more research is needed to understand how CRC ostomates benefit from high levels of social support.

Additionally, the possible mediating role of depression *i* in the social support-PWB relationship has been largely overlooked in the CRC population. Given the higher prevalence of depressive symptoms among CRC ostomates due to changes in body shape and self-image concerns [12,13], understanding this dynamic is crucial. Prior research shows that the level of depression in cancer patients is affected by the patient's perceived and experienced level of social support [14], and that high levels of depression produce low levels of quality of life [15]. In studies of multiple sclerosis patients and clinical nurses, controlling depression levels also improves PWB [16,17]. In addition, it is important to recognize that depression and social support are a mutual process. KS' research in the 1990s emphasized that patients with depression may expel their social support, and high levels of social support will also reduce patients' depression levels, indicating that social support is a mutual process, not just a one-way process [18]. These dynamic makes understanding the social support and depression link in CRC ostomates complicated. As this study is focused on how to use existing social support resources to alleviate the negative impact of depression on CRC ostomates' well-being, we will not explore the impact of depression levels on social support in these patients.

Body image disturbance, a significant issue for CRC ostomates, adds another layer of complexity. Changes in physical appearance and function challenge patients' perceptions of self, leading to increased vulnerability to depression [19]. Previous research has found that body image exerts a moderating effect on the relationship between external shame and depressive symptoms in people with disturbed body image [20], as well as the association between distress and both death anxiety and subjective nearness-to-death among older adults [21]. In Canada, a study of 318 undergraduate women highlighted the significant role of body image in disordered eating attitudes, depression, and subjective well-being, identifying body image disturbance as a key predictor of depression [22]. This finding aligns with other studies

in the cancer group, such as a study of 108 breast cancer patients, in which was found that body image disturbance can destroy women's overall mood and is significantly related to their depression levels, and investment in body image can be used as a moderator variable to affect women's PWB after breast cancer surgery [23]. Given these findings, this study hypothesizes that body image disturbance may simultaneously interact with social support and depression to jointly affect the formation of PWB, and body image disturbance may be an important moderating factor.

Thus, this study addresses a critical gap by investigating the interconnected roles of social support, depression, and body image disturbance in shaping the PWB of CRC ostomates. Specifically, this study will explore the following aspects: (1) how social support affects PWB in CRC ostomates; (2) depression as a mediator between social support and PWB; and (3) whether body image disturbance moderates the formation process of PWB and assess the extent of the moderating effect. Through this study, we expect to provide new theoretical insights for improving the mental health of CRC ostomates. The relevant model diagram is shown in **Figure 1**.

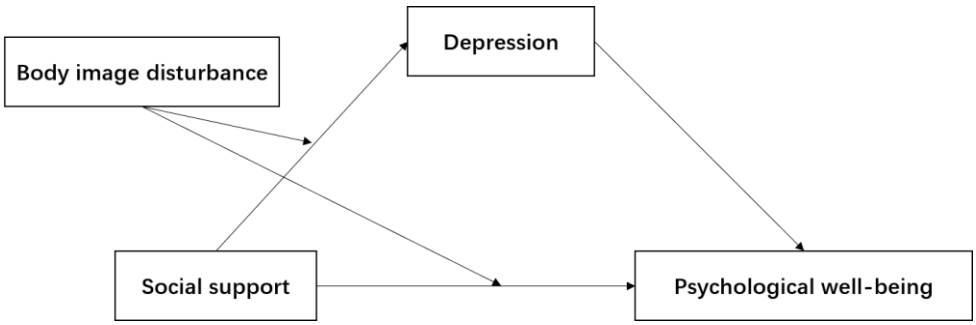


Figure 1. Conceptual framework.

2. Methods

2.1. Participants

The study protocol was approved by the Ethics Committee of Xuzhou Medical University, and a convenience sample of participants was subsequently recruited. Informed consents were obtained from all. Data were collected in Xuzhou between July and September 2023 using questionnaires in ostomy clinics of hospitals and through WeChat stoma groups for CRC ostomates. Patients with the following criteria were excluded: 1) underage; 2) with impaired self-care ability or intellectual disability or a history of mental illness; 3) unable to communicate or illiterate; 4) taking anti-anxiety or antidepressant medications. To determine the sample size, we used G*Power, specifying F tests for a linear multiple regression (effect size = 0.15, α = 0.05, power = 0.95). With 14 predictors, the predicted total sample size is 194 participants. In this research, a total of 356 patients completed the questionnaires. After eliminating invalid questionnaires, 319 questionnaires were finally included in the subsequent analysis and research, with a questionnaire validity rate of 89.6%.

2.2. Research tools

2.2.1. Perceived social support scale (PSSS)

Patient's social support was measured using the PSSS, developed by Zimet et al. [24] and adapted to Chinese in 1996. The PSSS has demonstrated strong psychometric properties in previous studies, and exhibited excellent internal consistency as evidenced by a Cronbach's alpha typically exceeding 0.90. The subscales (friends, family, and significant others) also show high internal consistency, with alpha values usually ranging from 0.85 to 0.92. Participants rated 12 items on the PSSS, which measures support across three areas (friends, family, significant others), each assessed with 4 items. A 7-point Likert scale (1 = strongly disagree, 7 = strongly agree) was used; higher scores denoted greater perceived social support.

2.2.2. Self-rating scale of body image (SSBI)

The SSBI is a scale compiled by Lu to assess an individual's perception and attitude towards his/her own image or specific parts of the body [25]. This scale contains 23 items that evaluate the subject's body image status from the following eight aspects: body defect, body appearance awareness, body appearance concern, emotional damage, social interaction, body appearance change, evaluation by others, and triggers of physical impairment. Each item is evaluated using a 4-point ordinal scale with values ranging from 0 to 3, whereby higher scores are indicative of a greater degree of body image disturbance. The SSBI demonstrates strong psychometric properties with internal consistency typically above 0.85, indicating high reliability. The test-retest reliability of the scale was found to be robust with coefficients exceeding 0.80, providing evidence of good temporal stability. The SSBI demonstrated good construct validity through the expected associations with self-esteem and depression, and its convergent validity was demonstrated through consistent results across various samples.

2.2.3. Self-rating depression scale (SDS)

The SDS is a psychological assessment tool designed to measure the presence and severity of depressive symptoms in an individual. This scale was compiled by Zung [26] in 1965. The scale employs 20 items that capture four dimensions of depression and responses to items are evaluated using a 4-point scale that reflects the range of frequency from "rarely or never" to "most or all of the time". Higher SDS scores indicate more severe depressive symptoms. Also, this scale has strong psychometric properties with good internal consistency, as evidenced by Cronbach's alpha values typically from 0.79 to 0.86. The scale demonstrated robust test-retest reliability with correlations typically greater than 0.80, indicating stability across time. The scale has demonstrated good convergent validity and been widely validated in diverse populations, making it a reliable instrument for measuring depressive symptoms.

2.2.4. Scales of PWB (SPWB)

The SPWB, a widely used instrument, was developed by Ryff [27] in 1989 to assess multiple dimensions of mental health. This scale contains 84 items. The Chinese version of the SPWB was adapted by Li [28] in 2014 and has a total of 18 entries. The items cover six dimensions: independence, environmental control, good relationships,

personal growth, life purpose, and self-acceptance. The scale ranged from 1 (strongly disagree) to 6 (strongly agree), with higher scores signifying greater PWB. The internal consistency for the total scale and its subscales is generally strong with Cronbach's alpha coefficients ranging from 0.70 to 0.90, reflecting strong internal consistency across the scale and its subscales. The scale also demonstrates robust test-retest reliability, with correlation coefficients typically exceeding 0.80, thus indicating good temporal stability. In terms of validity, the SPWB has shown good construct validity, reflecting well-established dimensions of PWB, and convergent validity, correlating positively with other mental health measures.

2.3. Statistical analysis

SPSS (version 25.0) was utilized for statistical data analysis. Descriptive statistical methods were utilized to present the level of PWB under different demographic characteristics of CRC ostomates. Harman's single factor test was used to explore potential common method variance. In this study, 40% below the standard threshold was used as the critical value. The Pearson correlation coefficient was calculated to assess the relationships between social support, body image disturbance, depression, and PWB. Model 4 in the PROCESS macro in SPSS 25.0 was used to measure the mediating effect of depression between social support and PWB, and Model 8 was performed to assess whether body image disturbance moderates the association between social support and depression, as well as between social support and PWB.

3. Results

3.1. General demographic information of CRC ostomates

The statistical descriptive information of the 319 CRC ostomates regarding gender, age, marital status, education level, residence, working status, monthly income, disease type, post-op time and stoma type is shown in **Table 1**. Analysis using *T*-test or analysis of variance revealed that PWB scores did not significantly differ based on demographic characteristics ($p > 0.05$). Consequently, these variables were not entered into the subsequent regression equation for analysis of mediating effects.

Table 1. Characteristics description of participants' basic information ($N = 319$, $\bar{x} \pm s$).

Characteristics		***N* (%)**	**PWB**		
			Score	***t*/*F***	***p***
Gender	Male	171 (53.6)	69.158 ± 17.275	−0.741	0.459
	Female	148 (46.4)	70.601 ± 17.422		
Age	18–30	11 (3.4)	77.364 ± 21.294	1.870	0.115
	31–40	26 (8.2)	72.192 ± 19.075		
	41–50	66 (20.7)	70.652 ± 16.695		
	51–60	132 (41.4)	67.008 ± 17.473		
	> 60	84 (26.3)	71.893 ± 16.114		

Table 1. (*Continued*).

Characteristics		*N* (%)	PWB		
			Score	*t*/*F*	*p*
Marital status	Married	242 (75.9)	69.736 ± 17.178	−0.168	0.867
	Widowed/Divorced/Unmarried	77 (24.1)	70.117 ± 17.914		
Education level	Elementary or lower	90 (28.2)	68.567 ± 16.720	1.252	0.291
	Junior high	100 (31.3)	68.790 ± 16.447		
	Senior high	75 (23.5)	69.827 ± 18.056		
	College or higher	54 (16.9)	73.852 ± 18.738		
Residence	Village	72 (22.6)	68.889 ± 18.238	2.882	0.058
	Town	109 (34.2)	72.991 ± 15.588		
	City	138 (43.3)	67.819 ± 17.910		
Working status	Public institutions employee	32 (10.0)	66.500 ± 21.216	1.336	0.249
	Enterprise employee	126 (39.5)	70.063 ± 16.517		
	Farmer	36 (11.3)	68.833 ± 18.415		
	Freelancer	96 (30.1)	70.396 ± 15.654		
	Unemployed	17 (5.3)	65.882 ± 15.656		
	Retired	12 (3.8)	80.250 ± 24.118		
Monthly income	< 2000 RMB	24 (7.5)	74.583 ± 14.166	1.027	0.381
	2000–6000 RMB	120 (37.6)	69.658 ± 18.942		
	6000–10,000 RMB	161 (50.5)	69.696 ± 16.152		
	> 10,000 RMB	14 (4.4)	64.643 ± 20.631		
Disease type	Colon cancer	132 (41.4)	70.000 ± 15.767	0.149	0.882
	Rectal cancer	187 (58.6)	69.706 ± 18.396		
Post-op time	0–12 months (within 1 year)	137 (42.9)	68.562 ± 17.442	1.006	0.390
	13–24 months (within 2 years)	88 (27.6)	72.466 ± 18.117		
	25–36 months (within 3 years)	75 (23.5)	69.520 ± 15.068		
	Over 37 months (over 3 years)	19 (6.0)	67.947 ± 20.922		
Stoma type	Temporary	89 (27.9)	69.483 ± 17.125	−0.22	0.826
	Permanent	230 (72.1)	69.961 ± 17.445		

3.2. Common method bias

Harman's single-factor test, using exploratory factor analysis, was employed to examine potential common method bias. The findings revealed that 16 common factors were extracted with eigenvalues each exceeding the threshold of 1.0. The maximum factor variance explanation rate was determined to be 25.2%, falling below the 40% conventional threshold established by Podsakoff et al. [29]. Consequently, these findings suggested that common method bias did not substantially impact the validity of the results.

3.3. Descriptive statistics and correlation

As depicted in **Table 2**, the scores of social support, body image disturbance, depression and PWB were 63.596 ± 12.081, 32.423 ± 17.057, 57.477 ± 14.867, 69.828 ± 17.331, respectively. Pearson bivariate correlation analysis revealed significant associations among these variables: (1) social support was significantly negatively associated with body image disturbance and depression, and positively with PWB; (2) body image disturbance had significant positive relationships with depression and negative relationships with PWB; (3) depression showed a significant negative relationship with PWB. The Pearson correlation coefficient values for these interrelationships exceeded 0.1, with corresponding p values below 0.05, indicating a substantial and significant correlation among the variables investigated in this study.

Table 2. Descriptive statistics and correlations ($N = 319$).

	Mean	SD	1	2	3	4
1) Social support	63.596	12.081	-			
2) Body image disturbance	32.423	17.057	−0.245**	-		
3) Depression	57.477	14.867	−0.350**	0.824**	-	
4) PWB	69.828	17.331	0.605**	−0.269**	−0.348**	-

Note: ** At the level of 0.01, the correlation is significant.

3.4. Mediation

Utilizing the Model 4 mediation model within the PROCESS macro, we assessed the mediating effect of patients' depression in the interaction between social support and PWB. The findings revealed that the social support available to patients significantly inversely related to depression ($B = -0.431$, $t = -6.654$, $p < 0.01$), while concurrently exhibited a significant factor in predicting higher the level of PWB ($B = 0.868$, $t = 13.520$, $p < 0.01$). Upon introducing depression into the aforementioned equation model, the predictive effect of social support on PWB remained significant and positive ($B = 0.790$, $t = 11.703$, $p < 0.01$), and the negative predictive effect of depression on PWB was also significant ($B = -0.181$, $t = -3.307$, $p < 0.01$), as depicted in **Table 3**. Furthermore, the direct effect of social support on PWB and the indirect effect of depression were significant, with 95% bootstrap confidence intervals that excluded 0. This indicates that social support not only directly predicts PWB but also predicts it through the mediating effect of depression. Effect decomposition results in **Table 4** showed that the direct effect accounted for 91.0% and the mediation effect for 9.0% of the total effect.

Table 3. Analysis of mediation model of depression.

	Depression			PWB			PWB		
	B	***t***	***p***	***B***	***t***	***p***	***B***	***t***	***p***
Social support	−0.431	−6.654	0.000	0.868	13.520	0.000	0.790	11.703	0.000
Depression							−0.181	−3.307	0.001
R^2	0.123			0.366			0.387		
F	44.281			182.779			99.720		

Table 4. Bootstrap analysis of mediation effect significance test.

	B	**Boot *SE***	**Boot LLCI**	**Boot ULCI**	**Effect (%)**
Indirect effect	0.078	0.029	0.025	0.138	9.0
Direct effect	0.789	0.068	0.657	0.922	91.0
Total effect	0.868	0.064	0.741	0.994	100

3.5. Moderated mediation

Utilizing Model 8 from the PROCESS macro, we conducted an examination of the moderated mediation model. The results revealed that upon introducing body image disturbance into the model, the interaction term between social support and body image disturbance significantly predicted depression ($B = 0.007$, $t = 3.038$, $p < 0.01$) and furthermore, significantly predicted PWB ($B = 0.013$, $t = 3.302$, $p < 0.01$). This implies that body image disturbance not only moderates the predictive effect of social support on depression but also plays a moderating role in the direct predictions of social support on PWB. Detailed information can be found in **Tables 5** and **6**.

Table 5. Moderated mediation model.

	Depression				**PWB**			
	B	***SE***	***t***	***p***	***B***	***SE***	***t***	***p***
Constant	57.820	0.464	124.664	0.000	82.801	5.498	15.060	0.000
Social support	−0.181	0.039	−4.676	0.000	0.805	0.067	12.037	0.000
Body image disturbance	0.669	0.028	24.152	0.000	−0.012	0.078	−0.154	0.878
Depression					−0.215	0.094	−2.281	0.023
Social support × body image disturbance	0.007	0.002	3.038	0.003	0.013	0.004	3.302	0.001
R^2	0.711				0.408			
F	257.973				54.017			

Table 6. Conditional effects at values of body image disturbance.

	Body image disturbance	***B***	**Boot *SE***	***t***	***p***	**LLCI**	**ULCI**
Social support → depression	M − 1SD	−0.297	0.051	−5.796	0.000	−0.398	−0.197
	M + 1SD	−0.065	0.058	−1.123	0.262	−0.178	−0.049
Social support → PWB	M − 1SD	0.591	0.090	6.547	0.000	0.413	0.768
	M + 1SD	1.020	0.096	10.599	0.000	0.830	1.209

3.6. Simple slope analysis

Additional insights were gained through simple slope analysis indicated that for participants with lower body image disturbance, social support significantly reduced depression levels ($B = −0.297$, $t = −5.796$, $p < 0.01$). In contrast, for participants with higher body image disturbance, the predictive effect of social support on depression was not significant ($B = −0.065$, $t = −1.123$, $p > 0.05$). This suggests that body image disturbance inversely moderates the link between social support and depression. Specifically, compared to those with lower body image disturbance, under conditions of higher body image disturbance, the influence of social support on depression is weaker, as depicted in **Figure 2**. For participants with both low and high levels of body

image disturbance, social support significantly predicted PWB positively (M-1SD: $B = 0.591$, $t = 6.547$, $p < 0.01$; M + 1SD: $B = 1.020$, $t = 10.599$, $p < 0.01$). Furthermore, as the level of body image disturbance increased, the influence of social support on PWB became more pronounced, as depicted in **Figure 3**.

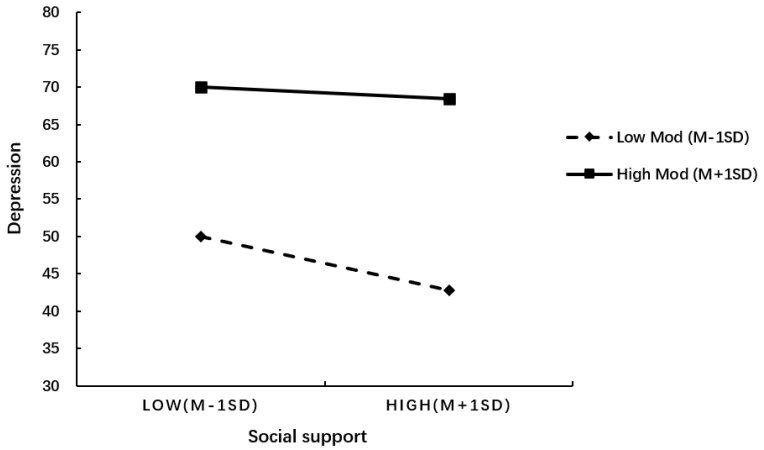


Figure 2. Moderating effect of body image disturbance between social support and depression.

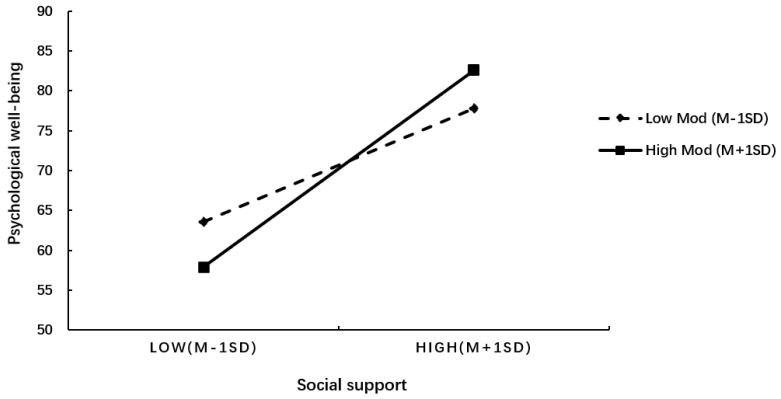


Figure 3. Moderating effect of body image disturbance between social support and PWB.

4. Discussion

4.1. Social support and PWB in CRC ostomates

This research observed a significant positive correlation between social support and PWB through a survey of CRC ostomates. This finding remained significant even after accounting for mediating variables, consistent with previous research on cancer survivors [30]. In the case of ovarian cancer survivors, higher levels of social support were correlated with more positive well-being and less negative mental health symptoms [31]. Additionally, a study of cancer patients after prostatectomy reported lower well-being and a more limited social network three months after surgery. However, by increasing the circle of social support, an improvement trend in patients' PWB levels was observed [32]. In addition, different types of social support have also shown a direct effect on PWB in research. A study of 383 older adults in Spain showed that higher support levels from friends and family led to higher indicators of well-

being [33]. On the contrary, a deficiency in social support, particularly from supervisors and colleagues, was associated with a decline in nurses' well-being [34]. In the cancer group, support from family and friends was more significant than other types of support in promoting PWB [35,36]. These studies further strengthen the evidence for the positive predictive effect of social support on PWB in CRC ostomates. The mechanism of this relationship is inseparable from the important role of social support in helping patients deal with emotions of the cancer experience and reducing the stress associated with treatment and cancer sequelae [37,38]. Our research also emphasizes the important role of social support in the PWB of CRC ostomates like the studies mentioned above. Therefore, in order to improve the level of PWB of patients, medical professionals, social support organizations, and family support systems can consider strengthening the social support network of CRC ostomates and encourage them to actively participate in social activities to promote their better adaptation. The cancer experience ultimately enhances the patient's capacity for self-development and well-being.

4.2. Depression as a mediator between social support and PWB

The existing literature shows a gap in the understanding of depression as a mediating variable in the social support-PWB relationship among CRC ostomates. In a cross-sectional study of Chinese adolescents, it was found that depression had a significant mediating effect between social support and Internet addiction, accounting for 18.2% of the total effect [39]. In research on individuals with depression, it was found that their scores on all six dimensions of the PWB questionnaire were significantly lower than those of the healthy population. The deficiencies, especially pronounced in the aspects of environmental mastery and self-acceptance, suggest that individuals with depression generally lack positive expectations towards things [40]. Similar results were proved in studies of patients with schizophrenia, in which negative symptoms and depression were found to be important predictors of mental health in these patients [41]. In the current study, we explored the mediation of depression on the relationship between social support and PWB among CRC ostomates. Results indicated that depression mediated the relationship, with a 9.0% effect. This means that in addition to the level of social support of CRC ostomates directly affecting the patient's PWB, it also affects the patient's depression level, which in turn has an indirect impact on PWB. Previous studies have proposed several potential causal mechanisms. Support from family or caregivers of CRC ostomates can provide emotional support and understanding, helping to relieve patients' emotional burden and depressive symptoms [42,43]. Good family relationships may also reduce the loneliness and social isolation of CRC ostomates [44]. Furthermore, depression acts as a negative predictor of PWB as mentioned above [41]. The patient's depressive symptoms may lead to emotional dysregulation, making it more difficult for the patient to experience positive emotions and pleasure, thus leading to a decrease in PWB [45]. In addition, the patient's depressive state leads to a greater tendency to focus on the negative aspects of life, thus hindering the perception of positive events and experiences, thereby reducing levels of PWB [46].

4.3. Moderating effects of body image disturbance

The findings demonstrated an inverse moderating effect of body image disturbance on the social support-depression link among individuals with CRC ostomies. The moderating effect of body image disturbance was more substantial when levels were low rather than high. In addition, body image disturbance could directly mediate the positive impact of social support on PWB in CRC ostomates. As the level of body image disturbance increased, the effect of social support on PWB gradually weakened. Despite limited research in cancer patients, body image disturbance frequently moderated relationships in obese people. Research showed that body image dissatisfaction might be related to anxiety and depression and has emerged as a prominent public health concern [47]. Among Chinese college students during the COVID-19 pandemic, body image was found to significantly moderate how physical activity affects anxiety. Notably, positive body image strengthened the mechanism by which physical activity reduces anxiety [48]. In studies with obese people, it was found that negative body image exerted a moderating influence on the relationship between emotion regulation and emotional eating in obese adolescents, highlighting its relevance for future interventions [49]. Additionally, a study of non-suicidal self-injury involving 2717 college students demonstrated a moderating effect of body image on the association between major life events and non-suicidal self-injury, as well as between rumination and non-suicidal self-injury [50]. The above studies revealed the impact of body image on psychological emotions, which was aligning with our findings. Exploring the reasons for the psychological and emotional impact of body image disturbance may be related to the fact that patients' dissatisfaction with their body image may damage their health. This may lead to psychosocial dysfunction in patients, including reduced self-esteem and psychological distress [51].

4.4. Research limitations and future prospects

There are several limitations associated with the current study that warrant discussion. First, the convenience sampling method of recruiting CRC patients with ostomies limits the generalizability of our findings to the broader population of patients with ostomies. The sample may not accurately represent the experiences of all CRC patients with ostomies, potentially introducing sampling bias and limiting the extent to which our conclusions apply to other populations of patients with ostomies, such as those with ostomies due to bladder cancer, or those from different demographic backgrounds. Second, the reliance on self-report data to assess social support, depression, body image disturbance, and mental health is subject to recall bias and subjective interpretation, affecting the accuracy and reliability of our measures. Our focus on support from family, friends, and significant others excluded broader social support systems, such as access to professional counseling services. This omission is a significant limitation given the potential importance of professional support in addressing body image issues and psychological distress associated with ostomies. In addition, the analysis of a mixed-sex sample may obscure the influence of gender on the relationships between social support, body image disturbance, depression, and mental health. Although we acknowledge these limitations, this study is crucial for understanding the PWB of CRC ostomy patients. It delves deeply into the mediating

role of depression in social support and PWB, shedding light on key factors in coping with the psychological distress that CRC ostomies may bring. Furthermore, the focus on the moderating effect of body image disturbance lays a foundation for understanding the impact of body image on patients' PWB, paving the way for more effective intervention measures. Therefore, in the future applications, healthcare professionals and family members of CRC ostomates can implement appropriate psychological intervention strategies to help patients cope with depressive emotions, while recognizing the moderating effect of body image disturbance also provides a basis for devising personalized support plans, promoting patients' PWB, and overall quality of life.

5. Conclusion

The study concludes that social support exerts a positive influence on PWB and mitigates depressive symptoms among CRC ostomates. Depression operates as a mediator in the association between social support and PWB. At the same time, body image disturbance moderates the relationship between social support and depression, and between social support and PWB. These findings highlight the critical role of social support in promoting PWB, pointing to depression as a mediating factor in this process, and the impact of body image disturbance on these factors needs to be considered through moderation. Therefore, strengthening social support, effectively intervening on depression, and alleviating body image disturbance are of great significance to improving the PWB of CRC ostomates. These findings provide guidance for clinical practice and highlight the need to develop individualized support plans to comprehensively improve patients' mental health and overall quality of life.

Author contributions: Study conception and design, SG and YZ; data collection, WY (Wenjing Yan) and MW; data analysis and interpretation of results, YZ, WY (Wenjun Yan) and QL; draft manuscript preparation, WY (Wenjing Yan) and YL. All authors have read and agreed to the published version of the manuscript.

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Availability of data and materials: The data associated with this study are available from the corresponding author upon reasonable request (Email: gong_shuai89@foxmail.com).

Ethical approval: This human subject study was approved by the Ethics Committee of Xuzhou Medical University, reference number XZHMU-2023081, and adhered to the Declaration of Helsinki, national and institutional guidelines.

Informed consent statement: Informed consent was obtained from all subjects involved in the study.

Conflict of interest: The authors declare no conflict of interest.

References

1. Sung H, Ferlay J, Siegel RL, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. CA: A Cancer Journal for Clinicians. 2021; 71(3): 209–249. doi: 10.3322/caac.21660
2. Xu Z, Becerra AZ, Justiniano CF, et al. Is the Distance Worth It? Patients With Rectal Cancer Traveling to High-Volume Centers Experience Improved Outcomes. Diseases of the Colon & Rectum. 2017; 60(12): 1250–1259. doi: 10.1097/dcr.0000000000000924
3. Krishnamurty D, Blatnik J, Mutch M. Stoma Complications. Clinics in Colon and Rectal Surgery. 2017; 30(03): 193–200. doi: 10.1055/s-0037-1598160
4. Sengul T, Oflaz F, et al. Disgust and Its Effect on Quality of Life and Adjustment to Stoma in Individuals with Ileostomy and Colostomy. Florence Nightingale Journal of Nursing. 2021; 29(3): 303–311. doi: 10.5152/fnjn.2021.20198
5. Langford CPH, Bowsher J, Maloney JP, et al. Social support: a conceptual analysis. Journal of Advanced Nursing. 1997; 25(1): 95–100. doi: 10.1046/j.1365-2648.1997.1997025095.x
6. Davis D, Ramamoorthy L, Pottakkat B. Impact of stoma on lifestyle and health-related quality of life in patients living with stoma: A cross-sectional study. Journal of Education and Health Promotion. 2020; 9: 328. doi: 10.4103/jehp.jehp_256_20
7. Frankland J, Wheelwright S, Permyakova NV, et al. Prevalence and predictors of poor sexual well-being over 5 years following treatment for colorectal cancer: results from the ColoREctal Wellbeing (CREW) prospective longitudinal study. BMJ Open. 2020; 10(11): e038953. doi: 10.1136/bmjopen-2020-038953
8. Efficace F, Breccia M, Cottone F, et al. Psychological well-being and social support in chronic myeloid leukemia patients receiving lifelong targeted therapies. Supportive Care in Cancer. 2016; 24(12): 4887–4894. doi: 10.1007/s00520-016-3344-6
9. Yan B, Yang LM, Hao LP, et al. Determinants of Quality of Life for Breast Cancer Patients in Shanghai, China. PLOS ONE. 2016; 11(4): e0153714. doi: 10.1371/journal.pone.0153714
10. Kim H, Son H. Moderating Effect of Posttraumatic Growth on the Relationship Between Social Support and Quality of Life in Colorectal Cancer Patients with Ostomies. Cancer Nursing. 2020; 44(3): 251–259. doi: 10.1097/ncc.0000000000000887
11. Ryff CD, Singer BH. Know Thyself and Become What You Are: A Eudaimonic Approach to Psychological Well-Being. Journal of Happiness Studies. 2006; 9(1): 13–39. doi: 10.1007/s10902-006-9019-0
12. Song L, Han X, Zhang J, et al. Body image mediates the effect of stoma status on psychological distress and quality of life in patients with colorectal cancer. Psycho-Oncology. 2020; 29(4): 796–802. doi: 10.1002/pon.5352
13. Song L, Pang Y, Zhang J, et al. Body image in colorectal cancer patients: A longitudinal study. Psycho-Oncology. 2021; 30(8): 1339–1346. doi: 10.1002/pon.5688
14. Kugbey N, Oppong Asante K, Meyer-Weitz A. Depression, anxiety and quality of life among women living with breast cancer in Ghana: mediating roles of social support and religiosity. Supportive Care in Cancer. 2019; 28(6): 2581–2588. doi: 10.1007/s00520-019-05027-1
15. Ma YF, Li W, Deng HB, et al. Prevalence of depression and its association with quality of life in clinically stable patients with COVID-19. Journal of Affective Disorders. 2020; 275: 145–148. doi: 10.1016/j.jad.2020.06.033
16. Hart S, Fonareva I, Merluzzi N, et al. Treatment for depression and its relationship to improvement in quality of life and psychological well-being in multiple sclerosis patients. Quality of Life Research. 2005; 14(3): 695–703. doi: 10.1007/s11136-004-1364-z
17. Jun WH, Lee ES, Lee KL. Relationships among Gratitude, Depression, and Psychological Well-being in Clinical Nurses. Journal of Korean Academy of Psychiatric and Mental Health Nursing. 2015; 24(2): 136. doi: 10.12934/jkpmhn.2015.24.2.136
18. Rook KS. Parallels in the Study of Social Support and Social Strain. Journal of Social and Clinical Psychology. 1990; 9(1): 118–132. doi: 10.1521/jscp.1990.9.1.118
19. Alenezi A, Livesay K, McGrath I, et al. Ostomy-related problems and their impact on quality of life of Saudi ostomate patients: A mixed-methods study. Journal of Clinical Nursing. 2022; 32(13–14): 3707–3719. doi: 10.1111/jocn.16466
20. Marta-Simões J, Ferreira C. Seeking a perfect body look: feeding the pathogenic impact of shame?. Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity. 2015; 21(3): 477–485. doi: 10.1007/s40519-015-0240-x

21. Bodner E, Bergman YS. The Utility of a Positive Body Image Among Community-Dwelling Older Adults Who Perceive Death to Be Near and Fear It. Research on Aging. 2019; 41(8): 751–771. doi: 10.1177/0164027519845115
22. Choma BL, Shove C, Busseri MA, et al. Assessing the Role of Body Image Coping Strategies as Mediators or Moderators of the Links Between Self-Objectification, Body Shame, and Well-Being. Sex Roles. 2009; 61(9–10): 699–713. doi: 10.1007/s11199-009-9666-9
23. Frost A. Embodied Reminders and Well-being Among Breast Cancer Survivors: Examining the Influence of Feminine Gender Role Orientation, Biographical Disruption, and Body Image [PhD thesis]. West Chester University; 2022.
24. Zimet GD, Powell SS, Farley GK, et al. Psychometric Characteristics of the Multidimensional Scale of Perceived Social Support. Journal of Personality Assessment. 1990; 55(3–4): 610–617. doi: 10.1080/00223891.1990.9674095
25. Yu Z, Zhang Z, Wang X, et al. Psychological evaluation of Asian female patients with rhinoplasty. Journal of Plastic, Reconstructive & Aesthetic Surgery. 2024; 88: 112–118. doi: 10.1016/j.bjps.2023.10.127
26. Zung WWK. Self-Rating Depression Scale in an Outpatient Clinic. Archives of General Psychiatry. 1965; 13(6): 508. doi: 10.1001/archpsyc.1965.01730060026004
27. Ryff CD. Happiness is everything, or is it? Explorations on the meaning of psychological well-being. Journal of Personality and Social Psychology. 1989; 57(6): 1069–1081. doi: 10.1037/0022-3514.57.6.1069
28. Li RH. Reliability and validity of a shorter Chinese version for Ryff's psychological well-being scale. Health Education Journal. 2014; 73(4): 446–452. doi: 10.1177/0017896913485743
29. Podsakoff PM, MacKenzie SB, Lee JY, et al. Common method biases in behavioral research: A critical review of the literature and recommended remedies. Journal of Applied Psychology. 2003; 88(5): 879–903. doi: 10.1037/0021-9010.88.5.879
30. Leow K, Lynch MF, Lee J. Social Support, Basic Psychological Needs, and Social Well-Being Among Older Cancer Survivors. The International Journal of Aging and Human Development. 2019; 92(1): 100–114. doi: 10.1177/0091415019887688
31. Hill EM, Watkins K. Women with Ovarian Cancer: Examining the Role of Social Support and Rumination in Posttraumatic Growth, Psychological Distress, and Psychological Well-being. Journal of Clinical Psychology in Medical Settings. 2017; 24(1): 47–58. doi: 10.1007/s10880-016-9482-7
32. Kollberg KS, Wilderäng U, Thorsteinsdottir T, et al. Psychological Well-being and Private and Professional Psychosocial Support After Prostate Cancer Surgery: A Follow-up at 3, 12, and 24 Months After Surgery. European Urology Focus. 2016; 2(4): 418–425. doi: 10.1016/j.euf.2015.10.005
33. Rey L, Extremera N, Sánchez-Álvarez N. Clarifying the Links Between Perceived Emotional Intelligence and Well-Being in Older People: Pathways Through Perceived Social Support from Family and Friends. Applied Research in Quality of Life. 2017; 14(1): 221–235. doi: 10.1007/s11482-017-9588-6
34. Burke RJ, Moodie S, Dolan SL, et al. Job Demands, Social Support, Work Satisfaction and Psychological Well-Being Among Nurses in Spain. SSRN Electronic Journal. 2012. doi: 10.2139/ssrn.2117051
35. Pehlivan S, Ovayolu O, Ovayolu N, et al. Relationship between hopelessness, loneliness, and perceived social support from family in Turkish patients with cancer. Supportive Care in Cancer. 2011; 20(4): 733–739. doi: 10.1007/s00520-011-1137-5
36. Bloom JR, Spiegel DJSS, Medicine. The relationship of two dimensions of social support to the psychological well-being and social functioning of women with advanced breast cancer. Social Science & Medicine. 1984; 19(8): 831–837. doi: 10.1016/0277-9536(84)90400-3
37. Boatemaa Benson R, Cobbold B, Opoku Boamah E, et al. Challenges, Coping Strategies, and Social Support among Breast Cancer Patients in Ghana. Advances in Public Health. 2020; 2020: 1–11. doi: 10.1155/2020/4817932
38. Szkody E, Stearns M, Stanhope L, et al. Stress-Buffering Role of Social Support during COVID-19. Family Process. 2020; 60(3): 1002–1015. doi: 10.1111/famp.12618
39. Wu X, Zhang Z, Zhao F, et al. Prevalence of Internet addiction and its association with social support and other related factors among adolescents in China. Journal of Adolescence. 2016; 52(1): 103–111. doi: 10.1016/j.adolescence.2016.07.012
40. Edmondson OliviaJH, MacLeod AK. Psychological Well-Being and Anticipated Positive Personal Events: Their Relationship to Depression. Clinical Psychology & Psychotherapy. 2014; 22(5): 418–425. doi: 10.1002/cpp.1911

41. Strauss GP, Sandt AR, Catalano LT, et al. Negative symptoms and depression predict lower psychological well-being in individuals with schizophrenia. Comprehensive Psychiatry. 2012; 53(8): 1137–1144. doi: 10.1016/j.comppsych.2012.05.009
42. Leyk M, Ksiazek J, Habel A, et al. The Influence of Social Support from the Family on Health Related-Quality of Life in Persons with a Colostomy. Journal of Wound, Ostomy & Continence Nursing. 2014; 41(6): 581–588. doi: 10.1097/won.0000000000000086
43. Iovino P, De Maria M, Corvese F, et al. The influence of patient and caregiver depression on patient self-care and caregiver contribution to self-care in ostomy: A dyadic analysis. Journal of Clinical Nursing. 2023; 32(17–18): 6441–6449. doi: 10.1111/jocn.16676
44. Qin F, Zhen L, Ye X, et al. Stigma and Its Influence on Patients with Temporary Ostomy. Journal of Wound, Ostomy & Continence Nursing. 2020; 47(3): 244–248. doi: 10.1097/won.0000000000000645
45. Chukwuemeka NA, Obioha CW. Emotion regulation strategies on psychological distress and psychological well-being of caregivers of mentally challenged children: moderating role of social support. Psychology, Health & Medicine. 2023; 29(1): 79–91. doi: 10.1080/13548506.2023.2289473
46. Bakioğlu F, Korkmaz O, Ercan H. Fear of COVID-19 and Positivity: Mediating Role of Intolerance of Uncertainty, Depression, Anxiety, and Stress. International Journal of Mental Health and Addiction. 2020; 19(6): 2369–2382. doi: 10.1007/s11469-020-00331-y
47. Gestsdottir S, Svansdottir E, Sigurdsson H, et al. Different factors associate with body image in adolescence than in emerging adulthood: A gender comparison in a follow-up study. Health Psychology Report. 2017; 6(1): 81–93. doi: 10.5114/hpr.2018.71201
48. Han B, Du G, Yang Y, et al. Relationships between physical activity, body image, BMI, depression and anxiety in Chinese college students during the COVID-19 pandemic. BMC Public Health. 2023; 23(1). doi: 10.1186/s12889-022-14917-9
49. Shriver LH, Dollar JM, Calkins SD, et al. Emotional Eating in Adolescence: Effects of Emotion Regulation, Weight Status and Negative Body Image. Nutrients. 2020; 13(1): 79. doi: 10.3390/nu13010079
50. Qin Q, Yang G, Li Y, et al. The relationship between major life events and non-suicidal self-injury among college students: the effect of rumination and body image. Frontiers in Public Health. 2024; 11. doi: 10.3389/fpubh.2023.1308186
51. McDermott E, Mullen G, Moloney J, et al. Body Image Dissatisfaction. Inflammatory Bowel Diseases. 2015; 21(2): 353–360. doi: 10.1097/mib.0000000000000287

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Article

Effect of borderline resection of mandible combined with psychological intervention on oral cancer

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Abstract: Oral cancers are defined as cancers that occur in people's mouth or back of the throat. The mucosal tissue of the lips and gums, the tongue itself, the root of the tongue, the outer mouth area, the neck, or beneath the tongue can all develop oral cancers. The common type of oral is squamous cell carcinoma (SCC) is the most common oral cancer, nearly occurrences for 90% of cases. Additional types comprise oral melanoma and adenocarcinoma by area and demography, prevalence rates differ. Monitoring of illness prevalence and disease-specific risk behaviors, mostly alcohol and tobacco use, are the main areas of difficulty. The research intended to observe the impact of psychosocial therapies in conjunction with mandible resection on oral cancer outcomes. We recruited 100 patients with oral cancer who had their mandibles resected. The data were analyzed using SPSS version 28.0 software. To obtain preoperative ratings and up to 12-month postoperative scores using anxiety and depression scale (ADS) for anxiety and depression. The result shows that in 4, 8, and 12 postoperative months, respectively, the number of patients who met the cut-off values for depression and adjustment disorder was achieved. The primary site and marital status were identified as variables influencing the ADS scores by the analysis of variance (ANOVA). Score variances at the preoperative and 12-month postoperative stages were analyzed using ANOVA to find group differences and validate results at a significance level of $p < 0.05$. Superior results are achieved when marginal mandible resection and psychological psychotherapy are combined as a comprehensive strategy for treating oral cancer.

Keywords: oral cancer; psychological; Anxiety and Depression Scale (ADS); risk behaviors

1. Introduction

The most prevalent type of cancer in India is oral cancer. The main causes of oral cancer are connected to areca nut and tobacco usage, particularly among men. Treatment for oral malignancies, which may vary slightly based on subsite-specific characteristics, primarily consists of surgery [1]. The mouth cavity is covered in stratified squamous epithelium that varies in keratin development. Multiple regions of the mouth might experience different keratinization processes, which can affect how resilient certain areas are to infections and mechanical stress. Starting at the vermilion border, the epithelium extends to cover the tongue, anterior fauces, and both the soft and hard palates [2]. Over 90% of oral cancers are malignant squamous cell carcinomas (SCC), which can originate in the neurovascular tissues, salivary glands, mucosa, dental tissues, or bone. It can be possible to circumvent oral cancers by screening for oral potentially malignant diseases (OPMDs) or by limiting sensitivity

to risk variables. Delayed diagnosis contributes to a poor quality of life and high mortality rate, with over half of SCC cases being diagnosed at an advanced stage [3]. To improve survival rates in individuals with SCC, early detection and timely treatment are crucial. Oral SCC can develop from several precursors to cancer, such as oral lichen planus, submucous fibrosis in the mouth, leukoplakia, and erythroplakia, due to continuous exposure to risk factors. Early detection of SCC through dental examinations, brush biopsies, narrow-band imaging, and molecular diagnostics such as biomarkers and salivary diagnostics faces challenges related to widespread implementation, healthcare provider awareness, and patient accessibility. The illness of head and neck cancer is heterogeneous, with several sub-sites with different pathology and molecular characteristics, causative factors, therapeutic response, and prognosis [4]. When addressing localized advanced cervical and head SCC, systemic therapy is usually employed. Induction chemotherapy offers potential benefits, including reduced risk of distant metastases, insights into in vivo tumor biology and response, and better-tailored, less toxic local treatments after downstaging. Mouth sores or unexplained growths are a sign of oral cancer, a global health concern that affects millions of people worldwide, especially in nations going through economic transformation. Since oral cancer is among the most common cancer, and its rising incidence should be the top priority for community health. Before a clinical examination, healthcare practitioners including dentists, physicians, and dental hygienists should assess potential and contributory risk factors for oral cancer development, such as hereditary predisposition, immunosuppressive medications, smoking, alcohol consumption, and associated diseases, of the development of oral cancer.

1.1. An indication of oral cavity anatomy

The pharynxes, movable oral tongue, along with durable and flexible palates are all parts of the oral cavity, which is made up of the mucosa of the lips [5]. Hard tissue teeth that pierce the mucosa and provide non-shedding surfaces for specific bacterial biofilm development are part of its unusual structure. Permanent bacterial colonization is hampered by the mucosal surfaces' ongoing renewal and the shedding of older epithelial layers. The human mouth cavity is a complicated and distinct anatomical structure due to its particular features. From the vermilion edge of the lips, the cavity inside the mouth extends upward to the joint of the hard palate with the soft palate and inferiorly to the circumvallated papillae of the tongue [6]. **Figure 1** illustrates the anatomical tissues that make up the pulp chamber, including the lip, oral tongue, floor of the mouth, buccal mucosa, upper and lower gum, retromolar trigone, and hard palate.

The mandible, the greatest and strongest bone in the face, is where the lower teeth are located. It is made up of two perpendicular pieces called rami that merge with the ends of the body almost at right angles, and a curving, horizontal portion called the body. A slight ridge on the outside of the skull denotes the symphysis, which joins the two bones at a young age [7]. The mental protuberance, which forms the mental tubercle, is enclosed by this ridge that divides below it. The mentalis and orbicularis Oris originated in the incisive fossa, which is situated beneath the incisor teeth. Nerve

and cognitive arteries operate through the mental avenue, which is located halfway between the body's upper and lower boundaries. The triangular and quadratus labii inferiors are joined by the horizontal line. It leaves each mental tubercle and moves both upward and backward. Due to their high fatality rates, oral tumors represent a serious worldwide health problem. Electrochemical biosensors involved in detection of oral cancer indicators were increasingly using non-material, such as protein, ribonucleic acid (RNA), and deoxyribonucleic acid (DNA) biosensors. Developments in these approaches and electro-analytical techniques are covered in the discussion. A common head and neck cancer with a high death rate was oral squamous cell carcinoma (OSCC). Salivary indicators could help with early detection, and conventional biopsy could be used to identify it. It could spread by metastasis.

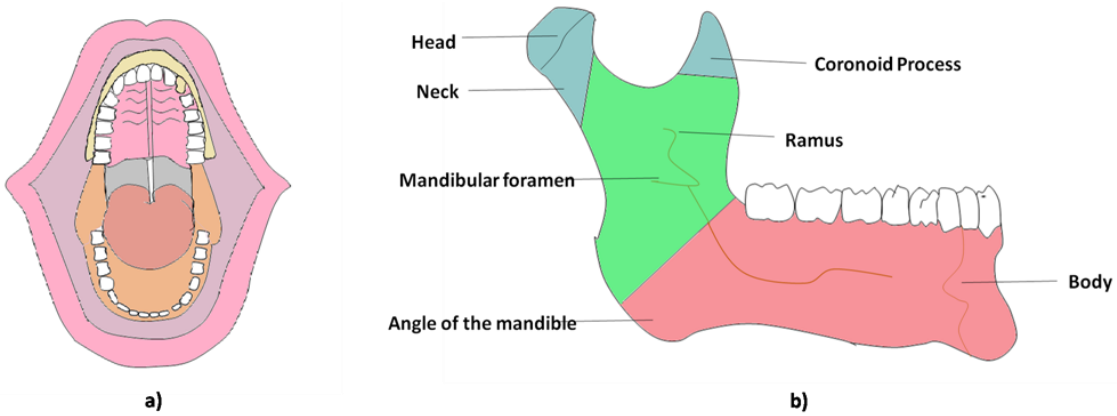


Figure 1. Highlighting Tooth Locations: **(a)** Anatomical Location of the Oral cancer **(b)** key Mandibular Landmarks.

1.2. An indication of oral mucosa anatomy

The mucous membrane known as the mucosa of the mouth borders the cavity in the mouth and combines with the esophageal mucosa and superficial epidermis of the lips. It is multi-layered and squamous, with localization-specific characteristics. Masticatory mucosa covers areas exposed to mechanical stress, while the lining mucosa is flexible and specialized at the tongue [8]. The oral mucosa senses pressure, temperature, and pain to protect the gastrointestinal tract from ingested substances and provides mechanical and immune barrier function.

1.3. Oral cavity premalignant lesions

Oral premalignant lesions are frequently referred to as possibly malignant illnesses. In the mouth, leukoplakia, oral erythroplakia, and oral submucous fibrosis (OSMF) are the most prevalent premalignant lesions. There is a significant risk of malignant transformation in these lesions. The precise etiological processes leading to the emergence of precancerous lesions in the oral cavity remain incompletely recognized in [9]. Abnormalities of the mouth and gums that are premalignant can be caused by a variety of significant etiological variables, including consuming alcohol, using tobacco, and biting on an areca nut-containing quid of betel. In addition to potentially conserving individuals, early detection is crucial in halting the malignant progression of these tumors [10]. To remove the premalignant growths in the oral

cavity; there are many treatment methods available, ranging from conservative to surgical.

Research Objective:

- To evaluate how effectively mandibular resection and psychosocial therapy work together for the psychological health of individuals with mouth cancer.
- To determine the impact of factors on patients' post-surgery anxiety and depression levels, as evaluated by the ADS, such as the main location of malignancy and marital status.

The following section provide the remining details: Section 2 describes the literature review; Section 3 contains the methods and materials. Section 4 presents the result of the investigation followed by the discussion. Final section determines the conclusion of the investigation.

2. Literature review

This section, addresses oral cancer therapy and detection, with a focus on non-invasive techniques and early diagnosis. It focuses attention on issues with psychological therapy, sustaining nutritional health, and difficulties experienced by advanced patients. The accuracy of cancer diagnosis is increased by advances in diagnostic technology including deep learning (DL) algorithms and optical equipment. The evaluation highlights the necessity of a multidisciplinary strategy to enhance patient care and treatment effectiveness.

2.1. Treatment strategies for oral cancer

Patients with cancers of the oral cavity frequently arrive late for therapy, and surgery is the recommended course of action. When it comes to treating oral cancer, chemotherapy and radiation are not usually the main treatments utilized, although they can assist with surgery when necessary. The advanced stage of the cancer, however, could make surgical excision difficult. The superlative evidence-based therapy modalities for individuals with locally advanced cancer of the oral cavity were summarized [11]. The standard of care is radiation therapy after surgery, either with or without chemoradiotherapy (CT). However, in situations of incurable illness, attempts at curative induction CT may be made. Throughout their anticancer therapy, the majority of cancer patients deal with different dietary issues. Muscle rehabilitation was hampered by metabolic abnormalities brought on by cancer, even with appropriate nutrition assistance [12]. It can also lead to the development of tumor anorexia-cachexia syndromes. To improve survival rates, oral cancer screening was essential for early identification and treatment. While fluorescence viewing with optical tools was non-invasive, easy, and provided instant results, where biopsies are invasive and unpleasant. A at Tokyo Dental College examined 314 patients using optical instruments between 2014 and 2018 [13]. Independent evaluations yielded 98.0% sensitivity and 43.2% specificity for oral cancer diagnosis. In contrast, independent assessments revealed mean luminance values of 62.7% and 61.9%, luminance ratios of 55.7% and 90.3%, and illumination coefficients of variability of 72.5% and 85.4%. The deep convolutional neural network (DCNN) applications were employed to construct an algorithm that automatically separated oral malignancies from oral

potentially malignant disorders (OPMDs) [14]. Patient records and histopathology reports were used to gather and label 510 intraoral images of OCs and OPMDs over three years. Using the U-Net architecture, the framework that achieved the lowest validation loss was selected for further validation. The dice similarity coefficient (DSC) value was 0.994 and the reliability between observers was 0.989, according to the patient's data. The validation accuracy and DSC of the method were 0.805 and 0.697, respectively. Treatment experts have difficulties when dealing with advanced head and neck malignancies because they must strike a balance between functional and oncological needs. The gold standard for abnormalities following tumor excision was free flap repair; nevertheless, advanced tumors can provide unique challenges, particularly in conditions where full-thickness resection is necessary. The investigation evaluating reconstructive techniques and oncological outcomes involved 33 patients with significant abnormalities resulting from oral SCC [15]. Among the 97% patients had malignancies that were locally progressed (78.8%) and tumors were completely removed. The anterolateral thigh flap with an 84.8% success rate, was the most commonly used technique. The cohort had moderate overall and progression-free survival rates along with a strong local control rate. Advanced cancers in important anatomical locations may require full-thickness tumor resections.

2.2. Methods used in the detection of oral cancer

Primary detection is essential for reducing fatality rate among those with oral cancer. As a result, there was a great need for non-invasive, immediate, and easy diagnostic methods for oral cancer. Promising methods for early oral cancer detection include salivary biomarkers and sophisticated imaging modalities like optical coherence tomography and fluorescence imaging. These non-invasive techniques are perfect for routine oral cancer screening because they reduce patients and early detection can be enhanced by incorporating these technologies into standard processes. The diagnosis of oral cancer began with a healthcare provider effectively observing any oral lesions. Examining the oral cavity thoroughly, including the lips, gums, tongue, and soft tissues using a magnifying glass, allows a medical professional to make an oral cancer diagnosis. If worrisome lesions are discovered, a biopsy is performed and submitted for lab testing [16]. A maxillofacial or dental surgeon performed the necessary diagnostics if cancer was detected. A dentist was essential to the early detection and investigation of oral cancer cases. **Figure 2** illustrates widely used approaches for diagnosis of oral cancer.

A total of 120 patients, 65 women (57%) and 55 men (43%), with OPMD, had their clinical-pathological variables examined [17]. The mandibular alveolar mucosa (10.83%), sagittal dental mucosal (9.17%), oral mucosal/vestibule (20%), lower lip (20.83%), and medial edge of the tongue (22.5%) were the most often occurring oral mucosal locations. In the group, there were no cases of pure erythroplakia. Urinary tract infections (UTIs) were reported by thirteen persons. The size of leukoplakia averaged 14.11 mm, but that of speckled leukoplakia was 14.9 mm. There were medium to serious abnormalities in the anatomy of the ventral tongue and the lower part of the mouth. Except for the lips, women were diagnosed with OPMD at a higher rate than men.

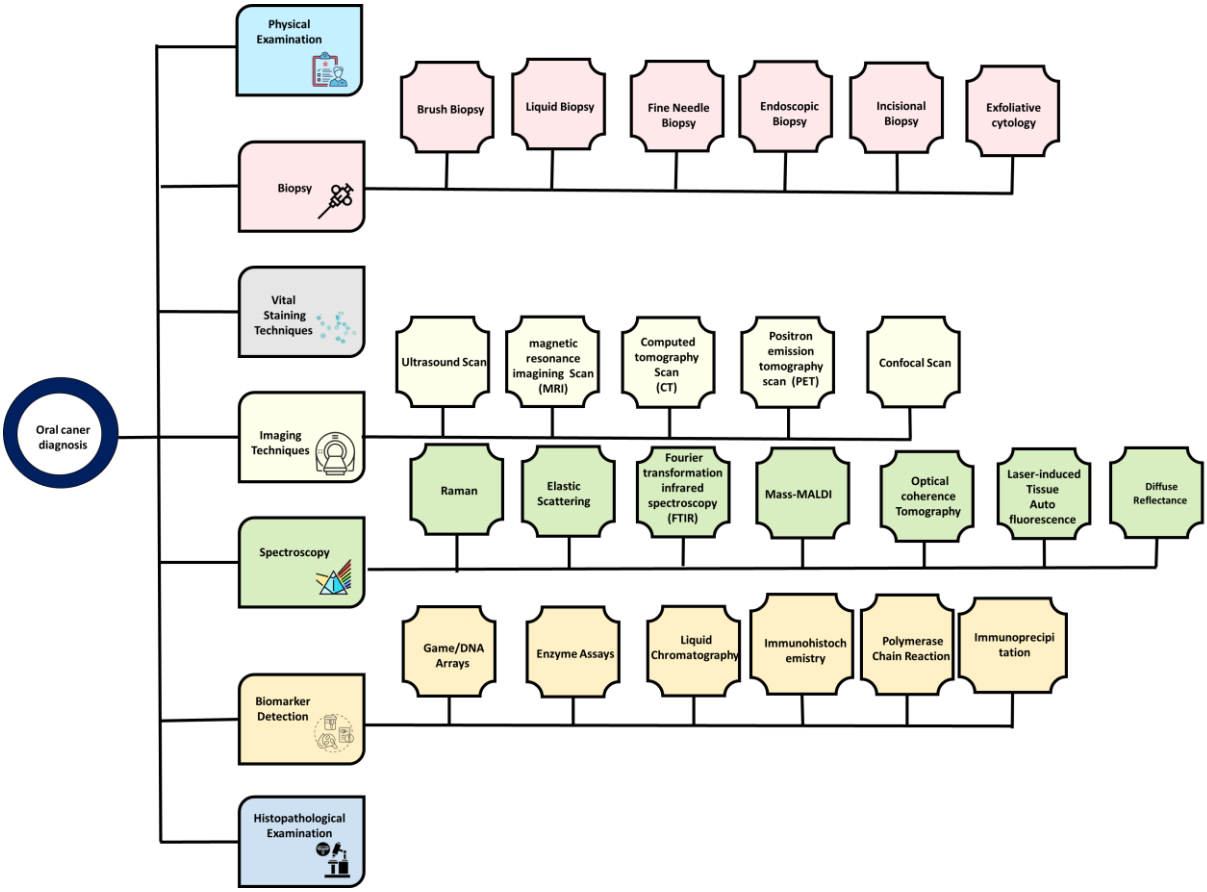


Figure 2. Detection methods for oral cancer.

2.3. Stress factors in the oral microbiome

The investigation explored relationship between depression and anxiety symptoms in adolescents, focusing on the oral microbiome [18]. The attendees, who were 14–18 years old and 69.70% female, provided specimens of saliva and admitted to signs of mood disorders, anxiety, and oral health. Saliva was taken for the sequencing of 16S ribosomal ribonucleic acid (rRNA) genes and cortisol and C-reactive protein (CRP) testing. The oral microbiota's broad variation was irrelevant to symptom assessments and declined based on the anxiety or melancholy subgroup, according to the results. The varying frequency of particular taxa of bacteria was linked to feelings of anxiety and despair. Longitudinal research could enhance understanding and identify early intervention targets. The purpose of the research was to ascertain how oxidative stress and vitamin D contributed to the etiology of cancers of the lips, oral cavity and pharynx (LOCP) among people from Europe [19]. Twenty LOCP elder individuals, twenty LOCP patients, and twenty-five mature in age; normal participants had samples of their blood evaluated for the research. The levels of vitamin D, osteopontin (OPN), melatonin, and malondialdehyde in blood serum were also measured, as well as malondialdehyde (MDA) levels and antioxidant enzyme activities. The findings suggested vitamin D insufficiency and disrupted oxidant-antioxidant equilibrium in LOCP patients, with drops in vitamin D and catalase (Cats) and elevations in OPN and blood plasma MDA. More investigation was necessary on the possible link between OPN and LOCP carcinogenesis. 180 patients with cancer of

the mouth who had treatment at the institution between January 2018 and January 2020 were distributed at random to groups A, B, and C; each group consisted of 60 cases. Submental island flap and free flap were used to repair groups A and B, respectively. Two groups were formed out of group C, and given normal nurse care [20]. In the treatment of oral cancer, an integrated approach and supportive treatment were said to reduce the duration of treatment and enhance results [21]. Few systematic researches exist, despite the overwhelming evidence supporting the involvement of oral and craniofacial physicians, dental professionals, and dental hygienists in providing supportive care for patients with oral cancer. Specifically, the term oral healthcare management refers to the supervision of oral function, management of oral hygiene, and dental hygiene during the treatment of oral cancer.

The researchers that use cross-sectional or retrospective designs, furthermore, relatively few have assessed oral cancer survivors' sleep quality. Case-control research was conducted to look at mood problems and sleep issues in 50 individuals who had survived overcrowding (OC) [22]. The research revealed that those who have experienced OC have considerably lower sleep quality as compared to individuals in good health, and they also have greater levels of worry and despair. The objectives of the investigation were to use the sequential Kriging optimization (SKO) technique, (1) develop a reverse recognition procedure, and (2) evaluate the skeletal muscle capabilities of a patient participating in a repair employing the fibula-free flap (FFF) technique in combination with patient-specific finite element analysis (FEA) in silico and occlusal force measurements at different stages of the patient's in vivo recuperation [23]. The findings supported the hypothesis and the suggested approach, which uses occlusal force evaluations, has a mathematical benefit compared with conventional, the greatest efficiency standards methods, which were primarily motivated by reducing the energy consumption of the involved tissue systems.

Patients with primary oral cancer were followed for up to five years following initial therapy, and healthy controls were evaluated in [24] using statistical analysis. The outcome variable for the mixed-model was masticatory performance. Maximal mouth opening (MMO), having effective dentures, and the number of occlusal units (OU) were factors positively linked with masticatory performance. The effects of maximal biting force (MBF) and tumor location varied depending on the evaluation moment. Participants were seventy-six individuals receiving therapy for oral cancer in hospitals. Communication tools based on the oral assessment guide (OAG) were required to exchange information on patients' oral health status. Using the OAG, a dental hygienist and a nurse conducted oral examinations following surgery [25]. To investigate variations and consistency in the dental hygienists' and nurses' ratings, comparative statistical analyses were carried out. There was an inadequate confidence interval among physicians and dental hygiene specialists when there was low κ levels for tongues, liquid saliva, mucous membrane, gum, teeth and flash teeth types.

3. Methods and materials

3.1. Data collection

The clinical practice standards for oral cancer served as a framework for oral cancer treatment. A total of 100 patients (78 men and 22 women) received primary

healthcare between March 2020 and April 2023, including 88 patients who underwent radical resection with reconstruction was included in the research. The patients were treated at multiple institutions. After excluding 14 individuals who declined to participate and 19 patients with insufficient medical data, a total of 55 people were included.

3.2. Evaluation of psychological intervention in oral cancer

Significant psychological difficulties are faced by patients obtaining treatment for oral cancer, especially those who need mandibular surgery. Patients with oral cancer frequently have psychological difficulties such as worry, sadness, problems with their bodies, and social isolation. These obstacles can be made worse by the dread of cancer recurrence, especially for those who need mandibular surgery. These difficulties are frequently measured using a psychometric measure. Patients are categorized by scale according to the scores:

- An evaluation of 0–7 indicates there is no depression or anxiety.
- An average of 8 to 10 indicates borderline depression or anxiety.
- An assessment of 11 or higher indicates probable depression or anxiety.

Patients with oral cancer requiring mandible surgery encounter significant psychological effects. Surgery can cause changes in a person's identity and social interactions, as well as modify the patient's facial appearance, speech, and swallowing abilities. A cancer diagnosis and the uncertainties surrounding treatment can exacerbate anxiety and sadness, which can be brought about by these physical alterations. The provision of psychological care is essential in helping these patients [26]. Throughout therapy and recovery, it seeks to alleviate emotional suffering, offer coping mechanisms, and improve general mental health. To maximize a patient's psychological resilience and quality of life throughout and following treatment, support groups, emotional counselling, and psychotherapy specifically designed to tackle anxiety, depression, society support, self-efficiency, and adjustment concerns are frequently incorporated into the course of treatment. The technique employed was the ADS, which is used to screen individuals with medical illnesses for anxiety and depression. Preoperatively, as well as four, eight, and twelve months after surgery, psychiatric symptoms were evaluated. Preoperative evaluations were carried out no later than one week before surgery.

3.3. Evaluation equipment for anxiety and depression

There are just ten questions on the ADS dimension, and each one is scored on a four-point scale. It is recognized for generating minimal participant strain and exhaustion. The items are minimal to be affected by physical symptoms, given that their primary purpose is to evaluate the cognitive components of sadness and anxiety. The total score is calculated by summing seven items on the anxiety scale and seven items on the emotion scale. Poorer health is indicated by a higher ADS score. The recommended ideal thresholds for depression and adjustment difficulties in people are 10/11 and 19/20, respectively.

3.4. Statistical analysis

The statical package for the social science (SPSS) 28.0 for Windows for data analysis, with the significance level of the set at a *p*-value of 0.05; analysis of variance (ANOVA) with repeated measures was used to examine variances in ADS scores between the preoperative and 12-month postoperative stages. The association among age and ADS scores was shown as spearman's rank correlation coefficient, while incessant variable quantity was handled as non-parametric and displayed as the interquartile range (IQR) and median. To define the patterns of the indications related to depression and anxiety about clinical and demographic characteristics, the chi-square test was employed. For every enduring factor, tests of variance homogeneity and normality were conducted. To investigate the association between anxiety and depressive symptoms and grouping characteristics such as an independent sample *T*-test, social support, perceived stress, a nonparametric test, stigma, optimism, and hope were employed.

4. Results

In this section, the oral cancer patient's clinical characteristics, with the subcategory, are included. The levels of ADS scores, with a range median of IQR, are also discussed below.

4.1. Evaluation of patients' clinical characteristics

The assessment of the clinical features of the patients indicated a heterogeneous age distribution, with a notable majority between the ages of 50 and 70. The majority of patients had mandibular lesions and were mostly in the advanced stages of the disease. There were more men than women in the sample, and a sizable portion of them reported drinking alcohol. Many of them had undergone unilateral neck dissection. Important demographic information is revealed by evaluating the clinical features of patients, such as age, gender, and the primary location of oral cancer. These traits shed light on the patient category and guide the development of individualized treatment plans. The presented data on various demographic and clinical factors in a cohort of patients are shown in **Table 1**. The primary sites and the age distribution are depicted in **Figure 3**. IQR percentages ranged from 2.7% to 29%, with corresponding median numbers ranging from 1 to 13 across different age groups. **Figure 4** describes the major affected area of oral cancer and primary tumor sites showed IQR percentages between 9.8% and 60.8%, with median numbers ranging from 4 to 23. The cancer stage exhibited an IQR spread from 10.8% to 64.9%, correlating with median numbers spanning 6 to 26. Gender distribution indicated an IQR of 37.6% to 62.4%, with median numbers of 18 to 23 for females and males, respectively. Neck dissection categories displayed IQR percentages of 29.9% to 70.1%, corresponding to median numbers ranging from 9 to 32. Postoperative treatment status showed an IQR range of 30.5% to 69.5%, with median numbers from 12 to 30. Employment status demonstrated an IQR distribution from 43.2% to 56.8%, with median numbers of 18 to 23 for unemployed and employed individuals, respectively. Additionally, smoking and drinking habits indicated IQR percentages of 21.2% to 78.8% and 39.2% to 60.8%, respectively, with median numbers ranging from 11 to 30 for smokers and

drinkers. Marital status presented IQR percentages of 30% to 69%, with median numbers of 12 to 30 for unmarried and married individuals, respectively.

Table 1. Clinical characteristics of oral cancer patients.

Characteristics	**Range**	**(IQR)%**	***N* = 55**
Age (years)	19–29	2.7	2
	30–39	2	1
	40–49	10.3	5
	50–59	29	13
	60–69	23.8	10
	70–79	29	12
	80–89	15.7	7
	89 above	12.5	5
Primary site	Mandible	60.8	23
	Tongue	28	13
	Oral floor	17.9	11
	Maxilla	9.8	8
Stage	II	10.8	19
	III	24.3	12
	IV	64.9	24
Gender	Male	62.4	32
	Female	37.6	23
Neck dissection	Unilateral	70.1	41
	Bilateral	29.9	14
Postoperative treatment	Yes	30.5	33
	No	69.5	22
Employment status	Employed	56.8	31
	Unemployed	43.2	24
Smoking habit	Yes	21.2	11
	No	78.8	44
Drinking habit	Yes	60.8	29
	No	39.2	26
Marital status	Married	69	30
	Unmarried	30	25

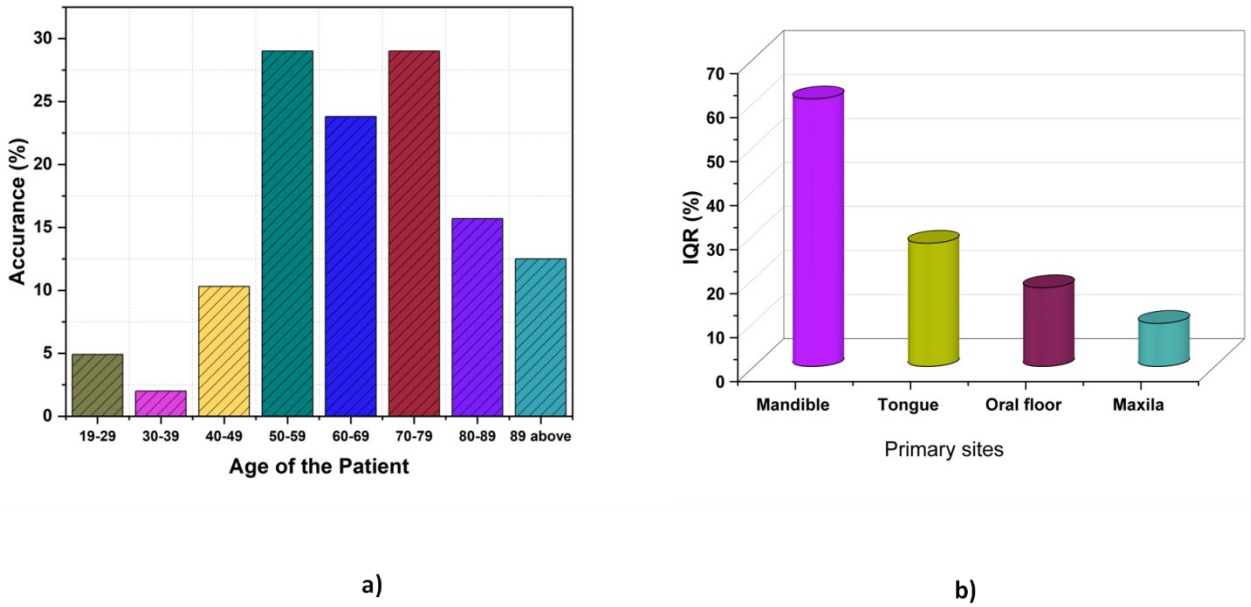


Figure 3. Clinical characteristics based on **(a)** Age distribution **(b)** Primary sites of oral cancer.

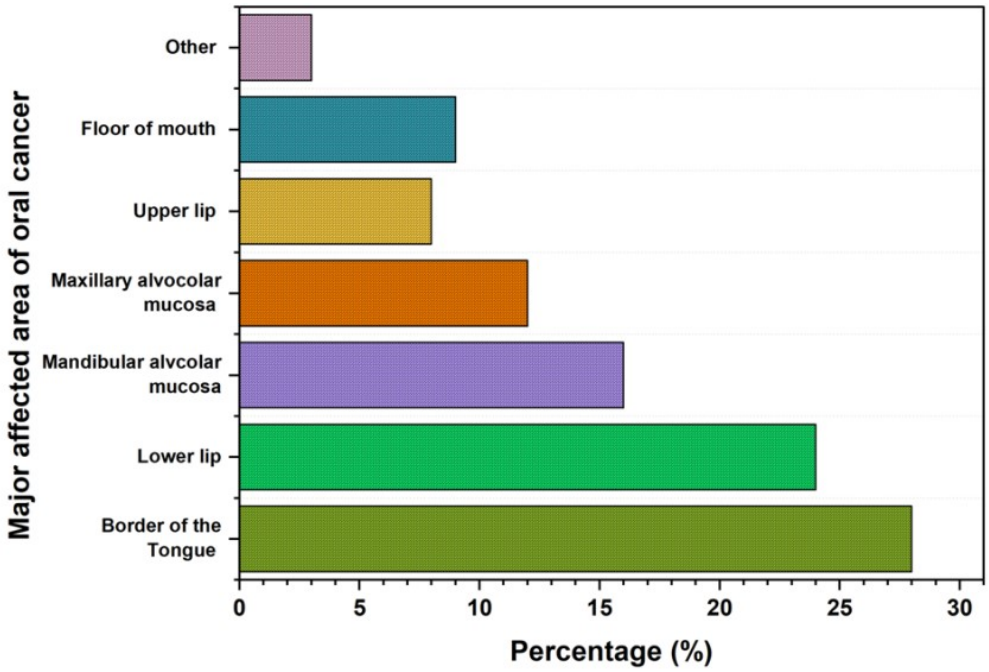


Figure 4. Major affected area of oral cancer.

4.2. Evaluation of oral cancer patients based on ADS scores

Based on the analysis of ADS scores, individuals with oral cancer were shown to be substantially more psychologically distressed before surgery if they had mandibular lesions. It was also discovered that these ratings were influenced by variables including drinking and smoking patterns, as well as the status of postoperative care. The ANOVA analysis brought to light the tremendous psychological burden that patients with oral cancer endure by highlighting the large disparities in ADS scores across different categories. The spearman's rank correlation coefficient despite age and ADS scores, which is evaluated in **Figure 5**, while incessant variables were handled as non-parametric and displayed with the IQR and the median. **Table 2** shows

the detailed evaluation of the ADS score of patients' clinical characteristics. It includes the characteristics with subcategories and the preoperative, 4 months postoperative, 8 months postoperative, and 12 months postoperative, with the median and also the value.

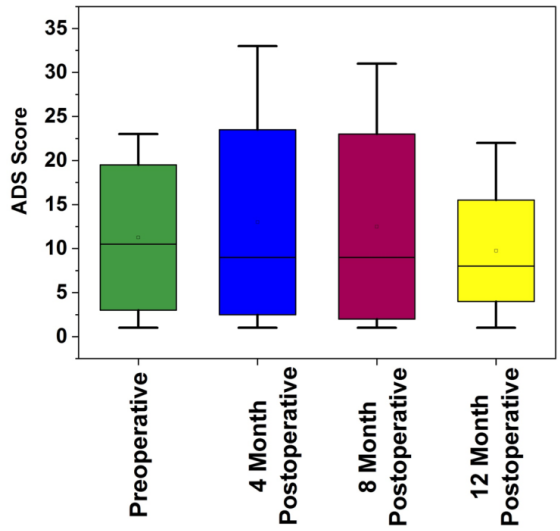


Figure 5. Level of ADS score in preoperative and postoperative.

Table 2. Numerical evaluation of the ADS scores in months of preoperative and postoperative.

Characteristics	Sub-category	Preoperative (Median, IQR)	*p*-value	4 months postoperative (Median, IQR)	*p*-value	8 months postoperative (Median, IQR)	*p*-value	12 months postoperative (Median, IQR)	*p*-value
Primary site	Mandible	11 (9–13)	-	8 (6–10)	0.01	6 (4–8)	0.01	5 (3–9)	0.01
	Tongue	10 (8–12)		7 (5–9)	0.04	5 (3–7)	0.00	2 (2–4)	0.04
	Oral floor	15 (9–11)		6 (4–8)	0.03	5 (3–7)	0.02	4 (2–6)	0.03
	Maxilla	9 (7–11)		6 (4–8)	0.04	4 (2–6)	0.04	3 (1–5)	0.04
Stage	II	10 (8–15)	-	7 (5–9)	0.02	5 (3–7)	0.02	2 (2–7)	0.01
	III	10 (8–14)		7 (5–9)	0.04	4 (3–7)	0.01	4 (2–6)	0.03
	IV	11 (9–13)		8 (6–10)	0.01	6 (4–8)	0.05	5 (3–9)	0.01
Neck dissection	Unilateral	6 (8–16)	-	7 (5–9)	0.02	5 (3–7)	0.02	4 (2–7)	0.04
	Bilateral	14 (8–12)		7 (5–9)	0.04	5 (3–7)	0.04	2 (2–6)	0.02
Postoperative treatment	Yes	12 (8–10)	-	7 (5–9)	0.04	6 (3–7)	0.02	4 (2–8)	0.01
	No	9 (7–11)		6 (4–8)	0.03	5 (3–7)	0.03	6 (2–6)	0.03
Smoking habit	Yes	19 (8–12)	-	7 (5–9)	0.02	3 (3–7)	0.02	5 (2–1)	0.02
	No	21 (7–11)		6 (4–8)	0.03	5 (3–7)	0.03	4 (2–4)	0.05
Drinking habit	Yes	11 (8–12)	-	7 (5–9)	0.02	4 (3–7)	0.01	4 (2–3)	0.02
	No	7 (9–15)		6 (4–8)	0.03	7 (3–7)	0.03	4 (2–6)	0.03

To examined the association between depressive and anxiety symptoms with several psychosocial factors, which are depicted in **Table 3**. Depressive symptoms showed significant differences across measures of social support (male (60.00%) and female (69.80%), $Z/t = -5.247$, $p = 0.000$), stigma (Male (52.00%) and female (34.90%), $Z/t = 7.382$, $p = 0.000$), optimism (male (17.00) and female (19.50), $Z/t =$

−5.525, $p = 0.000$), self-efficacy (male (23.86 ± 5.24) and female (30.01 ± 3.25), $Z/t = -7.471$, $p = 0.000$), perceived stress level of male (20.2) and female (15.20), $Z/t = 8.321$, $p = 0.000$), and hope of male (37.02) and female (30), $Z/t = -6.393$, $p = 0.000$). Similarly, anxiety symptoms exhibited significant differences about social support (male 59.21% and female 64.02%), $Z/t = -5.243$, $p = 0.000$), stigma (male 59.20% and female 41.05%), $Z/t = 6.978$, $p = 0.000$), optimism (male 17.25 and female 14.20), $Z/t = -5.685$, $p = 0.000$), self-efficacy of male (21.27 ± 2.89) and female (24.92 ± 4.09), $Z/t = -5.658$, $p = 0.000$), perceived stress (20.15 vs. 15.00, $Z/t = 7.256$, $p = 0.000$), and hope (35.95 vs. 38.25, $Z/t = -5.588$, $p = 0.000$). **Figure 6** determines the findings that highlight and interplay between psychosocial factors and mental health symptoms of both males and females, underscoring the importance of addressing these factors in therapeutic interventions and support strategies.

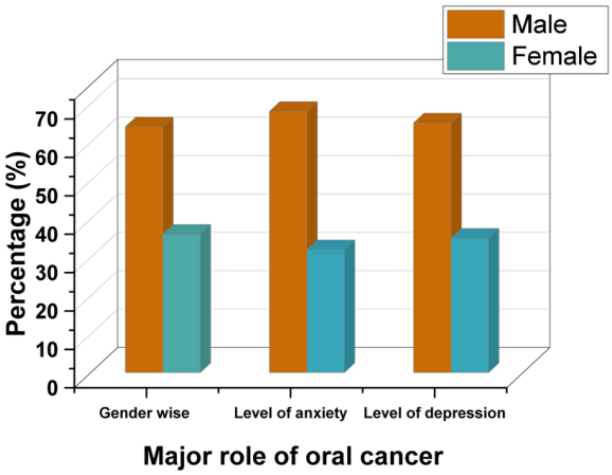


Figure 6. Comparing the role of oral cancer.

Table 3. Estimates of depressed and anxious symptoms in psychosocial factors.

Psychosocial factors	Depressive symptoms				Anxiety symptoms			
	Female	Male	*Z/t*	*p*	Female	Male	*Z/t*	*p*
Social support	60.00	69.80	−5.247	0.004	59.21	64.02	−5.243	0.005
Stigma	52.00	34.90	7.382	0.000	59.20	41.05	6.978	0.000
Optimism	17.00	19.50	−5.525	0.003	17.25	14.20	−5.685	0.001
Self-efficacy	23.86 ± 5.24	30.01 ± 3.25	−7.471	0.001	21.27 ± 2.89	24.92 ± 4.09	−5.658	0.004
Perceived stress	20.2	15.20	8.321	0.004	20.15	15.00	7.256	0.002
Hope	37.02	30	−6.393	0.002	35.95	38.25	−5.588	0.004

4.3. Discussion

The results might be affected by selection bias in addition to the previously mentioned limitations since patients who rejected to participate and those with inadequate clinical data could have been excluded. The participants may not accurately represent the general population of oral cancer patients with different stages and features, the limitation could affect the broader of the findings. The drawback includes a limited sample size, an emphasis on advanced oral cancer requiring reconstructing after resection, and the absence of an evaluation of oral function.

Reduced oral function is linked to advanced cancers, and this might result in anxiety and sadness. Patients with early-stage oral cancer tend to respond improved to therapy and experience less severe functional impairment after surgery. Depression affects 3 to 12% of cancer patients and greater than 15% of those with neck and head cancer. There was no discernible improvement in ADS scores from 8-month postoperative period, and patients with advanced oral cancer had a higher risk of adjustment disorder up to 12 months postoperatively. Nonetheless, individuals from the preoperative to the 4-month postoperative period had a greater incidence of adjustment disorder or worse, which may indicate more severe mental symptoms throughout therapy. Age has a negative correlation with ADS; women and people in their 40s and 50s are more likely to experience depression. There is no correlation between a decreased risk of depression and male patients. The smoking status at the start of therapy and the success rates of quitting were not examined in this research. It is important to carefully consider how smoking affects the ADS score since smokers who have cancer have reported higher levels of stress and psychological distress than non-smokers.

5. Conclusion

In research involving 100 patients with oral cancer, it was determined that the arrangement of psychological analysis with borderline mandible resection enhanced the patients' common and mental health. The sample consisted of 55 individuals with oral cancer who, between March 2020 and April 2023, had borderline mandible resection at various healthcare facilities. Individuals who refused to participate or had insufficient clinical data were eliminated, and adequate clinical data was a requirement for inclusion. According to the research, female patients had superior levels of social maintenance and self-efficacy, whereas male patients had privileged levels of depressive indication, disgrace, and apparent anxiety. The findings show that treating oral cancer with a combination of borderline mandible elimination and psychological therapy yields better results, and emphasizes the significance of psychosocial treatments in cancer concern. This inclusive approach enhances patients' overall well-being and mental health in accumulation to indulge in the medical components of cancer. Even after adjusting for clinical features, anxiety, and depressed symptoms were significantly and favorably correlated with apparent stress and widespread isolation brought by stigma. Positive anticipation and probability constituents of anticipation were adversely and substantially related to depressed symptoms, whereas optimism was negatively and strongly connected with anxious symptoms. Self-efficacy and perceived social support, however, did not significantly correlate with symptoms of depression. Perceived social support, self-efficacy, and depressive symptoms do not significantly correlate. This might be because some characteristics, such as self-efficacy, do not directly affect emotional well-being, and the quality of support received could fail to account for these aspects. The degree of perceived stress and social isolation due to stigma were the common forecasters of nervousness and sadness symptoms for individuals with oral cancer. Furthermore, optimism was associated with anxious symptoms and depressive symptoms separately.

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Availability of data and materials: The data used are not publicly available due to privacy and confidentiality concerns. The data contain sensitive information that could potentially identify individuals or institutions involved in the study. Requests for data access may be considered on a case-by-case basis, subject to appropriate ethical and legal approvals.

Ethical approval: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of Suining Central Hospital (protocol code 2020010023). The date of approval is 3 February 2020.

Informed consent statement: Informed consent was obtained from all subjects involved in the study.

Conflict of interest: The authors declare no conflict of interest.

References

1. Mahajan A, Agarwal U, PG N, et al. Imaging Recommendations for Diagnosis, Staging, and Management of Oral Cancer. Indian Journal of Medical and Paediatric Oncology. 2023; 44(02): 150–158. doi: 10.1055/s-0042-1760314
2. Warnakulasuriya S, Kujan O, Aguirre-Urizar JM, et al. Oral potentially malignant disorders: A consensus report from an international seminar on nomenclature and classification, convened by the WHO Collaborating Centre for Oral Cancer. Oral Diseases. 2020; 27(8): 1862–1880. doi: 10.1111/odi.13704
3. Friedlander AH, Rosenbluth SC, Rubin RT. The Adult Suicide-Prone Patient: A Review of the Medical Literature and Implications for Oral and Maxillofacial Surgeons. Journal of Oral and Maxillofacial Surgery. 2012; 70(5): 1253–1260. doi: 10.1016/j.joms.2011.02.024
4. Tuominen H, Rautava J. Oral microbiota and cancer development. Pathobiology. 2021; 88(2): 116–126. doi: 10.1159/00050979
5. Cruz Tapia RO, Peraza Labrador AJ, Guimaraes DM, et al. Oral mucosal lesions in patients with SARS-CoV-2 infection. Report of four cases. Are they a true sign of COVID-19 disease? Special Care in Dentistry. 2020; 40(6): 555–560. doi: 10.1111/scd.12520
6. Famuyide A, Massoud TF, Moonis G. Oral Cavity and Salivary Glands Anatomy. Neuroimaging Clinics of North America. 2022; 32(4): 777–790. doi: 10.1016/j.nic.2022.07.021
7. Lev D, Artzi Z. The Anatomy of the Maxilla and the Mandible: Related Structures and Inserted Muscles. In: Artzi Z (editor). Bone Augmentation by Anatomical Region: Techniques and Decision-Making. John Wiley & Sons; 2020. pp. 1–16.
8. Swain SK. Premalignant lesions of the oral cavity: current perspectives. International Journal of Research in Medical Sciences. 2021; 9(6): 1816. doi: 10.18203/2320-6012.ijrms20212259
9. Wu JH, Zhou Y, Luo XY. Role of narrow band imaging in the diagnosis of premalignant and malignant lesions of the oral cavity. Chinese Journal of Otorhinolaryngology Head and Neck Surgery. 2020; 55(2): 104–108. doi: 10.3760/cma.j.issn.1673-0860.2020.02.005

10. Bugshan A, Farooq I. Oral squamous cell carcinoma: metastasis potentially associated malignant disorders, etiology and recent advancements in diagnosis. F1000Research. 2020; 9: 229. doi: 10.12688/f1000research.22941.1
11. Morikawa T, Kozakai A, Kosugi A, et al. Image processing analysis of oral cancer, oral potentially malignant disorders, and other oral diseases using optical instruments. International journal of oral and maxillofacial surgery. 2020; 49(4): 515–521. doi: 10.1016/j.ijom.2019.08.016
12. Alzahrani R, Obaid A, Al-Hakami H, et al. Locally advanced oral cavity cancers: what is the optimal care? Cancer Control. 2020; 27(1). doi: 10.1177/1073274820920727
13. Gameeva EV. Prospects for the use of additional oral nutrition (siping) in nutritional support of cancer patients. Research and Practical Medicine Journal. 2020; 7(3): 136–145. doi: 10.17709/2409-2231-2020-7-3-14
14. Ünsal G, Chaurasia A, Akkaya N, et al. Deep convolutional neural network algorithm for the automatic segmentation of oral potentially malignant disorders and oral cancers. Journal of Engineering in Medicine. 2023; 237(6): 719–726. doi: 10.1177/09544119231176116
15. Borse V, Konwar AN, Buragohain P. Oral cancer diagnosis and perspectives in India. Sensors International. 2020; 1: 100046. doi: 10.1016/j.sintl.2020.100046
16. Moratin J, Mrosek J, Horn D, et al. Full-Thickness Tumor Resection of Oral Cancer Involving the Facial Skin—Microsurgical Reconstruction of Extensive Defects after Radical Treatment of Advanced Squamous Cell Carcinoma. Cancers. 2021; 13(9): 2122. doi: 10.3390/cancers13092122
17. Linares MF, Lopes SMP, Moreira AEB, et al. Active search screening for oral potentially malignant disorders and oral cancer in the city of Piracicaba. Brazilian Oral Research. 2023; 37. doi: 10.1590/1807-3107bor-2023.vol37.0015
18. Simpson CA, Adler C, du Plessis MR, et al. Oral microbiome composition, but not diversity, is associated with adolescent anxiety and depression symptoms. Physiology & Behavior. 2020; 226: 113126. doi: 10.1016/j.physbeh.2020.113126
19. Nuszkiewicz J, Czuczejko J, Maruszak M, et al. Parameters of Oxidative Stress, Vitamin D, Osteopontin, and Melatonin in Patients with Lip, Oral Cavity, and Pharyngeal Cancer. Oxidative Medicine and Cellular Longevity. 2021; 2021(1). doi: 10.1155/2021/2364931
20. Wang L, Dong Q, Ye M, et al. Effect of Different Repair and Reconstruction Methods Combined with Psychological Intervention on Quality of Life and Negative Emotion in Patients with Oral Cancer. Computational and Mathematical Methods in Medicine. 2022; 2022: 1–6. doi: 10.1155/2022/7359584
21. Matsuda Y, Jayasinghe RD, Zhong H, et al. Oral health management and rehabilitation for patients with Oral Cancer: a narrative review. Healthcare. 2022; 10(5): 960. doi: 10.3390/healthcare10050960
22. Gasparro R, Calabria E, Coppola N, et al. Sleep Disorders and Psychological Profile in Oral Cancer Survivors: A Case-Control Clinical Study. Cancers. 2021; 13(8): 1855. doi: 10.3390/cancers13081855
23. Zheng K, Liao Z, Yoda N, et al. Investigation on masticatory muscular functionality following oral reconstruction—An inverse identification approach. Journal of Biomechanics. 2019; 90: 1–8. doi: 10.1016/j.jbiomech.2019.04.007
24. de Groot RJ, Wetzels J, Merkx MAW, et al. Masticatory function and related factors after oral oncological treatment: A 5-year prospective study. Head & Neck. 2018; 41(1): 216–224. doi: 10.1002/hed.25445
25. Aoki T, Kudo M, Endo M, et al. Inter-rater reliability of the Oral Assessment Guide for oral cancer patients between nurses and dental hygienists: the difficulties in objectively assessing oral health. Supportive Care in Cancer. 2018; 27(5): 1673–1677. doi: 10.1007/s00520-018-4412-x
26. Song YL, Yap AU. Orthognathic treatment of dentofacial disharmonies: its impact on temporomandibular disorders, quality of life, and psychosocial wellness. Cranio-the Journal of Craniomandibular Practice. 2017; 35(1): 52–57. doi: 10.1080/08869634.2016.1147676

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Article

The effect of acceptance and commitment therapy nursing intervention on the psychological and mental state of patients with advanced cancer

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Abstract: Introduction: To investigate the effect of a nursing intervention with Acceptance and Commitment Therapy (ACT) on the improvement of psychological and mental state in patients with advanced cancer. **Method:** A total of 93 patients with advanced cancer who were admitted to the hospital from March 2022 to May 2024 were selected as the study sample and randomly divided into two groups. These patients were subsequently categorized into two distinct groups, employing a rigorous random grouping methodology. Specifically, the control group comprised 46 patients who underwent the standard nursing intervention. Conversely, the observation group, consisting of 47 patients, was administered ACT while adhering to the established standards of the control group. A comparison was conducted between the two groups, focusing on the disparities in mental state measured by the Hope Index Scale (HHI), psychological distress evaluated by the Functional Assessment of Chronic Disease Treatment-Spirituality Scale (FACIT-Sp), anxiety levels assessed through the Anxiety Self-Rating Scale (SAS), depression scores determined using the Depression Self-Rating Scale (SDS), and the quality of life indices calculated based on the Quality of Life Measurement Scale for Cancer Patients (FACT). **Result:** The scores of realistic and future positive attitudes [(11.82 ± 2.26) points], positive actions [(12.46 ± 1.95) points] and maintaining intimate relationships with others [(11.67 ± 1.28) points] in the HHI scale scores in the observation group were higher than those in the control group ($P < 0.05$). After intervention, the SAS scale score [(56.91 ± 3.23) points] and SDS scale score [(56.53 ± 4.41) points] of the patients in the observation group were significantly lower than those in the control group ($P < 0.05$). After the intervention, the FACIT-Sp score of the observation group significantly increased to (122.99 ± 13.02), demonstrating a statistically significant elevation compared to the control group ($P < 0.05$). Furthermore, the scores pertaining to physiological status within the observation group in the FACT scale were elevated to (20.84 ± 3.72), (19.21 ± 3.06), (21.34 ± 3.85), and (18.04 ± 3.22), respectively, all of which were notably higher than those observed in the control group ($P < 0.05$). **Conclusion:** ACT nursing intervention in patients with advanced cancer has significant effects, increasing the level of hope, reducing negative emotions and psychological distress, and improving quality of life.

Keywords: acceptance of commitment therapy; patients with advanced cancer; psychopsychiatric state

1. Introduction

Advances in medical technology have enabled the cure of many diseases, and people's confidence in hospitals has increased. Once the disease occurs, almost the entire process of disease development is in the hospital. However, there are some diseases that are still not curable, such as cancer. According to data published by the World Health Organization (WHO) in 2020 at the International Agency for Research on Cancer (IARC), In 2020, China reported a total of 4.57 million new cancer cases, about 23.7% of the world's; there are 3 million deaths, accounting for about 30% of

the world's deaths [1]. Among them, the incidence of cancer is higher in men than in women, higher in urban areas than in rural areas, and the mortality rate of the elderly population of 60~79 is the highest, and cancer has become one of the main diseases that threaten the health of Chinese residents. It is reported that China's elderly population is expected to rise to 327 million by 2035, accounting for 21.8% of the world's elderly [2]. Miao Xinlei and other scholars collected the relevant data of malignant tumor patients in Shaanxi Province from 1 January to 31 December 2019, and found that the prevalence of malignant tumors among residents in Shaanxi Province in 2019 was 392.38/100,000, and the age-specific standardized malignant tumor prevalence rate of residents aged 65~69 was the highest (62.89/100,000) [3]. In addition, according to the statistics of the National Cancer Center in 2022, there are about 828,100 new cases of lung cancer and about 657,000 deaths in China every year, with a mortality rate of 79.33% [4]. Based on a comprehensive survey, the five-year relative survival rate for all cancer patients in China stands at a mere 30.9%. Notably, there persists a significant disparity in the survival rates of cancer patients in China, compared to those in developed nations [5]. This data fully shows that the actual burden of cancer in China is quite heavy, and it is showing a continuous increasing trend, and the situation is becoming more and more severe. In the initial stages of cancer, detection remains challenging due to the symptoms being mild. Consequently, by the time patients seek medical attention for these symptoms, the disease has often progressed to a later stage. For patients with cancer, the level of suffering increases progressively as the disease progresses. Cancer not only has a very high proliferation rate but also has significant metastasis, which can easily lead to a series of other complications. Once the tumor has metastasized to a large area, surgical treatment is usually no longer appropriate. Clinically, the management of patients with advanced cancer primarily consists of chemotherapy, targeted therapy, immunotherapy, and various other modalities. However, the challenges associated with such treatments are immense, and the duration of the treatment process is often protracted [6–8]. Studies have shown that patients with advanced cancer generally have a deep fear of cancer recurrence after a series of treatments, and their quality of life is generally low, and follow-up results are not satisfactory [9]. Because many patients with advanced cancer have to face the grim reality that the disease is incurable, and the end of life is unpredictable, deep fear and anxiety often arise in the hearts of individuals [10]. In addition, most patients suffer from symptoms such as pain, fatigue, and anorexia, as well as increased economic burden and various unmet social support needs, which aggravate the negative emotions of patients and cause psychological distress [11]. Patients with advanced cancer who have been treated for a long time and whose condition continues to deteriorate will show a negative change in their attitude towards treatment and life. The loss of control over life, feelings of hopelessness, helplessness, worthlessness, and loss of meaning in life can lead to mental pain and existential pain, and the closer to death, the greater the need for spiritual support [12,13]. For cancer patients at the end of life, they often have a deeper perception of the threat of death, and it is difficult to strike a balance between survival and death, and there is a desire to accelerate death, increasing the risk of suicide. According to statistics, 6.67%~23.8% of patients with advanced cancer have a strong desire to die, which reduces the survival period of patients [14].

The psychological well-being and mental status of individuals diagnosed with terminal cancer hold a significant correlation with their overall quality of life and duration of survival, so it is necessary to adopt a series of scientific and effective nursing interventions to alleviate and improve their adverse psychological and mental conditions. The conventional model of care is limited to simply giving the patient technical operations and does not pay attention to the psychological and mental pain of the patient. Acceptance Commitment Therapy (ACT) is a unique, experience-based psychological intervention that uses acceptance and mindfulness strategies, complemented by commitment and behavior change strategies, to improve the psychological flexibility of individuals [15]. Psychological flexibility refers to an individual's comprehensive and in-depth perception of the current situation while remaining conscious, and based on interaction and adaptation to the surrounding environment, adhering to the chosen values and flexibly adjusting their behavior to adapt to the changing environment [16]. ACT was clearly proposed by the American therapist Steven C. Hayes in the 90s of the 20th century as one of the most distinctive empirical behavioral therapy methods in the "third wave" of cognitive behavioral therapy. ACT therapy advocates that patients should accept the objective fact that stressful and shocking external environments and internal negative emotions will inevitably recur at all stages of life. A reasonable coping strategy for such phenomena is not to try to confront, reject, or expel these negative thoughts, emotions, and feelings, but to focus on identifying and upholding our values, while pursuing and fulfilling their life values with all our might [17]. At present, ACT is widely used in psychological intervention for clinical patients. According to the research conducted by Zu Zeyuan and other scholars, the use of ACT therapy to treat mothers of children with autism can significantly help them cope with various emotional distress in the process of parenting and maintain a positive psychological state [18]. In addition, the therapy also encourages mothers to face their own and their children's problems and difficulties in life with a more accepting attitude and realize the transformation from excessive attention to children to balanced care for themselves and other family members so as to bring long-term quality of life improvement to mothers of autistic children. At the same time, acceptance and commitment therapy has shown significant effects in improving stoma acceptance and psychosocial adjustment in colorectal cancer patients with enterostomy [19]. Liu Yan et al. systematically evaluated the intervention effect of ACT on psychological flexibility, anxiety and quality of life of cancer patients through meta-analysis, and the results showed that ACT intervention could improve the psychological flexibility of cancer patients, reduce anxiety, and improve the quality of life [20]. Based on the aforementioned, the present study primarily aimed to observe and comprehensively analyze the impact of acceptance commitment therapy nursing intervention on enhancing the psychological and mental well-being of patients diagnosed with advanced cancer. This objective was pursued with the intention of mitigating the overall suffering experienced by these patients.

2. Materials and methods

2.1. Participants

The study included 93 patients with advanced cancer, who were divided into two

groups for a controlled trial according to the random number table method. In the control group, a total of 46 patients were enrolled, comprising 25 males and 21 females. The age range of these patients spanned from 50 to 77 years old, with the mean age being (62.82 ± 5.33) years; clinically, the patient's condition occurred for 2~11 years, and the average age was (5.06 ± 1.08) years. The BMI index of the patients was 18~27 kg/m^2, and the average BMI was (22.51 ± 1.08) kg/m^2, and the clinical data showed that there were 10 cases of lung cancer, 8 cases of breast cancer, 11 cases of prostate cancer, 8 cases of colon cancer and 9 cases of hepatocarcinoma. All patients in the group received routine nursing interventions. There were 47 patients in the observation group, including 26 males and 21 females, with an average age of (67.44 ± 5.21) years. Clinically, the patient's condition occurred for 3~12 years, and the average age was (6.05 ± 1.21) years. The BMI index of the patients was 19~27 kg/m^2, the average BMI was (23.65 ± 1.37) kg/m^2, and the clinical data showed that there were 15 cases of prostate cancer, 9 cases of lung cancer, 11 cases of breast cancer, 5 cases of colon cancer and 7 cases of hepatocarcinoma. The patients in the group were treated with acceptance commitment therapy for nursing intervention. The study was conducted between March 2022 and May 2024.

The inclusion criteria of the study are the cancer stage is stage III~IV, and the survival period is more than 6 months, and the patients and their respective families have provided informed consent for this experimental study. The exclusion criteria encompassed individuals diagnosed with coagulopathy patients, those suffering from severe psychological conditions or possessing a history of psychiatric illness, patients demonstrating limited experimental cooperation, as well as those unable to participate in experimental investigations.

2.2. Measures

The patients in the control group were given routine nursing, mainly (1) psychological support. When informing the patient's condition, it is necessary to impart anti-cancer knowledge step by step and enhance the patient's self-awareness and coping ability. At the same time, family members are encouraged to support the patient and build confidence. Soft music is played in the ward to relieve tension and fatigue. Divert attention from the disease through movies, books, etc. Create a relaxing atmosphere and reduce psychological stress. Medical staff listen to the patient's voice and accompany and support him. Patients are advised to be exposed to positive information, to respond positively to challenges, and to resist negative emotions. (2) Exercise activities for the patient. Patients are encouraged to take regular outdoor walks to get some fresh air and promote physical and mental health. Assist patients in choosing suitable and long-lasting exercise programs and develop exercise habits. Urge patients to do functional exercises to improve physical function. Pay attention to the amount of exercise should be gradual and avoid overexertion. Assist patients to participate in group sports to encourage each other and increase their confidence. In case of abnormalities, you should take a break immediately and consult a doctor if necessary. (3) Daily care. During chemotherapy, patients are more likely to have adverse reactions such as phlebitis, itchy skin, and numbness at the fingertips. Therefore, it is important to pay attention to hand hygiene to avoid skin damage. In

the event that you are experiencing feverish symptoms, it is advisable to promptly consult with a qualified medical professional. In addition, if you have fever, chills, sweating, cough, shortness of breath, nasal congestion and diarrhea, you should also seek medical attention in time to prevent further aggravation of infection. At the same time, ensure adequate sleep and nourish your spirits. In addition, the patient can be massaged and touched to relax the patient's muscles, relieve the patient's fatigue and prevent muscle atrophy.

Table 1 demonstrates the nursing intervention involving acceptance commitment therapy within the observation group.

Table 1. The specific content of acceptance of commitment therapy for patients with advanced cancer.

Content	Method
Accept yourself	Each patient is communicated with individually, the specific condition of the patient's body is explained, and the causes of the disease, the possible progression, the specific treatment, and the complications that will occur in the treatment are explained to the patient so that the patient can have a sufficient understanding of his current condition and future situation. It also uses the method of listing celebrity role models and sharing inspirational stories to motivate patients with terminal cancer to face their past and current circumstances positively. By guiding them to look back on their past experiences of overcoming difficulties, it helps patients to accept the reality of physical changes and further enhance their courage and inner motivation to overcome their illness.
Cognitive dissociation	To gain insight into the extent to which patients are worried about their current health conditions, as well as their emotional responses such as low self-esteem, anxiety and fear, and to deeply analyze the actual impairments of the patient's physical function reflected behind these negative emotions. Instruct patients to look at their own condition rationally, help them free themselves from excessive negative thoughts, and realize that these emotions are often over-amplified by fear of the disease, rather than negative conditions, so as to face their health status more objectively.
Focus on the present	It is strongly recommended that patients carefully observe the current situation and their inner psychological dynamics, and guide them to face the disease with a positive and optimistic attitude. Patients are encouraged to experience the inner world of the moment and the support and love from relatives and medical staff in a non-evaluative way. At the same time, patients are instructed to learn and practice meditation training, relaxation therapy, etc., and improve the ability to concentrate and focus on effective practice methods.
Contextualize yourself	Instruct the patient to focus on a clear goal. Through the use of metaphors, patients are helped to deeply understand the essential difference between the conceptual self and the real observational self. It is important that the patient realistically observe that the role of the individual remains the same in all situations, whether in the family as a father or mother, or in society as a real and ordinary individual.
Clarify values	During the intervention, patients are always stressed that although cancer is a disease that requires long-term treatment, patients still have social, family and personal values that cannot be ignored. It is committed to guiding patients to actively explore and clarify the future direction of life, helping them deeply understand the value and meaning of life, so as to adjust their mentality, face the disease with a positive and optimistic attitude, and overcome the disease together.
Committed actions	Gain an in-depth understanding of the patient's life wishes, and assist the patient in setting clear goals in the short, medium and long term according to their actual situation. We also actively support patients to achieve these goals, ensure that the goals and actions are effectively implemented, enhance patients' sense of fulfillment and achievement, realize self-worth, and improve their quality of life.

A 5-part scale was used during the course of the study.

The HHI scale [21] (3 dimensions) includes positive attitudes towards reality and the future, taking positive actions, and maintaining intimate relationships with others; the total score range set for each item is 1~48 points. According to the established scoring criterion, individuals who attain a score within the range of 1 to 23 are categorized as having a low level of performance. Conversely, those who secure scores between 24 and 35 are deemed to possess a moderate level of proficiency. Lastly, individuals who achieve scores ranging from 36 to 48 are recognized as demonstrating a high level of competency. It is crucial to observe that as the score rises, there may be a commensurate upward trend in the individual's expectation.

SAS scale and SDS scale [22] (20 items), each score range is 1~4 points, and the total score is 80 points. According to the score results, if the total score is less than 53 points, it indicates that the patient's mood is in a normal state; a total score of 53 or more indicates that the patient may have symptoms of anxiety or depression and requires further attention and evaluation.

FACIT-Sp scale [23] (7 dimensions), with a total score of 156 points. The score was positively correlated with the patient's physical-psychosocial-spiritual level.

The FACT scale [24] consists of four dimensions with a total score of 108, where a higher numerical value signifies a superior quality of life.

2.3. Statistical analysis

All data were statistically analyzed using SPSS 22.0 software; quantitative variables were described as mean and standard deviation, qualitative variables were described as numbers and percentages, and comparisons between groups were tested by χ^2. $P < 0.05$ was statistically significant.

3. Results

3.1. Hope index

As shown in **Table 2**, the findings indicated that the scores of the observation group were consistently lower in comparison to those of the control group ($P < 0.05$). In the post-intervention assessment of the observation group, the positive attitude score of the present and future was (11.82 ± 2.26), indicating that the test subjects had a moderate positive attitude towards it. In terms of taking positive action, the score reached (12.46 ± 1.95), reflecting the medium mobility of the respondents; in terms of maintaining intimacy with others, the score was (11.67 ± 1.28), all of which were in the range of 24~35 points, which belonged to the middle level. Overall, the total score of the observation group was between the medium level, showing a certain intervention effect.

Table 2. The results of HHI scale before and after the study in the two groups ($\bar{x} \pm s$ scores).

Constituencies	Number of examples	Positive attitude towards the present and the future		Take positive action		Maintain intimacy with others	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
Control group	46	5.06 ± 0.24	8.01 ± 1.34	5.13 ± 0.34	8.24 ± 1.55	5.07 ± 0.26	8.38 ± 1.26
Observation group	47	5.22 ± 0.01	11.82 ± 2.26	5.09 ± 0.41	12.46 ± 1.95	5.11 ± 0.41	11.67 ± 1.28
t-value		1.421	8.511	1.544	5.241	1.047	6.417
P-value		0.604	0.008	0.275	0.037	0.164	0.002

3.2. Psychological anguish, anxiety, depression

As shown in **Table 3**, the results showed that after the intervention, the average SAS scale score of the patients in the observation group was (56.91 ± 3.23) points, the average SDS scale score was (56.53 ± 4.41) points, and the average FACIT-SP scale score was (122.99 ± 13.02) points. Compared with the control group, the observation

group showed superior performance in various scales ($P < 0.05$).

Table 3. Comparison of SAS, SDS and FACIT-Sp scale scores between the two groups ($\bar{x} \pm s$ scores).

Constituencies	Number of examples	SAS		SDS		FACIT-Sp	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
Control group	46	63.21 ± 5.43	50.01 ± 3.26	67.04 ± 5.13	51.96 ± 3.82	85.13 ± 5.85	115.04 ± 10.32
Observation group	47	63.82 ± 5.17	56.91 ± 3.23	66.86 ± 5.15	56.53 ± 4.41	85.26 ± 5.44	122.99 ± 13.02
t-value		0.502	6.714	0.546	6.031	0.243	8.137
P-value		0.634	0.001	0.415	0.007	0.314	0.001

3.3. Quality of life

As shown in **Table 4**, the results showed that the physiological status of the patients in the observation group was (20.84 ± 3.72), social/family status (19.21 ± 3.06), emotional status ± (21.343.85) and functional status (18.04 ± 3.22) points after intervention, which were higher than those in the control group ($P < 0.05$).

4. Discussion

Patients with advanced cancer often experience multiple symptoms of discomfort, such as deterioration of their condition, cancer recurrence and metastasis, adverse drug reactions, and multi-organ failure, and are often plagued by a variety of uncomfortable symptoms, such as pain, fatigue, gastrointestinal problems, and sleep disturbances, which seriously impair the quality of life and functional status of patients [25]. In addition, the psychological stress caused by cancer often leads to a continuous decrease in the degree of cooperation with treatment, or even a refusal of treatment, which not only accelerates the deterioration of the disease, but also further increases the complexity and difficulty of treatment [26]. For patients who are nearing the end of their lives, when they lose the chance of curing cancer, the primary goal of treatment is no longer to pursue an active cure of the disease, but to turn to effective nursing intervention for various symptoms in order to alleviate the psychological and physical pain of patients and try their best to improve their quality of life. In this process, nurses are the core members of the palliative care multidisciplinary team, and they play a pivotal role in symptom control and comfort care for cancer patients. The nursing intervention model with nurses as the main body also has important value in the progression of advanced cancer patients and the evolution of their psychological state [27].

People generally regard patients with advanced cancer as the end of their lives and thus lose hope and expectation for treatment and life. However, for patients with advanced cancer, the importance of hope cannot be overlooked. Studies have shown that closely linking hope to patients' mental and socio-psychological well-being can exert a direct and salutary influence on individuals' physical health and overall quality of life [28]. In this comprehensive study, the outcomes pertaining to the nursing intervention utilizing acceptance commitment therapy among patients with advanced cancer revealed that following the intervention, the observation group exhibited higher

levels of positive attitudes, proactive behaviors, and strengthened interpersonal relationships as measured by the HHI scale. Notably, the scores observed in these domains progressed from low to medium, indicating a significant improvement compared to the control group ($P < 0.05$), indicating that ACT can improve the hope level of patients with advanced cancer, thereby improving the quality of life of patients. Studies have shown that providing prognostic information to patients and their caregivers at the end of life may be of greater significance than simply identifying the present outlook [29]. In the process of receiving Commitment Therapy care, we are committed to providing patients with a comprehensive and in-depth understanding of their own conditions and providing them with accurate and effective information support. At the same time, by using the enumeration method, we actively stimulate and enhance the hope and expectation of patients for life and help them face the disease with a more positive and optimistic attitude.

Table 4. Comparison of scores of each dimension of the FACT scale between the two groups ($\bar{x} \pm s$ scores).

Constituencies	Number of examples	Physiological condition		Social/family status		Emotional status		Functional status	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
Control group	46	13.21 ± 3.42	17.22 ± 3.51	11.06 ± 2.17	14.99 ± 3.24	11.83 ± 2.71	19.14 ± 3.66	12.68 ± 2.16	15.91 ± 3.27
Observation group	47	13.38 ± 3.35	20.84 ± 3.72	11.29 ± 2.09	19.21 ± 3.06	12.01 ± 2.63	21.34 ± 3.85	12.54 ± 2.39	18.04 ± 3.22
t-value		0.582	4.286	0.692	6.198	0.814	6.278	0.934	6.094
P-value		0.371	0.002	0.419	0.001	0.249	0.003	0.452	0.025

After the intervention, the observation group exhibited significantly superior SAS, SDS, and FACIT-Sp scores compared to the control group in this study ($P < 0.05$). This indicates that the nursing intervention employing Acceptance Commitment Therapy demonstrates significant efficacy in alleviating patients' negative emotions and psychological distress, thereby corroborating the findings of Eman Abdeen Ali's research [30]. ACT nursing interventions aim to eliminate the individual's preconceived cognitive biases through the key aspects of acceptance, cognitive dissociation, and experiencing the present moment, so that patients can fully feel and value the positive elements of their current life. This process helps to stimulate the patient's inner sense of change, prompting him to build a value system that meets his or her physical and psychological needs with a more positive and proactive attitude, and improve the patient's psychological resilience. In addition, in cancer patients treated with ACT, the expression levels of pro-inflammatory factors NF-kB and GATA family transcription factors were down-regulated, and the activity of interferon response factors was significantly enhanced, resulting in effective alleviation of inflammatory responses in patients [31]. This change can help significantly reduce the psychological stress of patients and improve their overall quality of life. In this research, the patients in the observation group exhibited higher scores in terms of physiological status, social/family status, emotional status, and functional status compared to those in the control group ($P < 0.05$). After the acceptance of the individual's condition and cognitive dissociation, the ACT nursing intervention emphasizes focusing on the current life situation, clarifying future life goals, and

affirming self-worth. This series of interventions can help patients effectively eliminate negative emotions such as anxiety and depression, and significantly reduce the psychological burden caused by the disease [32]. On the basis of a clear personal situation, patients are able to take targeted actions to achieve a significant improvement in quality of life [33].

This study has the following limitations that require attention. First of all, this study is a single-center study and the sample size is relatively small, which weakens the statistical power of the detection effect to a certain extent, which may affect the accuracy and reliability of the results. Second, the recruitment of participants in this study was confined solely to a single hospital, thereby constraining the extent of the findings' generalizability and applicability. Consequently, it poses challenges in extrapolating the results to a broader array of populations and diverse contexts. Finally, the scale scores used in this study are all self-rating scales, and the limitation of patients' self-perception may lead to certain subjectivity and bias in the scoring results, which also affects the objectivity and accuracy of the results.

5. Conclusion

In this study, the nursing intervention of acceptance commitment therapy was adopted in patients with advanced cancer to explore the effect of improving their psychological and mental state. The findings revealed that the implementation of nursing intervention had a substantial impact on enhancing the patients' sense of hope, alleviating negative emotions and psychological burden, and notably elevating their overall quality of life. Based on this study, it is expected to further explore whether acceptance-commitment therapy can also show similar care effects in patients with early-to-mid-stage cancer who are in a better psychological state.

Ethical approval: The study was conducted in accordance with the Declaration of Helsinki, and approved by Quanzhou First Hospital Ethics Review Committee (NO: 2022033, 2022.3–2024.5).

Informed consent statement: Informed consent was obtained from all subjects involved in the study.

Conflict of interest: The author declares no conflict of interest.

References

1. Wang H, Gou J, Tao L. Research progress on personal resilience and family resilience of cancer patients and caregivers at home and abroad. Sichuan Medicine. 2023; 44(04): 418–422.
2. Zhang Y. In the era of negative population growth, a policy system that actively responds to aging. Social Sciences Abstracts. 2023; (07): 11–13.
3. Miao X, Tang G, Ren L, et al. Analysis of the prevalence of malignant tumors among residents in Shaanxi Province in 2019. Chinese Journal of Public Health. 2023; 39(10): 1321–1326.
4. Zhao X, He G. 2022 National Cancer Center National Tumor Imaging Conference Minutes. Magnetic Resonance Imaging. 2022; 13(12): 4.
5. Zeng H, Chen W, Zheng R, et al. Changing cancer survival in China during 2003-15: A pooled analysis of 17 population-based cancer registries. Lancet Glob Health. 2018; 6(5): e555–e567.

6. Liu J, Dong L, Yang Z, et al. Prediction of lymph node metastasis after neoadjuvant chemotherapy by multiparametric MRI radiomics features of pre-treatment multiparametric MRI radiomics in patients with advanced cervical squamous cell carcinoma. Magnetic Resonance Imaging; 2024.
7. Liu Y, Dong X, Zhou C, et al. Mechanism of action and application of targeted short peptide drugs in pancreatic cancer. Advances in Biochemistry and Biophysics; 2024.
8. Tang Y, Hu X, Chao Z, et al. The role of CARM1 in malignant tumors and the research progress of targeted therapy. China Oncology; 2024.
9. Zhao M, He F, Ma X, et al. Fear of cancer recurrence after chemotherapy in patients with advanced gastric cancer and its impact on quality of life and follow-up outcomes. Chinese Journal of Social Medicine. 2023; 40(02): 192–195.
10. Liu H, Liu C, Wu X, et al. Research progress on death anxiety in patients with advanced cancer. Nursing Research. 2023; 37(09): 1606–1611.
11. Madsen R, Uhrenfeldt L, Birkelund R. Transition experiences during courses of incurable cancer from the perspective of patients. Eur J Oncol Nurs. 2019; 38(2): 13–20.
12. Soleimani MA, Bahrami N, Allen KA, et al. Death anxiety in patients with cancer: A systematic review and meta-analysis. European Journal of Oncology Nursing. 2020; 48: 101803. doi: 10.1016/j.ejon.2020.101803
13. Chen W, Chen Y, Xiao H. Existential Distress in Cancer Patients. Cancer Nursing. 2022; 45(2): E471–E486. doi: 10.1097/ncc.0000000000000925
14. de Vries E, Leal Arenas FA, van der Heide A, et al. Medical decisions concerning the end of life for cancer patients in three Colombian hospitals—a survey study. BMC Palliative Care. 2021; 20(1). doi: 10.1186/s12904-021-00853-9
15. Wang Y. Advances in the application of acceptance and commitment therapy in patients with advanced cancer. Journal of Clinical Nursing. 2022; 21(05): 66–69.
16. Macri JA, Rogge RD. Examining domains of psychological flexibility and inflexibility as treatment mechanisms in acceptance and commitment therapy: A comprehensive systematic and meta-analytic review. Clin Psychol Rev. 2024; 110: 102432.
17. Levin ME, Krafft J, Twohig MP. An Overview of Research on Acceptance and Commitment Therapy. Psychiatric Clinics of North America. 2024; 47(2): 419–431. doi: 10.1016/j.psc.2024.02.007
18. Zu Z, Fang M, Wu S, et al. Acceptance Commitment Therapy on the Improvement of Emotions, Cognition and Behavior of Mothers of Children with Autism: Based on Interpretive Phenomenology. Chinese Journal of Clinical Psychology. 2023; 31(06): 1500–1509.
19. Wang B, Zhang W, Chen X, et al. Effect of acceptance and commitment therapy on ostomy acceptance and psychosocial adjustment in patients with permanent enterostomy. Journal of Nursing. 2021; 28(20): 68–73.
20. Liu Y, Lv M, Zhang A. Meta-analysis of the effect of acceptance-commitment therapy on psychological flexibility in cancer patients. Chinese Journal of Mental Health. 2021; 35(08): 657–663.
21. Zhao H, Wang J. Social support and hope for hemodialysis patients. Chinese Journal of Nursing. 2000; 35(5): 306–308.
22. Cheng L, Gao W, Xu Y, et al. Anxiety and depression in rheumatoid arthritis patients: prevalence, risk factors and consistency between the Hospital Anxiety and Depression Scale and Zung's Self-rating Anxiety Scale/Depression Scale. Rheumatology Advances in Practice. 2023; 7(3): rkad100.
23. Liu X, Wei D, Chen Yongyi, et al. Chinese version of chronic disease treatment function assessment-reliability and validity evaluation of spiritual scale in cancer patients. Chinese Journal of Nursing. 2016; 51(9): 1085–1090.
24. Wan C, Meng Q, Tang X, et al. Quality of life measurement scale for cancer patients FACT-G Chinese version review. Practical Oncology. 2006; 21(1): 77–80.
25. Huang G, Tian X, Wang Z, et al. A qualitative study on the coping experience of advanced cancer patients from the perspective of psychological consistency. Chinese Journal of Nursing. 2024; 59(05): 526–532.
26. Konstantinidis TI, Samonis G, Sarafis P, et al. Assessment of needs of hospitalized cancer patients with advanced cancer. Global Journal of Health Science. 2016; 9(6): 555–559.
27. Gong W, Zhao J, Han Y, et al. Research on the application effect of advance medical care planning intervention based on cross-theoretical model in patients with advanced cancer. Military Nursing. 2023; 40(08): 14–17.
28. Lu S, Cao X, Sheng Y. Correlation between hope level and resilience in patients with newly diagnosed surgery for liver cancer. PLA Journal of Nursing. 2018; 35(21): 11–15.

29. Kako J, Oosono Y, Kajiwara K, et al. The significance of caregivers in end-of-life care: Hope, optimism, and their importance. Cancer. 2019; 125(23): 4329.
30. Ali EA, Khedr MA, Alabdullah AAS, et al. Effect of acceptance and commitment therapy-based interventions on mental health and cognitive impairment for patients with advanced colorectal cancer. Public Health Nurs; 2024.
31. Plumb VJ, Winger JG, Teo I, et al. Coping skills training and acceptance and commitment the rapy for symptom manage ment: feasibility and acceptability of abrief telephone-delivered protocol for patients with advanced cancer. J. Pain Symptom Manage. 2020; 59(2): 270–278.
32. Fang P, Tan L, Cui J, Yu L. Effectiveness of Acceptance and Commitment Therapy for people with advanced cancer: A systematic review and meta-analysis of randomized controlled trials. J. Adv. Nurs. 2023; 79(2): 519–538.
33. Li H, Jin X, Ng MSN, et al. Effects of Acceptance and Commitment Therapy on fatigue interference and health-related quality of life among patients with advanced lung cancer: A pilot randomized controlled trial. Asia Pac. J. Oncol. Nurs. 2022; 9(8): 100102.

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Article

The effects of mindfulness meditation combined with happiness therapy on the psychological status and survival of patients with middle and advanced non-small cell lung cancer

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Abstract: Objective: The study aimed to investigate the effectiveness of the intervention on psychological resilience, negative emotions, and overall well-being of subjects with non-small cell lung cancer (NSCLC) in middle and advanced stages utilizing happiness therapy combined with positive thinking-meditation expected to provide a basis for clinical psychological intervention. Methods: One hundred patients with stage III/IV SCLC were chosen as the study population. The participants were assigned into two groups randomly, depending on a random number table: a control cohort (n = 50) and an intervention cohort (n = 50). The control group received systemic anti-tumour therapy and daily care, while the intervention group received an additional 4-week psychosocial intervention of happiness therapy and positive thinking meditation on top of the systemic anti-tumour therapy and daily care. The study used the Hospital Anxiety and Depression Scale (HADS), the Psychological Resilience Scale (CD-RISC), and the General Well-Being Scale (GWB) as assessment tools to comprehensively evaluate psychological state before and after therapy, respectively. Patients in the 2 groups were also reviewed at a 6-month follow-up to record progression-free survival (PFS) in both groups. Results: Data analysis illustrated that following intervention, the psychological resilience score (78.30 ± 8.47) and the general well-being score (81.06 ± 3.43) of the patients within the intervention cohort were significantly higher than the control (t = −11.13, −10.14, P < 0.001). Anxiety and depression scores in patients of the intervention group (17.80 ± 3.47) were notably lower than those in the control group (t = 5.30, P < 0.001), and there was a different median progression-free survival (PFS) time (171.00 vs. 219.00 days, P = 0.037). Conclusion: Present study demonstrated that happiness therapy combined with positive thinking meditation as psychological intervention can improve psychological resilience caused by middle- and late-stage NSCLC effectively, reduce their negative emotions, significantly enhance their overall sense of well-being, delay disease progression.

Keywords: mindfulness meditation; psychological resilience; progression-free survival; lung cancer; anxiety; general well-being

1. Introduction

The latest release of China Cancer Data 2023 reveals that lung cancer has become the most prevalent and deadliest malignancy in China, ranking first in both incidence and mortality rates. Non-small lung cancer (NSCLC) constitutes the vast majority of cases, with a proportion as high as 80%–85% [1]. Given the insidious onset and rapid progression of NSCLC, most patients have developed middle to late stages upon diagnosis [2] and only received systemic therapy. Medical factors such as prolonged

treatment cycles and significant side effects, together with psychosocial factors such as economic burdens and changes in interpersonal relationships, substantially impact the psychological well-being of patients. These challenges often lead to reduced psychological resilience and difficulty in effectively managing the physical and psychological demands of their condition [3].

Psychological resilience refers to an individual's ability to demonstrate adaptation and recovery by mobilizing internal resources in response to significant internal and external pressures and challenges [4]. Cancer patients with high levels of psychological resilience are better equipped to handle life changes brought about by their illness and are less likely to experience psychological disorders [5]. Psychological health is deeply connected to a patient's emotional state and significantly impacts the occurrence, development, and prognosis of tumors by affecting multiple bodily systems, such as neurological, endocrine, and immune systems [6–10]. Therefore, strengthening psychological resilience and improving cancer patients' mental health have become key areas of focus in the field of psychological rehabilitation for cancer care.

In recent years, psychological interventions have significantly improved the mental health of cancer patients, with mindfulness techniques and happiness therapy showing particularly notable results [11–14]. Mindfulness technique, originating from Buddhism, emphasizes focusing attention on the present moment and accepting all experiences in a non-judgmental manner [15]. It has been widely adopted in psychological interventions for oncology patients, and its efficacy has been supported by empirical studies [16–19]. Happiness therapy, a short-term psychotherapeutic strategy, effectively enhances patients' well-being by guiding them through the process of revisiting and addressing moments of impaired happiness. It has demonstrated significant benefits in alleviating anxiety and depressive symptoms among lung cancer patients in the short term [13]. Mindfulness techniques assist patients in alleviating negative emotions like anxiety and depression by utilizing meditation and concentration exercises [20], while the happiness therapy focuses on enhancing patients' sense of well-being through cognitive and behavioral adjustments [21]. This multi-dimensional psychological support, which ranges from enhancing well-being and alleviating negative emotions to promoting physical and mental balance, offers a more effective approach to alleviating the patients' psychological stress. The two methods complement each other, creating a comprehensive and systematic psychological intervention framework. A review of the literature indicates that current clinical practices predominantly use single intervention models. To investigate the combined effects of happiness therapy and mindfulness meditation on psychological resilience, negative emotions, and overall well-being in patients with middle- to late-stage NSCLC, the following study was conducted.

2. Methods

2.1. Targeted samples

The study selected 100 patients with NSCLC at stage III/IV who were admitted to a certain hospital in Xuzhou City from April 2023 to April 2024. Inclusion criteria: (1) age ≥ 18 years, ≤ 75 years, gender is not limited; (2) patients were diagnosed by

pathology/cytology, clinical stage III/IV, and systematic anti-tumor treatment; (3) never received any previous formal and systematic psychological interventions and psychological counselling; (4) general status ECOG scores ≤ 2, while psychological distress thermometer scores < 4; (5) expected survival time ≥ 6 months; (6) participants able to understand the content and complete the questionnaire; (7) signed informed consent provided. Exclusion Criteria: (1) patients with severe comorbid cardiac, hepatic, or renal diseases, or patients with other cancer types; (2) histories of mental illness, cognitive dysfunction, or mental retardation that hinders accurate self-assessment of feelings; (3) presence of symptomatic central nervous system metastasis; (4) currently undergoing other psychological interventions or having recently participated in other similar studies.

Based on previous literature containing similar interventions, we initially enrolled 122 patients, of whom 8 did not undergo subsequent chemotherapy and were therefore excluded, 10 patients chose to withdraw from the study due to boredom with cooperating with the relevant interventions, and 4 patients were excluded because they were unavailable for contact during the study. Finally, 100 patients were enrolled in the study, all of whom volunteered to participate in the study and signed an informed consent form. Using the random number table method, there were 100 eligible patients meeting inclusion criteria assigned to either the control (50 patients) or the intervention group (50 patients). The Hospital Ethics Committee (XZXY-LK-20240129-0025) was responsible for the review of this study.

There was no statistical difference in general information (**Table 1**).

Table 1. Comparison of general information of patients in the two groups [cases (%)].

Sports event		**Contral group (*n* = 50)**	**Intervention group (*n* = 50)**	**Statistical value**	***P*-value**
Age [(c ± s) years]		64.38 ± 8.10	65.08 ± 7.96	−0.44	0.664
Distinguishing between the sexes				0.20[b]	0.656
	male	35	37		
	women	15	13		
Educational attainment				−0.83[c]	0.406
	Primary and below	23 (46.0)	20 (40.0)		
	Junior high school	6 (12.0)	6 (12.0)		
	High school and Specialized	13 (10.0)	12 (24.0)		
	Undergraduate and above	8 (16.0)	12 (24.0)		
Marital status				1.90[b]	0.387
	Married	46 (92.0)	43 (86.0)		
	Divorce	3 (6.0)	3 (6.0)		
	Bereaved of one’s spouse (literary)	1 (2.0)	4 (8.0)		

Table 1. (*Continued*).

Sports event		Contral group (n = 50)	Intervention group (n = 50)	Statistical value	P-value
Monthly per capita household income				−0.52[c]	0.601
	Less than 1000	5 (10.0)	2 (4.0)		
	1000–2999	16 (32.0)	16 (32.0)		
	3000–4999	20 (40.0)	24 (48.0)		
	5000 and above	9 (18.0)	8 (16.0)		
Squamous cell carcinoma/Non-squamous cell carcinoma				0.877[a]	0.349
	Squamous cell carcinoma (SCC)	9 (18.0)	6 (12.0)		
	Non-squamous cell carcinoma (Non-SCC)	41 (82.0)	44 (88.0)		
TNM				0.25[a]	0.617
	III	11 (22.0)	9 (18.0)		
	IV	39 (78.0)	41 (82.0)		
ECOG				−0.448[b]	0.654
	0	18 (36.0)	20 (40.0)		
	1	25 (50.0)	24 (48.0)		
	2	7 (14.0)	6 (12.0)		
Treatment regimen				−0.134[b]	0.893
	Chemotherapy alone	23 (46.0)	27 (54.0)		
	Chemotherapy plus immunotherapy	12 (24.0)	14 (28.0)		
	Chemotherapy plus targeted therapy	6 (12.0)	8 (16.0)		
	Others	9 (18.0)	11 (22.0)		

Note: $P < 0.05$, difference is statistically significant; a is t value; b is χ^2 value; c is z value.

2.2. Methodology

2.2.1. Control group

Standard systemic anti-tumor therapy and routine care were provided (standard systemic anti-tumor therapy includes chemotherapy, targeted, immune or combination therapy regime in accordance with NCCN and CSCO guidelines). Upon admission, patients primarily received routine care, such as ensuring a clean and comfortable ward environment. Psychological resilience, anxiety and depression levels, and general well-being were assessed upon admission. No psychological intervention was applied during the subsequent 4 weeks.

2.2.2. Intervention group

In addition to the standard care provided to the control group, psychological intervention combining happiness therapy and mindfulness meditation was implemented. 1) Formation of the psychological intervention team: The team consisted of medical oncologists, psychiatrists, social workers, and several trained nurses. 2) Development of the intervention training program: An extensive literature

review was conducted, and, guided by psychiatrists, they collaborated to design the intervention program aligned with the clinical goal. The intervention was implemented by team members qualified in psychological casework. 3) Specific content of the joint intervention program: Upon admission, the team conducted face-to-face meetings with the patients, introducing themselves and providing an overview of the intervention and relevant protocols. These sessions included health education and behavioral guidance, offering a preliminary introduction to the principles of happiness therapy and mindfulness meditation, helping patients gain an initial understanding of the study's content. Throughout the communication process, they proactively assessed the patients' basic circumstances and psychological state, as well as their needs and concerns. Health education was provided to patients using effective methods, such as sharing positive case studies, appropriately addressing the risks of irrational thoughts, and guiding patients to develop positive and rational beliefs. Relevant questionnaires were completed before the intervention began. The intervention program was delivered through a diversified approach, combining bedside guidance, face-to-face group sessions, and individualized support via the WeChat platform, tailored to the specific circumstances and needs of each patient.

Mindfulness meditation practice: (1) On the day of the patient's hospital admission, the team conducted an informative session, explaining the origin, development, fundamental concept, and significance of positive thinking. (2) In the 1st to 2nd week, the primary focus was on practicing mindfulness meditation through breathing exercises. Guided by online audio instructions, patients were taught to direct their attention to their natural breathing, without consciously controlling it, but simply observing and feeling the breath. They were encouraged to remain present in the moment, perceiving the gentle rise and fall of their abdomen as they inhaled and exhaled. (3) During the 3rd to 4th week, patients were guided through a body scan exercise. In a quiet environment, they lay down with their eyes closed and their bodies fully relaxed. Following instructions, they systematically focused on each part of their body from the toes to the head, paying close attention to the sensations in each area. Each meditation session lasted approximately 20–30 min.

Happiness therapy mainly consisted of three stages: (1) Identifying moments of happiness: Patients were guided to review their daily experiences, focusing particularly on the people, events, and things that made them feel happy. They were encouraged to think about the reasons these moments brought happiness and to record them in detail. Additionally, patients were asked to rate the intensity of happiness associated with each event, assigning a score to quantify the level of happiness experienced. Happiness intensity was rated on a scale from 0 to 100, with higher scores indicating a greater level of happiness experienced by the patient. (2) Identifying negative thoughts impacting happiness: Patients were guided to recognize the negative thoughts that hindered the experience of happiness, exploring the root causes of their diminished sense of joy. (3) Addressing identified causes: Based on the root causes identified in the second stage, targeted interventions were provided, including positive information interpretation and cognitive adjustment strategies. These strategies aimed to help patients develop a more rational and positive cognitive framework, ultimately enhancing their overall sense of well-being.

4) Implementation of the intervention program: The comprehensive joint intervention program spanned 4 weeks. Patients were instructed to engage in mindfulness meditation 5 times per week, with each session lasting 20–30 min. After each meditation, patients were asked to identify and record positive events, which they could share with group members. Group members provided timely feedback, facilitating the third phase of the happiness therapy. At the end of the 4th week, patients were encouraged to complete relevant self-assessment scales. At the end of 4 weeks, patients in both groups were followed up for 6 months to document their survival.

2.3. Observation indicators

2.3.1. Psychological Resilience Scale (Connor-Davidson Resilience Scale, CD-RISC)

The scale was revised by Xiao Nan Yu from the Chinese University of Hong Kong [22] and comprises 25 items across 3 dimensions: self-reliance, optimism, and resilience. Reliability of full scale and its three subscales was well-supported, with Cronbach's alpha values of 0.91, 0.88, and 0.60, respectively. Responses are measured on a 5-point Likert scale ranging from 0 (never) to 4 (almost always). Both the overall score and subscale scores are calculated on a 0–4 scale, reflecting higher adaptability and more positive coping mechanisms in response to illness. The scale demonstrates an overall Cronbach's alpha of 0.74.

2.3.2. Hospital Anxiety and Depression Scale (HADS)

The scale includes 14 items, evenly divided between anxiety and depression, with 7 items assessing each aspect. Each item is rated on a 4-point scale from 0 to 3, reflecting increasing severity. The scores are summed for cumulative evaluation across both dimensions. The HADS, as an assessment tool to understand symptoms of anxiety and depression, was developed by Zigmond and Snaith in 1983 [23] and has been used mainly in general hospital patients. Higher scores suggest more severe symptoms, reflecting a poorer psychological state. Cronbach's α coefficients for internal consistency were 0.78 and 0.81 in this study, respectively.

2.3.3. General well-being schedule (GWB)

In 1966, Duan [24] revised the scale to assess individuals' perceptions of happiness. The scale comprises 18 items that cover six dimensions: concerns about health, energy levels, life satisfaction and interest, emotional state (melancholic or pleasant), emotional and behavioral control, and relaxation versus tension. A higher overall score on the scale signifies a stronger sense of well-being. The scale demonstrates excellent reliability, with a Cronbach's alpha coefficient of 0.950 and a retest reliability of 0.850.

2.4. Statistical methods

Measurement data following a normal distribution were presented in the form of mean ± standard deviation ($x \pm s$). For comparisons between two groups, an independent samples *t*-test was applied, while paired samples *t*-tests were used for within-group comparisons before and after the intervention. Categorical variables such as gender, age, and education level were analyzed using the chi-square (χ^2) test

or rank-sum test. Survival graphs were plotted using Kaplan-Meier, and patient survival was tested by log-rank. Data analysis was conducted using IBM SPSS version 27.0, with statistical significance set at $P < 0.05$.

3. Result

3.1. CD-RISC scores comparison

Following intervention, the intervened group exhibited a significantly higher psychological resilience score compared to their pre-intervention levels and to the control group, with improvements observed across all dimensions ($P < 0.05$) (**Table 2**).

Table 2. Comparison of psychological resilience scores between two groups pre- and post-intervention.

groups	time	optimism	strength	toughness	Total psychological resilience score
	Pre-intervention	10.44 ± 1.94	21.68 ± 4.52	30.64 ± 6.32	62.76 ± 11.74
Intervention group	Post-intervention	12.22 ± 1.8	27.52 ± 2.94	39.22 ± 4.73	78.30 ± 8.47
	t/*P*/	−5.40/< 0.001*	−8.24/< 0.001*	−8.12/< 0.001*	−8.51/< 0.001*
	Pre-intervention	10.08 ± 1.68	21.48 ± 3.04	30.10 ± 5.21	61.66 ± 9.05
Control subjects	Post-intervention	10.10 ± 1.31	22.04 ± 3.19	30.32 ± 3.75	62.46 ± 6.2
	t/*P*/	−0.06/0.950	−0.89/0.379	−0.25/0.804	−0.52/0.609
Comparison	Pre-intervention	−0.99/0.323	−0.26/0.796	−0.47/0.642	−0.53/0.601
t/*P*	Post-intervention	−6.73/< 0.001*	−8.93/< 0.001*	−10.43/< 0.001*	−11.13/< 0.001*
d		−1.346	−1.786	−2.085	−2.227

* $P < 0.05$, statistically significant difference.

3.2. HADS scores comparison

The difference in HAD scores distribution of two groups before intervention was statistically insignificant ($P > 0.05$); after intervention, the scores of intervened groups were lower than those in the pre-intervention period and lower than control ($P < 0.05$) (**Table 3**).

Table 3. Anxiety and depression scores comparison pre- and post-intervention in two groups.

groups	times	Anxiety dimension	Depression dimension	Total score
	Pre-intervention	9.62 ± 2.30	12.5 ± 3.48	22.12 ± 4.99
Intervention group	Post-intervention	7.50 ± 1.53	10.3 ± 2.54	17.80 ± 3.47
	t/*P*/	5.11/< 0.001*/	3.52/< 0.001*	4.79/< 0.001*
	Pre-intervention	10.04 ± 2.70	13.04 ± 2.86	23.08 ± 4.97
Control group	Post-intervention	9.64 ± 2.89	12.54 ± 2.98	22.18 ± 4.70
	t/*P*/	0.82/0.417	0.92/0.362	1.03/0.309
Comparison	Pre-intervention	0.84/0.405	0.85/0.398	0.96/0.338
t/*P*/	Post-intervention	4.63/< 0.001*	4.04/< 0.001*	5.30/< 0.001*
d		0.925	0.808	1.061

* $P < 0.05$, statistically significant difference.

3.3. GWB scores comparison

After intervention, scores of subjects in the intervention group surpassed those in the pre-intervention and control groups ($P < 0.05$) (**Table 4**).

Table 4. General well-being scores comparison pre- and post-intervention in the two groups.

groups	times	Relaxation and tension	Emotional and behavioral control	State of mind	energies	Satisfaction and interest in life	Health concerns	Level of general well-being
Intervention group	Pre-intervention	15.48 ± 1.74	5.96 ± 1.63	16.70 ± 2.2.0	16.96 ± 1.67	6.86 ± 1.21	13.84 ± 1.08	75.80 ± 3.56
	Post-intervention	18.54 ± 1.81	5.04 ± 1.48	18.58 ± 1.53	18.86 ± 1.87	5.66 ± 1.04	14.38 ± 1.07	81.06 ± 3.43
	t/*P*/	−8.00/<0.001*	2.83/<0.007*	−5.19/<0.001*	−5.51/<0.001*	5.33/<0.001*	−2.67/<0.001*	−7.36/<0.001*
Control group	Pre-intervention	15.50 ± 1.16	5.94 ± 1.54	16.00 ± 1.85	16.72 ± 1.91	6.74 ± 1.29	13.82 ± 1.02	75.58 ± 3.41
	Post-intervention	15.08 ± 1.71	5.68 ± 1.15	16.62 ± 1.88	17.00 ± 1.87	6.34 ± 1.19	13.66 ± 1.12	74.38 ± 3.16
	t/*P*/	1.39/0.171	1.05/0.298	−1.61/0.113	−1.02/0.315	1.49/0.142	0.80/0.429	0.49/0.626
Comparison	Pre-intervention	0.07/0.946	−0.06/0.950	−1.72/0.088	−0.67/0.506	−0.48/0.633	−0.10/0.924	−0.32/0.753
t/*P*/	Post-intervention	−9.82/<0.001*	2.41/0.018*	−5.72/<0.001*	−4.96/<0.001*	3.04/0.003*	−3.30/0.001*	−10.14/<0.001*
d		−1.964	0.482	−1.143	−0.993	0.608	−0.659	−2.029

* $P < 0.05$, statistically significant difference.

3.4. Survival of intermediate and advanced NSCLC patients in 2 groups

A total of 100 patients with intermediate and advanced NSCLC were included in the survival analysis at 6 months after treatment. No mortalities were recorded among the patients throughout the duration of the study. Kaplan-Meier survival analysis was performed on the NSCLC patients in the 2 groups, and it was found that the progression-free survival of the intervention group was significantly better than that of the control group, with a median PFS of 171.00 days and 219.00 days, respectively ($P = 0.037$) (**Figure 1**).

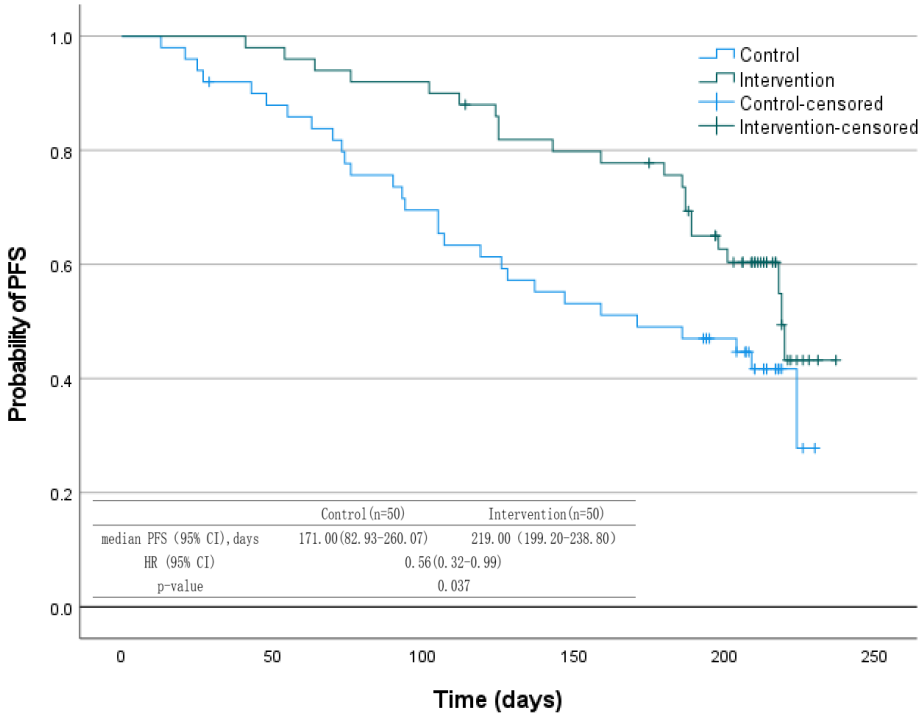


Figure 1. Kaplan-Meier survival analysis of the patients in the two groups.

4. Discussion

In this study, we integrated happiness therapy and mindfulness meditation into a combined intervention for lung cancer patients. Results demonstrated that this approach effectively enhanced patients' psychological resilience and overall well-being while significantly reducing negative emotions. In addition, the progression-free survival of the patients was significantly prolonged, suggesting that active psychological interventions may delay disease progression to some extent.

Post four weeks of combined intervention involving happiness therapy and positive thinking meditation, the psychological resilience of the patients illustrated notable improvement. Prior to the intervention, the patients' psychological resilience score in this study was 62.76 ± 11.74, notably lower than the average level for the general adult population in China (70.50 ± 13.48) [25]; after the intervention, the psychological resilience score improved significantly to 78.30 ± 8.74, with the difference being statistically significant. This aligns with the findings of similar studies by other scholars [26]. The patient's sense of well-being is also one of the outward manifestations of positive psychology; the the improvements observed in the four dimensions—relaxation and tension, mood (melancholic or happy), energy levels, and health-related worries—are consistent with an overall increase in well-being. The underlying reasons for these changes are as follows: Positive Thought Meditation training emphasizes "non-judgmental awareness", which can be enhanced through short, frequent sessions. This training fosters the development of positive thinking, thereby improving patients' ability to tolerate negative emotions and enhancing their overall mental resilience; meanwhile, by engaging in detailed discussions with patients, we can gain insights into their perceptions of the disease and their life circumstances [27]. This allows for tailored psychological interventions that address

patients' misconceptions about their condition and foster positive emotions, ultimately leading to improved mental well-being.

The scores for dimensions such as "control of emotions and behaviors" and "satisfaction and interest in life" were slightly lower compared to pre-intervention levels. Previous analyses of the various dimensions of general well-being in cancer patients have been limited [28,29]. Therefore, the possible reasons for this result observed in this study include: 1) Happiness therapy assists patients in exploring their positive emotions by recalling joyful events and examining the development of negative emotions during the intervention. This process can lead to emotional fluctuations, which may affect the stability of emotion and behavior control; 2) The study lacks long-term follow-up data, and the combined intervention approach requires further investigation in future research to assess its sustained efficacy. Future studies should explore the long-term effectiveness of the combined intervention approach on various dimensions of patients' overall well-being. This will help clarify the specific impact of the psychological intervention on emotional and behavioral control, as well as satisfaction and interest in life.

Additionally, the prevalence of anxiety and depression among cancer patients was significantly higher, with rates of 49.7% and 54.9%, respectively, compared to 18.4% and 17.5% in the general population without cancer [30]. Nevertheless, following a 4-week combined psychological intervention, patients in the intervened group showed improvements comparable to those reported by Fava et al. [25,31,32]. Although this study demonstrates some improvement in patients' anxiety and depression, it falls short of the desired outcomes. This may be attributed to the short duration of the 4-week intervention, whereas alleviating depression typically requires a longer-term approach [33].

For cancer patients, the role of psychological factors is not only associated with their mood swings, but it is actually extremely closely linked to tumor onset, progression, and prognosis [6–10], a link that reveals the complexity and importance of psychological states in the tumor course. The survival of 2 groups of tumor patients over a period of 6 months was followed up and compared. The results showed that in the intervention group that received targeted psychological interventions, patients had significantly higher progression-free survival than the control group that did not receive psychological interventions (171.00 days vs 219.00 days, $p = 0.037$). This finding not only strongly proves that psychological interventions can significantly improve patients' adverse emotional states and enhance their quality of life in the short term, but more importantly, it also prolongs patients' survival time to a certain extent, thus indicating that psychological interventions have a non-negligible positive effect on improving the survival rate of tumor patients.

These research findings have unveiled the positive effects of mindfulness meditation combined with happiness therapy in the holistic treatment of cancer patients. However, they also underscore several key limitations. Primarily, the studies lacked in-depth subgroup analyses based on different treatment protocols, patient gender, and specific tumor stages, which diminished the depth and universal applicability of the research conclusions. Secondly, the scope of this research is confined to patients with stage III/IV non-small cell lung cancer, thereby limiting its broader applicability. If considering extending this combined therapy to untreated or

early-stage non-small cell lung cancer patients, its efficacy would necessitate more rigorous and in-depth exploration and validation. Furthermore, in our research, we failed to comprehensively acquire baseline neuro-immunological data from patients, instead relying solely on clinical scales with high subjectivity and progression-free survival data that reflect the overall disease trajectory for analysis. The intricate and profound interplay between psychology and immunology has yet to be thoroughly explored, undoubtedly marking a crucial direction for future research that requires in-depth investigation.

5. Conclusions

In summary, happiness therapy combined with mindfulness meditation provides a new perspective and effective means for psychological intervention in cancer patients. This program not only improves patients' psychological resilience and overall well-being but also effectively alleviates anxiety and depression. These benefits are significant for enhancing patients' psychological status and quality of life. Future research should investigate the long-term effects and applicability of this therapy across diverse patient groups to support its broader integration into clinical practice.

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References

1. Han B, Zheng R, Zeng H, et al. Cancer incidence and mortality in China, 2022. Journal of the National Cancer Center. 2024; 4(1): 47-53. doi: 10.1016/j.jncc.2024.01.006
2. Herbst RS, Morgensztern D, Boshoff C. The biology and management of non-small cell lung cancer. Nature. 2018; 553(7689): 446-454. doi: 10.1038/nature25183
3. Chen S, Mei R, Tan C, et al. Psychological resilience and related influencing factors in postoperative non-small cell lung cancer patients: A cross-sectional study. Psycho-Oncology. 2020; 29(11): 1815-1822. doi: 10.1002/pon.5485
4. Ristevska-Dimitrovska G, Filov I, Rajchanovska D, et al. Resilience and Quality of Life in Breast Cancer Patients. Open Access Macedonian Journal of Medical Sciences. 2015; 3(4): 727-731. doi: 10.3889/oamjms.2015.128
5. Joyce S, Shand F, Tighe J, et al. Road to resilience: a systematic review and meta-analysis of resilience training programmes and interventions. BMJ Open. 2018; 8(6): e017858. doi: 10.1136/bmjopen-2017-017858

6. Wu Y, Luo X, Zhou Q, et al. The disbalance of LRP1 and SIRPα by psychological stress dampens the clearance of tumor cells by macrophages. Acta Pharmaceutica Sinica B. 2022; 12(1): 197-209. doi: 10.1016/j.apsb.2021.06.002
7. Carlson LE, Doll R, Stephen J, et al. Randomized Controlled Trial of Mindfulness-Based Cancer Recovery Versus Supportive Expressive Group Therapy for Distressed Survivors of Breast Cancer (MINDSET). Journal of Clinical Oncology. 2013; 31(25): 3119-3126. doi: 10.1200/jco.2012.47.5210
8. Gouldthorpe C, Power J, Davies A. Circadian rhythm disorders in patients with advanced cancer: a scoping review. Frontiers in Oncology. 2023; 13. doi: 10.3389/fonc.2023.1240284
9. Carlson LE, Beattie TL, Giese-Davis J, et al. Mindfulness-based cancer recovery and supportive-expressive therapy maintain telomere length relative to controls in distressed breast cancer survivors. Cancer. 2014; 121(3): 476-484. doi: 10.1002/cncr.29063
10. Zeng Y, Hu CH, Li YZ, et al. Association between pretreatment emotional distress and immune checkpoint inhibitor response in non-small-cell lung cancer. Nature Medicine. 2024; 30: 1680-1688. doi: 10.1038/s41591-024-02929-4
11. Hsieh CC, Ho CC, Lin ZZ, et al. Trait mindfulness and depressive symptoms in non-small cell lung cancer patients: the mediating roles of quality of life and meaning in life. Psychology & Health. 2020; 36(9): 1102-1114. doi: 10.1080/08870446.2020.1825713
12. Zhang Q, Zhao H, Zheng Y. Effectiveness of mindfulness-based stress reduction (MBSR) on symptom variables and health-related quality of life in breast cancer patients—a systematic review and meta-analysis. Supportive Care in Cancer. 2018; 27(3): 771-781. doi: 10.1007/s00520-018-4570-x
13. Carletto S, Tesio V, Borghi M, et al. The Effectiveness of a Body-Affective Mindfulness Intervention for Multiple Sclerosis Patients with Depressive Symptoms: A Randomized Controlled Clinical Trial. Frontiers in Psychology. 2017; 8. doi: 10.3389/fpsyg.2017.02083
14. Farias M, Maraldi E, Wallenkampf KC, et al. Adverse events in meditation practices and meditation-based therapies: a systematic review. Acta Psychiatrica Scandinavica. 2020; 142(5): 374-393. doi: 10.1111/acps.13225
15. Malins S, Biswas S, Rathbone J, et al. Reducing dropout in acceptance and commitment therapy, mindfulness-based cognitive therapy, and problem-solving therapy for chronic pain and cancer patients using motivational interviewing. British Journal of Clinical Psychology. 2020; 59(3): 424-438. doi: 10.1111/bjc.12254
16. Carlson LE, Speca M, Patel KD, et al. Mindfulness-Based Stress Reduction in Relation to Quality of Life, Mood, Symptoms of Stress, and Immune Parameters in Breast and Prostate Cancer Outpatients. Psychosomatic Medicine. 2003; 65(4): 571-581. doi: 10.1097/01.psy.0000074003.35911.41
17. van der Lee ML, Garssen B. Mindfulness-based cognitive therapy reduces chronic cancer-related fatigue: a treatment study. Psycho-Oncology. 2010; 21(3): 264-272. doi: 10.1002/pon.1890
18. Lengacher CA, Reich RR, Paterson CL, et al. Examination of Broad Symptom Improvement Resulting from Mindfulness-Based Stress Reduction in Breast Cancer Survivors: A Randomized Controlled Trial. Journal of Clinical Oncology. 2016; 34(24): 2827-2834. doi: 10.1200/jco.2015.65.7874
19. Faghani F, Choobforoushzadeh A, Sharbafchi MR, et al. Effectiveness of mindfulness-based supportive psychotherapy on posttraumatic growth, resilience, and self-compassion in cancer patients. Wiener klinische Wochenschrift. 2022; 134(15-16): 593-601. doi: 10.1007/s00508-022-02057-4
20. Tian X, Yi LJ, Liang CSS, et al. The Impact of Mindfulness-Based Stress Reduction (MBSR) on Psychological Outcomes and Quality of Life in Patients With Lung Cancer: A Meta-Analysis. Frontiers in Psychology. 2022; 13. doi: 10.3389/fpsyg.2022.901247
21. Fava GA. Well-Being Therapy: Conceptual and Technical Issues. Psychotherapy and Psychosomatics. 1999; 68(4): 171-179. doi: 10.1159/000012329
22. Cheng C, Dong D, He J, et al. Psychometric properties of the 10-item Connor–Davidson Resilience Scale (CD-RISC-10) in Chinese undergraduates and depressive patients. Journal of Affective Disorders. 2020; 261: 211-220. doi: 10.1016/j.jad.2019.10.018
23. Annunziata MA, Muzzatti B, Bidoli E, et al. Hospital Anxiety and Depression Scale (HADS) accuracy in cancer patients. Supportive Care in Cancer. 2019; 28(8): 3921-3926. doi: 10.1007/s00520-019-05244-8
24. Duan J. Results and analyses of the General Happiness Scale among college students in China. Chinese Journal of Clinical Psychology. 1996; 4(1): 56-57.

25. Wei Y, Zhu DQ, Li YM. Progress of research on the impact of psychological resilience on health outcomes in adults with chronic diseases. Chinese Journal of Practical Nursing. 2019; 35(5): 391.
26. Boyle CC, Stanton AL, Ganz PA, et al. Improvements in emotion regulation following mindfulness meditation: Effects on depressive symptoms and perceived stress in younger breast cancer survivors. Journal of Consulting and Clinical Psychology. 2017; 85(4): 397-402. doi: 10.1037/ccp0000186
27. Fava GA, Cosci F, Guidi J, et al. Well-being therapy in depression: New insights into the role of psychological well-being in the clinical process. Depression and Anxiety. 2017; 34(9): 801-808. doi: 10.1002/da.22629
28. Chudzicka-Czupała A, Zalewska-Łunkiewicz K. Subjective well-being, general self-efficacy and coping with stress in former psychiatric patients preparing for the peer support role: an exploratory study. Health and Quality of Life Outcomes. 2020; 18(1). doi: 10.1186/s12955-020-01348-6
29. McDonough MH, Sabiston CM, Wrosch C. Predicting changes in posttraumatic growth and subjective well-being among breast cancer survivors: the role of social support and stress. Psycho-Oncology. 2013; 23(1): 114-120. doi: 10.1002/pon.3380
30. Yang YL, Liu L, Wang Y, et al. The prevalence of depression and anxiety among Chinese adults with cancer: a systematic review and meta-analysis. BMC Cancer. 2013; 13(1). doi: 10.1186/1471-2407-13-393
31. Ruini C, Fava GA. Well-being therapy for generalized anxiety disorder. Journal of Clinical Psychology. 2009; 65(5): 510-519. doi: 10.1002/jclp.20592
32. Gok Metin Z, Karadas C, Izgu N, et al. Effects of progressive muscle relaxation and mindfulness meditation on fatigue, coping styles, and quality of life in early breast cancer patients: An assessor blinded, three-arm, randomized controlled trial. European Journal of Oncology Nursing. 2019; 42: 116-125. doi: 10.1016/j.ejon.2019.09.003
33. Walker J, Magill N, Mulick A, et al. Different independent associations of depression and anxiety with survival in patients with cancer. Journal of Psychosomatic Research. 2020; 138: 110218. doi: 10.1016/j.jpsychores.2020.110218

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Article

Well-dying and psychological well-being: The role of social support in end-of-life peace

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Abstract: This study examines the relationship between well-dying perception, social support, and psychological well-being among elderly patients. As aging populations face terminal illnesses, the concept of a "good death" becomes increasingly relevant, emphasizing dignity, acceptance, and emotional peace. Social support, encompassing emotional, informational, and practical assistance, has been recognized as a key factor in mitigating psychological distress. However, the mechanisms through which well-dying perception and social support interact to influence psychological well-being remain underexplored. Using survey data from 400 elderly cancer patients in South Korea, this study investigates the effects of well-dying perception and both received and provided social support on psychological well-being. Results indicate that a stronger well-dying perception positively influences psychological well-being. Additionally, both receiving and providing social support enhance psychological resilience and moderate the relationship between perceptions of well-dying and well-being. These findings highlight social support's critical role in emotional adaptation at life's end.

Keywords: well-dying; psychological well-being; social support; elderly; cancer; South Korea

1. Introduction

As the aging population faces an increasing prevalence of terminal illnesses, particularly cancer, the psychological and emotional challenges associated with end-of-life care have become more pronounced. The concept of well-dying—a death experience that aligns with personal values while minimizing suffering—has emerged as a crucial consideration [1]. Closely linked to the quality of palliative care, a well-dying experience fosters dignity, acceptance, and emotional peace in a patient's final stages [2]. In this context, both the perception of well-dying and the availability of social support—whether received or provided—are essential factors in shaping the psychological and emotional well-being of elderly cancer patients.

Social support—encompassing emotional, informational, and practical assistance from family, friends, and healthcare professionals—is widely recognized as a critical protective factor against psychological distress [3–6]. Empirical research indicates that social support not only strengthens resilience but also mitigates the psychological burden associated with terminal illnesses, contributing to a greater sense of meaning and fulfillment in later life [7]. Despite extensive evidence highlighting the benefits of social support, the precise mechanisms through which it interacts with individuals' perceptions of well-dying and subsequently influences psychological well-being remain insufficiently examined.

This study aims to fill this gap by examining three key aspects: Firstly, how perceptions of well-dying influence psychological well-being; secondly, how both receiving and providing social support impact psychological well-being; and thirdly, whether social support moderates the relationship between well-dying perception and psychological well-being. Conducted in South Korea, this study focuses on elderly individuals aged 65 and older diagnosed with cancer, providing empirical insights into their end-of-life experiences.

The remainder of this paper is structured as follows: Section 2 presents the theoretical framework underpinning the study. Section 3 details the methods and data used for analysis. Section 4 reports the estimation results, followed by Section 5, which concludes with key findings and implications.

2. Well-dying, social support and psychological well-being

2.1. Perceptions of a good death

A good death is a multidimensional concept shaped by personal, social, and cultural factors [8]. While definitions vary, common elements include pain management, spiritual peace, dignity, psychological closure, and the presence of loved ones [9]. For elderly individuals facing terminal illness, particularly cancer, achieving a pain-free experience, maintaining strong family connections, and attaining a sense of life completion are central to well-dying [2].

Cultural perspectives play a role in shaping these perceptions. In Western societies, autonomy and individual decision-making are often emphasized, whereas Eastern cultures prioritize family involvement, harmony, and acceptance of fate [10]. For example, a study in Thailand found that a good death is characterized by a peaceful, natural passing, symptom control, and spiritual support from family and religious practices [11]. Despite these cultural variations, well-dying universally contributes to psychological well-being by reducing existential distress and fostering emotional preparedness [12].

A key psychological component of well-dying is death acceptance, which helps individuals find meaning in life and alleviates existential distress [13]. Research in positive psychology has linked death acceptance to reduced depression and anxiety, as well as an increased sense of purpose and emotional stability [14]. Palliative care interventions, such as life-review therapy and dignity therapy, are widely used to facilitate this process, improving both perceptions of well-dying and overall psychological well-being [1].

Individuals who perceive their lives as meaningful and complete tend to experience lower distress as they approach death, whereas unresolved conflicts, unfulfilled goals, or a perceived lack of control can heighten anxiety and depression [15]. Therefore, providing elderly cancer patients with opportunities to express their final wishes, resolve personal affairs, and achieve psychological closure is essential for enhancing their emotional well-being [16].

2.2. Social support as an integral component of well-dying

Social support plays a fundamental role in shaping both social and personal perceptions of a good death [4–6,17]. Many terminally ill patients express a strong desire not to die alone and emphasize the importance of emotional support from family and loved ones [18]. Studies have shown that social support enhances dignity, reduces existential anxiety, and fosters a sense of comfort and security [19]. In contrast, social isolation, unresolved family conflicts, or the absence of emotional connections can exacerbate distress and negatively impact psychological well-being [20].

Two prominent psychological theories help explain the significance of social support in elderly cancer patients' mental health. The Stress-Buffering Hypothesis suggests that social support helps mitigate the adverse psychological effects of stress, providing reassurance and practical assistance that reduce anxiety and depressive symptoms [3]. The Socioemotional Selectivity Theory argues that older adults prioritize emotionally meaningful relationships over a broad social network, focusing on quality over quantity in their interactions [21]. This theory underscores that for elderly cancer patients, the presence of trusted, meaningful support figures is more critical than having an extensive network.

Social support has been consistently linked to improved psychological well-being. Empirical studies indicate that strong social support networks correlate with lower levels of depression and anxiety, enhanced coping mechanisms, and better overall quality of life [7]. Research also highlights that perceived social support—defined as the belief that help is available when needed—is particularly influential in fostering resilience [22]. Furthermore, social support has been associated with physiological benefits, including reduced inflammation and improved immune function, emphasizing its role in comprehensive cancer care [23].

Despite these benefits, the reception of social support can be complex. Some elderly patients experience guilt or diminished self-worth if they perceive themselves as burdensome to their caregivers [24]. In societies that emphasize self-reliance, excessive dependence on social support can cause distress rather than relief [25,26]. Therefore, the effectiveness of social support depends on its quality and context, ensuring that it aligns with the patient's psychological needs and values.

2.3. Giving vs. receiving social support in later life

Social support is a reciprocal process, and while receiving assistance is beneficial, providing support can also enhance an individual's psychological well-being. Elderly individuals who engage in caregiving, mentoring, or other supportive roles often report increased self-worth and emotional fulfillment. Studies indicate that providing support fosters social integration, generates positive emotions, and cultivates a sense of purpose and dignity [27].

However, maintaining balance is crucial. Elderly cancer patients must engage in support exchanges that do not exceed their emotional and physical capacities. The most effective social support systems are those that facilitate mutual exchange, where the individual both gives and receives assistance, reinforcing social bonds and psychological well-being.

Social support also functions as a moderator that buffers the adverse effects of

illness-related stress on psychological well-being [28]. For example, while functional impairments or symptom burdens often contribute to depression, individuals with strong social support systems tend to exhibit greater emotional resilience. Research demonstrates that elderly individuals with high levels of social support maintain a better quality of life despite experiencing severe health declines, whereas those with limited support experience a more pronounced decline in life satisfaction. This aligns with the Stress-Buffering Hypothesis, which suggests that social support can mitigate the detrimental psychological impact of health-related stressors [28]. Based on the theoretical foundations outlined above, this study proposes the following hypotheses:

- Hypothesis 1: The well-dying perception of elderly individuals positively influences their psychological well-being.
- Hypothesis 2: Received and provided social support positively influences their psychological well-being.
- Hypothesis 3: Received and provided social support moderates the relationship between well-dying perception and psychological well-being, further reinforcing its positive effect.

3. Methods and data

This study primarily focuses on elderly individuals as defined by the domestic Elderly Welfare Act. According to the act, individuals aged 65 and older are classified as elderly; thus, the target population for this study comprises individuals aged 65 and above. Among these, the study targets elderly people with cancer.

Within this age group and geographic scope, a survey was conducted from 21 August to 31 August 2023, in collaboration with a professional survey research firm. The survey was administered through both face-to-face interviews, targeting 434 panel members. To ensure data quality, 34 invalid or insincere responses were excluded, resulting in a final dataset of 400 valid responses. Invalid or insincere responses refer to survey entries that exhibit response patterns indicative of a lack of genuine engagement with the questionnaire. This includes cases where respondents repeatedly altered their answers during the survey process or provided uniform ratings across all items, despite being given adequate time to consider each question. Such responses were identified and excluded to maintain the reliability and validity of the data.

In face-to-face interviews, researchers provided respondents with a physical copy of the questionnaire, allowing them to complete it independently. However, when participants required assistance due to physical limitations or difficulties in understanding certain items, interviewers documented their verbal responses on their behalf. In contrast, for telephone interviews, interviewers read each question aloud, ensured that respondents fully understood the content, and then recorded their responses accordingly (see Appendix for questionnaire details). This approach was designed to maintain consistency across both interview methods while accommodating the diverse needs of the elderly participants.

The collected responses were systematically coded based on predefined criteria to ensure consistency and reliability in data analysis. The survey instrument consisted of 19 items assessing well-dying perception, 18 items measuring psychological well-being, and 25 items each evaluating received and provided social support. The

questionnaire was designed using validated measurement scales and informed by previous empirical studies, ensuring both construct validity and alignment with existing literature [1,3,9,10,17,20,21]. Responses were recorded on a four-point Likert scale: Not at all (1), unlikely (2), likely (3), and very likely (4), with higher scores reflecting stronger agreement with the corresponding statements. For a detailed breakdown of survey items, refer to Appendix.

This study incorporates a comprehensive set of variables, including the psychological well-being, well-dying perception, received social support, and provided social support. Additionally, to analyze moderation effects, binary variables for "high received social support" and "high provided social support" were created. Specifically, a received social support score of 3 or higher was classified as "high received social support" (coded as 1), while scores below 3 were coded as 0. Similarly, a provided social support score of 3 or higher was classified as "high provided social support" (coded as 1), whereas lower scores were coded as 0.

Socioeconomic and demographic control variables were included based on established literature on psychological and social preferences. These variables encompassed gender, age, individual income, home ownership, education level, employment status, religious affiliation, cohabitation status, and health condition.

Gender was coded as 1 for females and 0 for males. Age was categorized into three groups: 65–69 years (1), 70–79 years (2), and 80–89 years (3). Respondents aged 90 or above were initially considered but excluded due to the absence of qualifying participants. Individual income, encompassing wages, pensions, savings, and allowances, was classified into five brackets: less than 1 million KRW (1), 1–2 million KRW (2), 2–3 million KRW (3), 3–4 million KRW (4), and 4 million KRW or more (5). Home ownership was coded as 1 for homeowners and 0 for non-homeowners.

Education level was categorized as elementary school or lower (1), middle school (2), high school (3), and college or higher (4). Employment status was coded as 1 for individuals engaged in economic activities and 0 otherwise. Religious affiliation was coded as 1 for those practicing a religion (e.g., Christianity, Catholicism, Buddhism) and 0 for those without religious affiliation. Cohabitation status was classified as living alone (0), living with a spouse or partner (1), or living with both a spouse/partner and children (2). Health condition was assessed on a three-point scale: poor (1), average (2), and good (3). To account for potential regional effects at the metropolitan and province levels (such as Seoul, Gyeonggi-do, and Jeollanam-do), fixed region effects are incorporated.

4. Estimation results

This section employs multiple regression analysis to investigate the causal relationship between well-dying perception and psychological well-being while incorporating the moderating effects of received and provided social support. The primary research hypothesis focuses on the interaction between well-dying perception and social support, analyzing how these factors influence psychological well-being and how social support moderates this relationship. The fundamental analytical model is as follows, with additional models explained in subsequent sections.

$$y = \beta x_1 + \gamma x_2 + \delta x_1 x_2 + \eta X + \varepsilon$$

In this analytical model, the dependent variable (y) represents psychological well-being, while the independent variable (x_1) denotes well-dying perception. The moderator variable (x_2) represents received or provided social support, and the interaction term (x_1x_2) captures the moderating effect. The model also includes a set of socioeconomic and demographic control variables (X).

The dependent variable, psychological well-being, was operationalized as the mean score across 18 related survey items. Given the continuous nature of this variable, the Ordinary Least Squares (OLS) regression model was employed as the primary analytical approach.

In **Table 1**, Model (1) examines the effects of well-dying perception and received social support on psychological well-being without including interaction terms or control variables. Model (2) incorporates control variables, excluding interaction terms. Model (3) includes both control variables and interaction terms, while Model (4) replaces the social support variable with a binary "high social support" variable (coded as 1 if the social support received was 3 or higher).

Table 1. Well-dying perception, received social support and psychological well-being.

	DV: Psychological well-being			
	(1)	**(2)**	**(3)**	**(4)**
Well-dying perception	0.283*** (0.033)	0.281*** (0.033)	−0.126 (0.169)	0.289*** (0.037)
Received social support	0.345*** (0.033)	0.281*** (0.033)	−0.181 (0.192)	
High received social support				−0.318 (0.245)
Well-dying perception × Received social support			0.145** (0.059)	
Well-dying perception × High received social support				0.158** (0.074)
Sex		−0.038 (0.023)	−0.035 (0.023)	−0.019 (0.023)
Age		0.023 (0.022)	0.029 (0.022)	0.045* (0.023)
Income		0.023** (0.009)	0.025*** (0.009)	0.026*** (0.009)
Homeownership		0.017 (0.028)	0.009 (0.028)	0.007 (0.029)
Education		0.007 (0.018)	0.007 (0.018)	0.007 (0.019)
Economic activity		−0.002 (0.024)	0.004 (0.024)	0.02 (0.024)
Religions affiliation		−0.001 (0.023)	−0.002 (0.023)	0.001 (0.024)
Cohabitation		−0.022 (0.016)	−0.016 (0.016)	−0.024 (0.016)
Health condition		0.092*** (0.017)	0.094*** (0.017)	0.101*** (0.018)
Constant	0.928*** (0.101)	0.854*** (0.124)	2.121*** (0.531)	1.498*** (0.139)

Table 1. (*Continued*).

	DV: Psychological well-being			
	(1)	**(2)**	**(3)**	**(4)**
R^2	0.46	0.55	0.56	0.54
N	400	400	400	400

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The results reveal several notable findings. Well-dying perception exhibits a significant positive effect on psychological well-being across Models (1), (2), and (4). Received social support also shows a significant positive effect in Models (1) and (2). Notably, interaction terms in Models (3) and (4) demonstrate that both "well-dying perception × received social support" and "well-dying perception × high social support" have significant positive effects on psychological well-being.

In **Table 2**, Model (5) examines the effects of well-dying perception and provided social support on psychological well-being without including interaction terms or control variables. Model (6) incorporates control variables, excluding interaction terms. Model (7) includes both control variables and interaction terms, while Model (8) replaces the social support variable with a binary "high social support" variable (coded as 1 if the provided social support is 3 or higher).

Table 2. Well-dying perception, provided social support and psychological well-being.

	DV: Psychological well-being			
	(5)	**(6)**	**(7)**	**(8)**
Well-dying perception	0.221*** (0.038)	0.22*** (0.037)	−0.082 (0.184)	0.256*** (0.047)
Provided social support	0.388*** (0.038)	0.325*** (0.038)	0.007 (0.193)	
High provided social support				−0.251 (0.236)
Well-dying perception × Received social support			0.101** (0.04)	
Well-dying perception × High provided social support				0.127** (0.053)
Sex		−0.016 (0.023)	−0.015 (0.023)	−0.016 (0.024)
Age		0.036 (0.022)	0.039* (0.022)	0.038 (0.023)
Income		0.031** (0.009)	0.032*** (0.009)	0.031*** (0.009)
Homeownership		0.021 (0.028)	0.015 (0.029)	0.016 (0.03)
Education		0.008 (0.018)	0.008 (0.018)	0.005 (0.019)
Economic activity		0.006 (0.023)	0.008 (0.023)	0.013 (0.025)
Religions affiliation		−0.001 (0.023)	−0.001 (0.023)	0.011 (0.024)

Table 2. (*Continued*).

	DV: Psychological well-being			
	(5)	**(6)**	**(7)**	**(8)**
Cohabitation		−0.031* (0.016)	−0.029* (0.016)	−0.024 (0.017)
Health condition		0.095*** (0.017)	0.095*** (0.017)	0.103*** (0.018)
Constant	0.938*** (0.102)	0.806*** (0.125)	1.744*** (0.573)	1.576*** (0.165)
R^2	0.45	0.55	0.55	0.51
N	400	400	400	400

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 2 reveals consistent patterns, with well-dying perception significantly enhancing psychological well-being in Models (5), (6), and (8). Provided social support positively influences well-being in Models (5) and (6), while its interaction with well-dying perception ("well-dying perception × provided social support" and "well-dying perception × high provided social support") shows a significant positive effect in Models (7) and (8), confirming the study's hypotheses.

These findings strongly support all three research hypotheses: (1) well-dying perception positively affects psychological well-being; (2) received and provided social support moderate this relationship; and (3) both forms of social support amplify the benefits of well-dying perception.

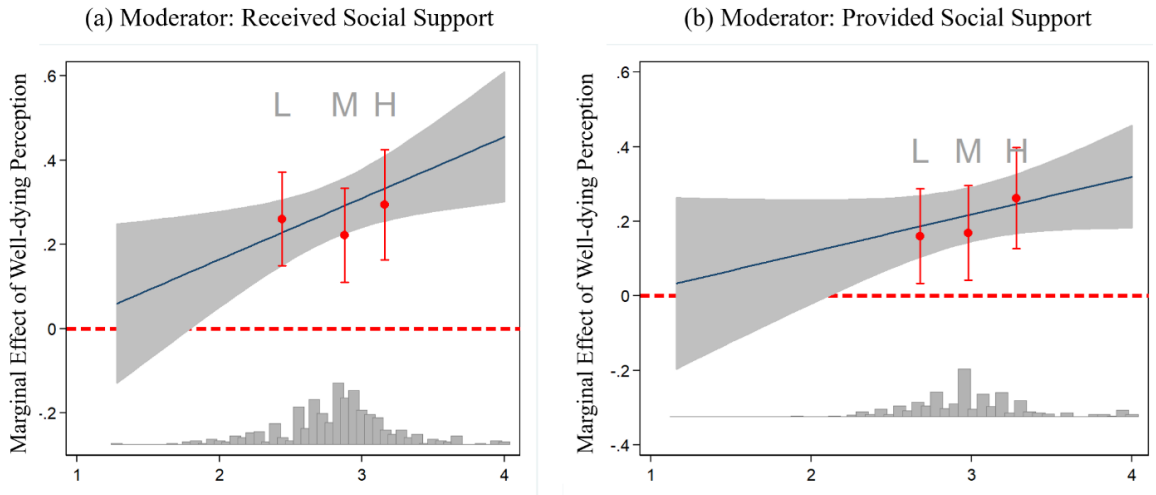


Figure 1. Moderating effect of received and provided social support: **(a)** Moderator: received social support; **(b)** Moderator: provided social support.

Figure 1 illustrates these relationships using the binning estimator method, showing that as received and provided social support increases, the positive effect of well-being perception on psychological well-being intensifies. This pattern, statistically significant across all groups, aligns with results from Models (3) and (7) in **Tables 1** and **2**, reinforcing the moderating role of social support in this relationship.

The findings confirm that well-dying perception and social support significantly enhance psychological well-being in older adults, supporting the study's primary

hypothesis. Both received and provided social support, moderating this relationship and reinforcing the positive impact of well-dying perception. These results align with the stress-buffering hypothesis, which emphasizes social support's role in reducing psychological distress and enhancing resilience. By integrating well-dying perception with social support dynamics, this study highlights the importance of fostering meaningful connections and promoting end-of-life awareness to improve well-being, particularly among elderly cancer patients.

5. Conclusion

This study provides empirical evidence on the relationship between well-dying perception and psychological well-being among elderly individuals, particularly those diagnosed with cancer. The findings indicate that a stronger perception of well-dying is positively associated with psychological well-being, thereby confirming the study's first hypothesis. Furthermore, both receiving and providing social support significantly contribute to psychological well-being, not only as direct determinants but also as moderating factors that enhance the beneficial effects of well-dying perception. These results substantiate the second and third hypotheses, demonstrating that social support serves as a crucial mechanism for alleviating psychological distress and fostering resilience among elderly individuals confronting end-of-life challenges.

The moderating role of social support aligns with established psychological theories, such as the stress-buffering hypothesis, which posits that social support mitigates the negative psychological consequences of stress and promotes emotional well-being. The empirical evidence suggests that both received and provided social support strengthen the positive relationship between well-dying perception and psychological well-being, underscoring the fundamental role of social connections in shaping end-of-life experiences. Additionally, the findings highlight the reciprocal nature of social support, emphasizing that both giving and receiving support contribute to an individual's overall psychological well-being.

From a policy and practical standpoint, these insights have significant implications for the development of welfare policies aimed at improving the mental well-being of the elderly population. Specifically, the study underscores the necessity of strengthening social support systems, particularly for elderly individuals diagnosed with terminal illnesses such as cancer. Healthcare interventions should prioritize the cultivation of robust social networks and the integration of psychosocial support within palliative care frameworks. Programs that facilitate meaningful interactions, promote dignity therapy, and provide opportunities for emotional closure may further enhance the well-dying experience and overall psychological well-being of aging individuals.

This study has certain limitations that should be acknowledged. Notably, it does not account for the specific types and severity of cancer among the elderly participants, which could influence the findings. Given that different types and stages of cancer may have distinct psychological and social implications, future research could enhance specificity by considering these factors in the analysis. However, the primary objective of this study is to elucidate the broader relationship between well-dying perception, social support, and psychological well-being as commonly experienced by elderly

individuals with serious illnesses. By focusing on this overarching dynamic, this study aims to provide generalizable insights rather than disease-specific conclusions. Future research should build on these findings by conducting more nuanced analyses that incorporate the type and severity of illnesses, thereby refining the understanding of how these variables interact with well-dying perception and psychological well-being.

Additionally, adopting a longitudinal research design would be instrumental in establishing clearer causal relationships between these factors. Furthermore, cultural variations in the impact of well-dying perception and social support warrant further investigation, as sociocultural contexts may shape individuals' experiences and coping mechanisms. Expanding the scope beyond cancer patients to encompass other elderly populations undergoing end-of-life transitions would provide a more comprehensive understanding of these complex dynamics, ultimately contributing to more targeted and effective interventions in palliative care and gerontology.

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Data availability: Data used in this study are shared at Harvard Dataverse (https://doi.org/10.7910/DVN/SAXNEU).

Ethical approval: The study was conducted in accordance with the Declaration of Helsinki. The ethical review of this study was approved by the Ethics Committee of Kyonggi University, approval number 202400121, approval date: 30 May 2024.

Informed consent statement: All participants signed the informed consent in this study.

Conflict of interest: The authors declare no conflict of interest.

References

1. Chochinov HM. Dying, dignity, and new horizons in palliative end-of-life care. CA Cancer J Clin. 2006; 56(2): 84–103.
2. Steinhauser KE, Christakis NA, Clipp EC, et al. Factors considered important at the end of life by patients, family, physicians, and other care providers. JAMA. 2000; 284(19): 2476–2482.
3. Cohen S, Wills TA. Stress, Social Support, and the Buffering Hypothesis. Psychol Bull. 1985; 98(2): 310–357.
4. Luo X, Miao X, Ding N, et al. Application of the end-of-life demands card game and mindfulness-based cancer recovery program for reducing negative emotion in patients with advanced lung cancer: a randomized controlled trial. Frontiers in Psychology. 2025; 16: 1476207.
5. Zhang Y, Wu Q, Xie Q, et al. Psychological stress and influence factors in elderly patients with mild coronary heart disease: a longitudinal follow-up study in Shanghai, China. Frontiers in Psychology. 2024; 15: 1399061.
6. Zhu W. The Impact of Social Support on the Mental Health of Cancer Patients: Evidence from China. Psycho-Oncologie. 2024; 18(1): 69–77.
7. Uchino BN. Understanding the Links Between Social Support and Physical Health: A Life-Span Perspective with Emphasis on the Separability of Perceived and Received Support. Perspectives on Psychological Science. 2009; 4(3): 236–255.
8. Meier DE, McCormick E, Lagman RL. Hospice: Philosophy of care and appropriate utilization in the United States—UpToDate. J Pain Symptom Manage. 2016; 52(2): 128–132.
9. Krikorian A, Maldonado C, Pastrana T. Patient's Perspectives on the Notion of a Good Death: A Systematic Review of the Literature. J Pain Symptom Manage. 2020; 59(1): 152–164.

10. Gysels MH, Evans C, Higginson IJ. Patient, caregiver, health professional and researcher views and experiences of participating in research at the end of life: A critical interpretive synthesis of the literature. BMC Med Res Methodol. 2012; 12(1): 1–17.
11. Kongsuwan W, Keller K, Touhy T, Schoenhofer S. Thai Buddhist intensive care unit nurses' perspective of a peaceful death: an empirical study. Int J Palliat Nurs. 2010; 16(5): 241–247.
12. Miyashita M, Morita T, Sato K, et al. Good Death Inventory: A Measure for Evaluating Good Death from the Bereaved Family Member's Perspective. J Pain Symptom Manage. 2008; 35(5): 486–498.
13. Gesser G, Wong PTP, Reker GT. Death Attitudes across the Life-Span: The Development and Validation of the Death Attitude Profile (DAP). OMEGA—Journal of Death and Dying. 1988; 18(2): 113–128.
14. Neimeyer RA, Klass D, Dennis MR. A Social Constructionist Account of Grief: Loss and the Narration of Meaning. Death Stud. 2014; 38(8): 485–498.
15. Breitbart W, Rosenfeld B, Gibson C, et al. Meaning-centered group psychotherapy for patients with advanced cancer: a pilot randomized controlled trial. Psychooncology. 2010; 19(1): 21–28.
16. Murray SA, Kendall M, Boyd K, Sheikh A. Illness trajectories and palliative care. BMJ: British Medical Journal. 2005; 330(7498): 1007.
17. Seale C. Constructing Death: The Sociology of Dying and Bereavement [Internet]. Constructing Death. Cambridge University Press; 1998.
18. McIlfatrick S, Hasson F, McLaughlin D, et al. Public awareness and attitudes toward palliative care in Northern Ireland. BMC Palliat Care. 2013; 12(1).
19. Gott M, Seymour J, Bellamy G, et al. Older people's views about home as a place of care at the end of life. Palliat Med. 2004; 18(5): 460–467.
20. Higginson IJ, Sen-Gupta GJA. Place of care in advanced cancer: a qualitative systematic literature review of patient preferences. J Palliat Med. 2000; 3(3): 287–300.
21. Carstensen LL. Social and emotional patterns in adulthood: support for socioemotional selectivity theory. Psychol Aging. 1992; 7(3): 331–338.
22. Sherbourne CD, Stewart AL. The MOS social support survey. Soc Sci Med. 1991; 32(6): 705–714.
23. Green McDonald P, O'Connell M, Lutgendorf SK. Psychoneuroimmunology and cancer: A decade of discovery, paradigm shifts, and methodological innovations. Brain Behav Immun. 2013; 30(0): S1.
24. Li LW, Conwell Y. Effects of changes in depressive symptoms and cognitive functioning on physical disability in home care elders. J Gerontol A Biol Sci Med Sci. 2009; 64(2): 230–236.
25. Ohara C, Komaki G, Yamagata Z, et al. Factors associated with caregiving burden and mental health conditions in caregivers of patients with anorexia nervosa in Japan. Biopsychosoc Med. 2016; 10(1): 1–9.
26. Noguchi T, Nakagawa-Senda H, Tamai Y, et al. The Association between Family Caregiver Burden and Subjective Well-Being and the Moderating Effect of Social Participation among Japanese Adults: A Cross-Sectional Study. Healthcare. 2020; 8(2): 87.
27. Zanjari N, Abolfathi Momtaz Y, et al. The Influence of Providing and Receiving Social Support on Older Adults' Well-being. Clin Pract Epidemiol Ment Health. 2022; 18(1): e174501792112241.
28. Travis LA, Lyness JM, Shields CG, et al. Social support, depression, and functional disability in older adult primary-care patients. The American journal of geriatric psychiatry. 2004; 12(3): 265–271.

Appendix

Table A1. Questions for psychological well-being in Korean.

	문항	전혀 아니다	아니다	그렇 다	매우 그렇다
1	나는 다른 사람의 입장을 잘 따르는 편 이다.	①	②	③	④
2	다른 사람이 뭐라 해도 내 생각이 옳으 면 그대로 하는 편이다.	①	②	③	④
3	다른 사람의 판단보다는 나 자신의 판 단이 중요하다.	①	②	③	④
4	나는 내 성격을 대체로 좋아한다.	①	②	③	④
5	내 인생을 돌아볼 때 지금까지 살아온 것에 만족한다.	①	②	③	④
6	지금까지 살면서 내가 성취한 것이 많 다고 생각한다.	①	②	③	④
7	지금까지 나의 인생은 배움과 변화 그 리고 성장의 과정이었다.	①	②	③	④
8	나는 새로운 경험이나 도전하는 것을 좋아한다.	①	②	③	④
9	나는 내 생활을 한번 크게 바꾸거나 고 쳐 보고 싶다.	①	②	③	④
10	나는 내가 성취하고 싶은 인생의 목표 가 있다.	①	②	③	④
11	나는 그날그날을 살면서 앞으로의 미래 에 대하여 생각한다.	①	②	③	④
12	현재 나는 더 이상 할 일이 없다고 생 각하지 않는다.	①	②	③	④
13	매일 매일의 내 생활은 피곤하지 않다.	①	②	③	④
14	전반적으로 나는 계획성 있게 사는 편 이다.	①	②	③	④
15	나는 일상생활에서 내가 맡은 책임을 잘 수행하는 편이다.	①	②	③	④
16	친밀한 관계를 유지하는 것이 나에게 어렵게 느껴지지 않는다.	①	②	③	④
17	나는 다른 사람들과 어울리는 것을 좋 아하는 편이다.	①	②	③	④
18	나는 가깝거나 친한 사람이 대체로 많 은 편이다.	①	②	③	④

Table A2. Questions for psychological well-being in English.

	Questions	Not at all	Unlikely	Likely	Very likely
1	I tend to follow other people's perspectives well.	①	②	③	④
2	I stick to my own opinion if I believe it is right, regardless of what others say.	①	②	③	④
3	My own judgment is more important to me than others' judgments.	①	②	③	④
4	I generally like my personality.	①	②	③	④
5	When I look back on my life, I am satisfied with how I have lived so far.	①	②	③	④
6	I believe I have accomplished a lot in my life.	①	②	③	④
7	My life so far has been a process of learning, change, and growth.	①	②	③	④
8	I enjoy new experiences and challenges.	①	②	③	④
9	I want to make a significant change or improvement in my life.	①	②	③	④
10	I have life goals that I want to achieve.	①	②	③	④
11	While living day by day, I also think about my future.	①	②	③	④
12	I do not believe that I have nothing left to do in life.	①	②	③	④
13	I do not feel exhausted in my daily life.	①	②	③	④
14	Overall, I tend to live in a planned and organized manner.	①	②	③	④
15	I generally fulfill my responsibility.	①	②	③	④

Table A2. (*Continued*).

	Questions	Not at all	Unlikely	Likely	Very likely
16	Maintaining close relationships does not feel difficult for me.	①	②	③	④
17	I enjoy socializing with others.	①	②	③	④
18	I generally have many close or intimate relationships.	①	②	③	④

Table A3. Questions for well-dying perception in Korean.

	문항	전혀 아니다	아니다	그렇다	매우 그렇다
1	나는 내 삶의 의미를 찾으려 노력한 다.	①	②	③	④
2	나는 하루하루를 의미 있게 보내려고 노력한다.	①	②	③	④
3	나는 내 삶의 중요한 가치를 찾고자 노력한다.	①	②	③	④
4	나는 내 삶을 의미있게 하는 일을 찾 는다.	①	②	③	④
5	나는 내 삶의 목적 또는 사명을 찾으 려고 노력한다.	①	②	③	④
6	나는 평소에 가족들과 호스피스에 대 해 의논할 것이다.	①	②	③	④
7	나는 평소에 내가 원하는 마지막을 보 내는 장소(병원,집,등)에 대하여 가족 들과 대화를 나눌 것이다.	①	②	③	④
8	나는 평소에 내가 원하는 장례식이나 장례방법(매장,화장,시신기증)에 대해 가족들과 대화를 나눌 것이다.	①	②	③	④
9	나는 평소에 가족에게 내가 원하는 방 식으로 삶을 마무리할 수 있게 협조를 구할 것이다.	①	②	③	④
10	나는 죽음이 내 인생의 자연스러운 과 정이라고 생각한다.	①	②	③	④
11	나는 언제라도 나에게 죽음이 찾아올 수 있다는 사실을 인정한다.	①	②	③	④
12	나는 죽음을 내 삶의 일부로 받아들인 다.	①	②	③	④
13	나는 나의 죽음을 떠올렸을 때 드는 느낌을 있는 그대로 받아 들인다.	①	②	③	④
14	나는 죽음을 생각하며 어떻게 살아야 할지 고민한다.	①	②	③	④
15	나는 어떻게 죽는 것이 사람답게 죽는 것인가에 대해 생각한다.	①	②	③	④
16	나는 사람답게 죽기 위해 어떠한 준비 가 필요한지 생각한다.	①	②	③	④
17	나는 연명의료를 받을지 미리 결정할 것이다.	①	②	③	④
18	나는 호스피스를 받을지 미리 결정할 것이다.	①	②	③	④
19	나는 사전연명의료의향서를 작성할 것 이다.	①	②	③	④

Table A4. Questions for well-dying perception in English.

	Questions	Not at all	Unlikely	Likely	Very likely
1	I strive to find meaning in my life.	①	②	③	④
2	I make an effort to spend each day meaningfully.	①	②	③	④
3	I seek to identify the important values in my life.	①	②	③	④
4	I look for activities that bring meaning to my life.	①	②	③	④
5	I strive to discover my life's purpose or mission.	①	②	③	④
6	I will discuss hospice care with my family in advance.	①	②	③	④
7	I will talk with my family about where I would like to spend my final moments (e.g., hospital, home).	①	②	③	④

Table A4. (*Continued*).

	Questions	Not at all	Unlikely	Likely	Very likely
8	I will discuss my preferred funeral arrangements or burial method (e.g., burial, cremation, body donation) with my family.	①	②	③	④
9	I will ask my family to support me in ending my life in the way I desire.	①	②	③	④
10	I believe death is a natural part of life.	①	②	③	④
11	I acknowledge that death can come to me at any time.	①	②	③	④
12	I accept death as a part of my life.	①	②	③	④
13	I accept my feelings as they are when I think about my own death.	①	②	③	④
14	I reflect on how I should live my life while thinking about death.	①	②	③	④
15	I contemplate what it means to die with dignity.	①	②	③	④
16	I consider what preparations are necessary to ensure a dignified death.	①	②	③	④
17	I will decide in advance whether to receive life-sustaining treatment.	①	②	③	④
18	I will decide in advance whether to receive hospice care.	①	②	③	④
19	I will complete an advance directive for life-sustaining treatment.	①	②	③	④

Table A5. Questions for received social support in Korean.

	문항	전혀 아니 다	아니 다	그렇 다	매우 그렇 다
1	내 주변사람들은 내가 사람과 보살 핌을 받고 있다고 느끼게 해준다.	①	②	③	④
2	내 주변 사람들은 내가 고민하는 문 제에 대해 이야기 하면 기꺼이 들어 준다.	①	②	③	④
3	내 주변 사람들은 함께 있으면 친밀 감을 느끼게 해준다.	①	②	③	④
4	내 주변 사람들은 내가 마음 놓고 의지할 수 있는 사람이다.	①	②	③	④
5	내 주변 사람들은 항상 나의 일에 관심을 갖고 걱정해 준다.	①	②	③	④
6	내 주변 사람들은 내가 결단을 내리 지 못하고 망설일 때 격려해 주고 용기를 준다.	①	②	③	④
7	내 주변 사람들은 내가 기분이 좋지 않을 때 나의 감정을 이해하고 기분을 전환시켜 주려고 노력한다.	①	②	③	④
8	내 주변 사람들은 내가 취한 행동의 옳고 그름을 객관적으로 평가해준다.	①	②	③	④
9	내 주변 사람들은 내가 필요하고 가 치 있는 존재임을 인정하고 알게 해 준다.	①	②	③	④
10	내 주변 사람들은 내가 하는 일에 자부심을 가질 수 있도록 나의 일을 인정해준다.	①	②	③	④
11	내 주변 사람들은 나를 인격적으로 존중해준다.	①	②	③	④
12	내 주변 사람들은 내가 잘 했을 때 칭찬을 아끼지 않는다.	①	②	③	④
13	내 주변 사람들은 나의 의견을 존중 해 주고 긍정적으로 받아들여준다.	①	②	③	④
14	내 주변 사람들은 내가 중요한 선택 을 해야 할 때 충고와 조언을 해준다.	①	②	③	④
15	내 주변 사람들은 내게 일어난 문제 의 원인을 찾는데 도움이 되는 정보와 지식을 제공해 준다.	①	②	③	④
16	내 주변 사람들은 네기 모르거나 이 해할 수 없는 사실에 대해 알게 해 준다.	①	②	③	④
17	내 주변 사람들은 내가 현실을 이해 하고 잘 적응할 수 있도록 건전한 충고를 해준다.	①	②	③	④

Table A5. (*Continued*).

	문항	전혀 아니 다	아니 다	그렇 다	매우 그렇 다
18	내 주변 사람들은 대체로 내가 배울 점이 많은 존경할 만한 사람들이다.	①	②	③	④
19	내 주변 사람들은 내가 어려운 상황 에 직면하면 현명하게 대처할 수 있는 방안을 제시해 준다.	①	②	③	④
20	내 주변 사람들은 내가 필요로 하는 돈이나 물건 등을 최선을 다해 마련해 준다.	①	②	③	④
21	내 주변 사람들은 내가 도움이 필요 할 때 걱정 또는 간접적으로 도와준다.	①	②	③	④
22	내 주변 사람들은 나의 일에 대사를 바라지 않고 도와준다.	①	②	③	④
23	내 주변 사람들은 내가 필요로 할 때 자기가 소유한 것들을 빌려준다.	①	②	③	④
24	내 주변 사람들은 내가 요청할 때마 나 기꺼이 시간을 내주고 응해 준다.	①	②	③	④
25	내 주변 사람들은 내가 아플 때 대 신해 줄 수 있는 일을 대신해 준다.	①	②	③	④

Table A6. Questions for received social support in English.

	Questions	Not at all	Unlikely	Likely	Very likely
1	The people around me make me feel cared for and supported.	①	②	③	④
2	The people around me are willing to listen when I talk about my concerns.	①	②	③	④
3	The people around me make me feel a sense of closeness when we are together.	①	②	③	④
4	The people around me are individuals I can rely on with confidence.	①	②	③	④
5	The people around me always show interest in and concern for my well-being.	①	②	③	④
6	The people around me encourage and give me courage when I hesitate to make a decision.	①	②	③	④
7	The people around me understand my emotions and try to uplift me when I am feeling down.	①	②	③	④
8	The people around me objectively assess whether my actions are right or wrong.	①	②	③	④
9	The people around me acknowledge and help me realize that I am a needed and valuable person.	①	②	③	④
10	The people around me recognize my efforts, allowing me to take pride in my work.	①	②	③	④
11	The people around me treat me with respect and dignity.	①	②	③	④
12	The people around me do not hesitate to praise me when I do well.	①	②	③	④
13	The people around me respect my opinions and respond positively to them.	①	②	③	④
14	The people around me provide advice and guidance when I need to make important decisions.	①	②	③	④
15	The people around me provide information and knowledge to help me understand the causes of my problems.	①	②	③	④
16	The people around me help me learn about things I do not know or understand.	①	②	③	④
17	The people around me offer sound advice to help me understand and adapt to reality.	①	②	③	④
18	The people around me are generally respectable individuals from whom I can learn a lot.	①	②	③	④
19	The people around me suggest wise solutions when I face difficult situations.	①	②	③	④
20	The people around me do their best to provide money or goods when I need them.	①	②	③	④

Table A6. (*Continued*).

	Questions	Not at all	Unlikely	Likely	Very likely
21	The people around me help me either directly or indirectly when I need assistance.	①	②	③	④
22	The people around me help me selflessly, without expecting anything in return.	①	②	③	④
23	The people around me lend me their belongings when I need them.	①	②	③	④
24	The people around me willingly make time for me whenever I ask.	①	②	③	④
25	The people around me take care of things on my behalf when I am sick.	①	②	③	④

Table A7. Questions for provided social support in Korean.

	문항	전혀 아니 다	아니 다	그렇 다	매우 그렇 다
1	나는 내 주변사람들에게 사랑과 보 살핌을 받고 있다고 느끼게 해준다.	①	②	③	④
2	는 내 주변사람들이 고민하는 문제 에 대해 이야기하면 가까이들어준다.	①	②	③	④
3	나는 내 주변사람들과 함께 있으면 친밀감을 느끼게 해준다.	①	②	③	④
4	나는 내 주변사람들이 마음 놓고 의 지할 수 있는 사람이다.	①	②	③	④
5	나는 항상 내 주변사람들의 일에 관 심을 갖고 걱정해 준다.	①	②	③	④
6	나는 내 주변사람들이 결단을 내리 지 못하고 망설일 때 격려해 주고 용기를 준다.	①	②	③	④
7	나는 내 주변사람들이 기분이 좋지 않을때 그들의 감정을 이해하고 기분을 전환시켜주려고 노력한다.	①	②	③	④
8	나는 내 주변사람들이 취한 행동의 옳고 그름을 객관적으로 평가해준다.	①	②	③	④
9	나는 내 주변사람들이 필요하고 가 치 있는 존재임을 인정하고 존재임 을 인정하고 알게 해준다.	①	②	③	④
10	나는 내 주변사람들이 하는 일에 자 부심을 가질 수 있도록 그들의 일을 인정해준다.	①	②	③	④
11	나는 내 주변사람들을 인격적으로 존중해준다.	①	②	③	④
12	나는 내 주변사람들이 잘 했을 때 칭찬을 아끼지 않는다.	①	②	③	④
13	나는 내 주변사람들의 의견을 존중 해 주고 긍정적으로 받아들여준다.	①	②	③	④
14	나는 내 주변사람들이 중요한 선택 을 해야 할 때 충고와 조언을 해준 다.	①	②	③	④
15	나는 내 주변사람들에게 일어난 문 제의 원인을 찾는데 도움이 되는 정보와 지식을 제공해준다.	①	②	③	④
16	나는 내 주변사람들이 모르거나 이 해할 수 없는 사실에 대해 알게 해 준다.	①	②	③	④
17	나는 내 주변사람들이 현실을 이해 하고 잘 적응할 수 있도록 건전한 충고를 해준다.	①	②	③	④
18	나는 대체로 내 주변사람들이 배울 점이 많은 존경할 만한 사람이다.	①	②	③	④
19	나는 내 주변사람들이 어려운 상황 에 직면하면 현명하게 대처할 수 있는 방안을 제시해 준다.	①	②	③	④
20	나는 내 주변사람들이 필요로 하는 돈이나 물건 등을 최선을 다해 마련해 준다.	①	②	③	④
21	나는 내 주변 사람들이 도움이 필요 할 때 직접 또는 간접적으로 도와준다.	①	②	③	④
22	나는 내 주변 사람들의 일에 대가를 바라지 않고 도와준다.	①	②	③	④

Table A7. (*Continued*).

	문항	전혀 아니 다	아니 다	그렇 다	매우 그렇 다
23	나는 내 주변 사람들이 필요로 할 때 내가 소유한 것들을 빌려준다.	①	②	③	④
24	나는 내 주변사람들이 요청할 때마 다 기꺼이 시간을 내주고 응해 준다.	①	②	③	④
25	나는 내 주변사람들이 아플 때 대신 해 줄 수 있응 일을 대신해 준다.	①	②	③	④

Table A8. Questions for provided social support in English.

	Questions	Not at all	Unlikely	Likely	Very likely
1	I make the people around me feel loved and cared for.	①	②	③	④
2	I listen attentively when the people around me share their concerns.	①	②	③	④
3	I create a sense of closeness when I am with the people around me.	①	②	③	④
4	I am someone the people around me can rely on with confidence.	①	②	③	④
5	I always show interest in and concern for the well-being of those around me.	①	②	③	④
6	I encourage and give courage to those around me when they hesitate to make a decision.	①	②	③	④
7	I understand the emotions of those around me when they are feeling down and try to uplift them.	①	②	③	④
8	I objectively assess the rightness or wrongness of the actions taken by those around me.	①	②	③	④
9	I acknowledge and help the people around me recognize their worth and importance.	①	②	③	④
10	I recognize the efforts of those around me so they can take pride in their work.	①	②	③	④
11	I treat the people around me with respect and dignity.	①	②	③	④
12	I do not hesitate to praise the people around me when they do well.	①	②	③	④
13	I respect and positively acknowledge the opinions of those around me.	①	②	③	④
14	I provide advice and guidance when the people around me need to make important decisions.	①	②	③	④
15	I provide information and knowledge to help the people around me identify the causes of their problems.	①	②	③	④
16	I help the people around me understand things they do not know or find difficult to comprehend.	①	②	③	④
17	I offer sound advice to help those around me understand and adapt to reality.	①	②	③	④
18	I am generally a respectable person from whom the people around me can learn a lot.	①	②	③	④
19	I suggest wise solutions when those around me face difficult situations.	①	②	③	④
20	I do my best to provide money or necessary items when the people around me need them.	①	②	③	④
21	I help the people around me directly or indirectly when they need assistance.	①	②	③	④
22	I help the people around me selflessly, without expecting anything in return.	①	②	③	④
23	I lend my belongings to those around me when they need them.	①	②	③	④
24	I willingly make time for those around me whenever they ask.	①	②	③	④
25	I take care of responsibilities on behalf of those around me when they are sick.	①	②	③	④

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Article

The effects of music therapy on psychological distress and quality of life in cancer surgery patients: A systematic review and meta-analysis

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Abstract: Background and **object:** The research on the impact of music therapy in alleviating psychological distress and improving the quality of life in perioperative cancer patients remains inconclusive. The primary objective of this study is to analyze the effects of music therapy on psychological distress and quality of life in patients undergoing cancer surgery. **Method:** A search strategy was used with PubMed, Embase, Cochrane Library, and Web of Science. The search period covered all records from database inception to November 2024. This systematic review and meta-analysis followed the publishing guidelines as set forth by PRISMA and was registered with PROSPERO (registration number CRD 42024587929). The selection criteria were based on randomized clinical trials evaluating pain, anxiety, quality of life, and sleep in patients undergoing perioperative surgery for cancer. This study used the Cochrane Risk of Bias Assessment Tool to determine. Meta-analysis was performed using Stata 18.0 software and Revman 5.4. **Results:** patients' pain, the pain relief in the intervention group was significantly better than that in the control group at 4 h after extubation [SMD = −2.95 (95% CI: −3.58, −2.31)], and during longer follow-up, it was found that the patients' pain relief was significantly better as the duration of the intervention increased, with 1–2 weeks being [SMD = −0.70 (95% CI: −1.58, 0.18)], 4–6 weeks [SMD = −1.01 (95% CI: −1.83, −0.19)], > 6 weeks [SMD = −1.51 (95% CI: −2.17, −0.85)]. The study of patient anxiety found that pre-surgical music therapy did not significantly alleviate anxiety [SMD = −0.37 (95% CI: −0.81, 0.08)], and at 4 h after extubation, the intervention group had a significantly better anxiety effect than the control group [SMD = −3.42 (95% CI: −4.11, −2.73)]. The patients' sleep was analyzed for a total of about 18 weeks of follow-up, and it was found that as the duration of the intervention increased, the patients' overall sleep showed significant improvement compared to the control group, which showed a trend of further improvement as the duration of the intervention increased. Patients' long-term quality of life was evaluated using PRI scores (long-term prognosis), and the results indicated that music therapy patients showed superior outcomes compared to the control group at 2 weeks [WMD = −1.52, 95% CI: −2.48 to −0.57], 4 weeks [WMD = −1.62, 95% CI: −2.57 to −0.57], and 6 weeks [WMD = −1.27, 95% CI: −1.96 to −0.58]. Moreover, the benefits of music therapy were sustained over the long term. In a 12-month follow-up study, music therapy patients were consistently more likely to report better quality of life scores than those in the control group. **Conclusion:** The use of music therapy for cancer surgery patients can significantly improve postoperative pain and anxiety and help patients improve their sleep and long-term prognosis.

Keywords: music therapy; cancer surgery patients; systematic review; meta-analysis; pain; anxiety; quality of life; long-term outcomes

1. Introduction

On 4 April 2024, CA: A Cancer Journal for Clinicians released [1] the latest global cancer statistics report. The article highlights that approximately one in five individuals worldwide will develop cancer during their lifetime, with about one in nine men and one in twelve women dying from the disease. Based on global data on new cancer cases and deaths, it is estimated that in 2022 there were nearly 20 million new cancer cases and approximately 9.7 million cancer-related deaths worldwide. Although the clinical ability to diagnose and treat cancer has appeared to improve significantly in recent years, few studies have focused on the psychological distress of cancer patients in the perioperative period.

In fact, approximately [2] 50% of cancer patients have been shown to suffer from psychological distress, including clinically significant conditions such as anxiety, depression, or other undetected or untreated psychological distress associated with different stages of cancer progression. These psychological distress problems are associated with decreased quality of life, prolonged recovery time, poor treatment adherence, and abnormal illness behaviors [3–5]. A literature review [6] suggests that patients with different types of cancer exhibit slightly different rates of psychological distress problems, including anxiety. These variations are associated with differences in prognoses, pain levels, body image disruptions, tumor-related neuropsychiatric effects, and treatment-related neuropsychiatric side effects.

Before cancer surgery, patients may be under psychological distress, suffer from psychological distress such as preoperative anxiety, depression, and low self-efficacy [7], or suffer from psychological depression, repression [8,9], and irritability caused by pain in the affected area, or suffer from psychological stress, anxiety, and depression caused by unknown risks in the future surgical treatment, all of which may make surgery more difficult [7] to perform. Anxiety and depression significantly affect the patient's quality of life, especially during the surgical stage [7], and may even affect the success rate of the surgery or the degree of healing after surgery [10], prolonging the recovery time [11].

There are many therapies available for anxiety and depression and for improving quality of life in cancer patients. Music therapy, mindfulness-based therapy [12], psychoeducational intervention [13], and cognitive behavioral therapy [14], although these interventions have the potential to alleviate anxiety in cancer patients, they have significant limitations. Mindfulness therapy requires patients to spend a lot of time mastering the skills of mindfulness practice. Psychoeducational interventions are often delivered in small groups or in a uniform format and may not meet the individual needs of patients. Cognitive-behavioral therapy requires high-demand psychological resources, active patient involvement, and a change in mindset. However, perioperative cancer patients may not be able to fully cooperate due to physical or mental fatigue, and the treatment must be customized according to the patient's specific needs and stage of the disease. Music therapy can be personalized based on the patient's preferences and can be implemented using simple equipment (such as headphones or speakers) without the need for expensive instruments or invasive procedures. The non-invasive, flexible, and efficient implementation of music

therapy [15–17] for preoperative and postoperative cancer patients stands out among many interventions.

Music therapy is a type of psychotherapy that utilizes a variety of musical experiences designed by a trained music therapist to help manage and mitigate psychological barriers and further restore or enhance the patient's physical and mental health. Music therapy has been demonstrated to be one of the most effective complementary therapies, particularly in addressing psychological and physical symptoms, as evidenced by previous systematic reviews and meta-analyses [18]. In fact, music therapy can effectively alleviate physical and psychological distress in patients through rhythm and tone in a non-invasive way. It is also considered a highly effective psychotherapy method for relieving mental illness. Music, as a medium, can help patients better express their thoughts and emotions and promote communication of inner emotions. There are some preliminary studies reporting the effectiveness of music therapy, but there is a lack of evidence-based medicine.

This study aims to explore the effects of music therapy on the psychological distress and quality of life of patients undergoing cancer surgery in order to provide new ideas for improving the survival prognosis of cancer patients.

2. Materials and methods

2.1. Inclusion and exclusion criteria

Inclusion criteria: Following the PICOS principle: (1) Study subjects (P): Patients undergoing cancer surgery during the perioperative period (preoperative, intraoperative, or postoperative phases); (2) Intervention (I): Standard treatment combined with music therapy; (3) Control measure (C): standard treatment; (4) Outcome indicators (O): Pain condition, anxiety, psychological state, sleep condition, and quality of life; (5) Type of study (S): Randomized controlled trial. Exclusion criteria: (1) animal studies; (2) reviews, dissertations, and case reports; (3) inability to obtain valid data; (4) duplicate publications.

2.2. Search strategy

The following four databases were used: PubMed, Embase, The Cochrane Library, and Web of Science. The search period ranged from the inception of each database to November 2024. The following English search terms were used: "Neoplasms", "Tumors", "Music", "Songs", and others. Detailed search terms and strategies are provided in Appendix **Table A1**.

2.3. Data extraction

Two researchers (ZL and SH) independently screened the literature, extracted the data, and assessed the quality of the included studies based on the inclusion and exclusion criteria. Disagreements were resolved through discussion or referred to a third party for arbitration. Data were extracted after full-text review. Extracted data included the number of subjects in the experimental and control groups, age, follow-up duration, and intervention measures. For continuous variables, the number of subjects, mean, and standard deviation were extracted.

2.4. Quality assessment

The Cochrane [19] risk of Bias Assessment tool was used in this study. The following criteria were assessed: (1) whether the randomization method introduces bias; (2) whether the allocation method introduces bias; (3) whether blinding was implemented; (4) whether the data are complete; (5) whether the study results introduce bias; (6) whether there are other potential sources of bias. If all six criteria are fully met, the risk of bias is low; if some criteria are met, the risk of bias is moderate; if none of the criteria are met, the risk of bias is high. This study excluded literature with a high risk of bias.

2.5. Statistical analysis

Meta-analysis was conducted using Stata 18.0 [20] and RevMan 5.4 software [21]. Statistical heterogeneity was assessed using the Q test and I^2 test. $I^2 < 50\%$ indicates moderate heterogeneity, while $I^2 \geq 50\%$ indicates high heterogeneity. If no statistical heterogeneity was found, the fixed-effects model was used; otherwise, the random-effects model was applied. The extracted data are all continuous numerical variables. For variables with the same unit, WMD (Weighted Mean Difference) is used for combined calculation, and for a variable with different units, SMD (Standardized Mean Difference) is used for calculation. Meta-regression was performed to assess the effect of intervention time on outcome measures. The Egger and Begg tests were employed to assess publication bias.

3. Results

3.1. Literature screening process and results

The initial search identified 5427 relevant articles. After sequential screening, 2152 duplicate articles were excluded, along with 564 articles, including basic research and reviews. A further 2700 articles were excluded based on title and abstract review. Finally, 8 articles were included [22]. The literature screening process and results are shown in **Figure 1**.

3.2. Literature characterization table

This study included 8 articles [23–30], with a total of 918 participants. The average age of the experimental group was 51.60 years, with a maximum age of 67.26 years and a minimum age of 44.47 years. The average age of the control group was 51.66 years, with a maximum age of 66.89 years and a minimum age of 45.00 years. The studies were conducted in Asia and North America. Details are provided in the **Table 1**. Comprehensive feature descriptions can be found in the Appendix **Table A3** Feature table.

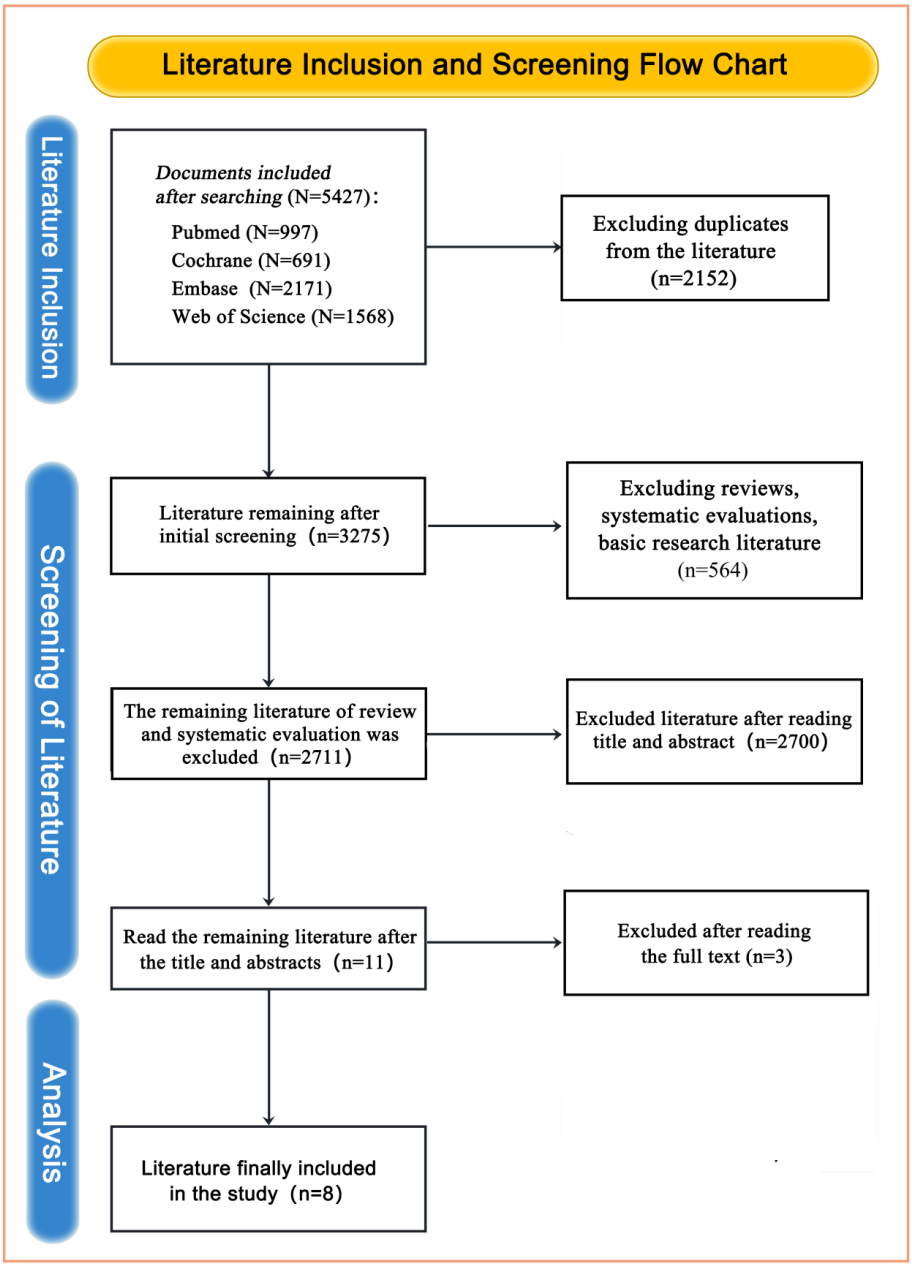


Figure 1. PRISMA flow diagram.

3.3. Quality evaluation table

This meta-analysis included 8 studies, all of which were randomized controlled trials (RCTs). Four studies [24,25,29,30] clearly described the allocation method. Due to the nature of the experiments, none of the studies implemented blinding, and two studies [23,27] combined music intervention with other interventions, which may introduce bias. Therefore, an "uncertain" risk of bias was assigned. No high risk of bias was identified in the other studies. Details are provided in **Figures 2** and **3**.

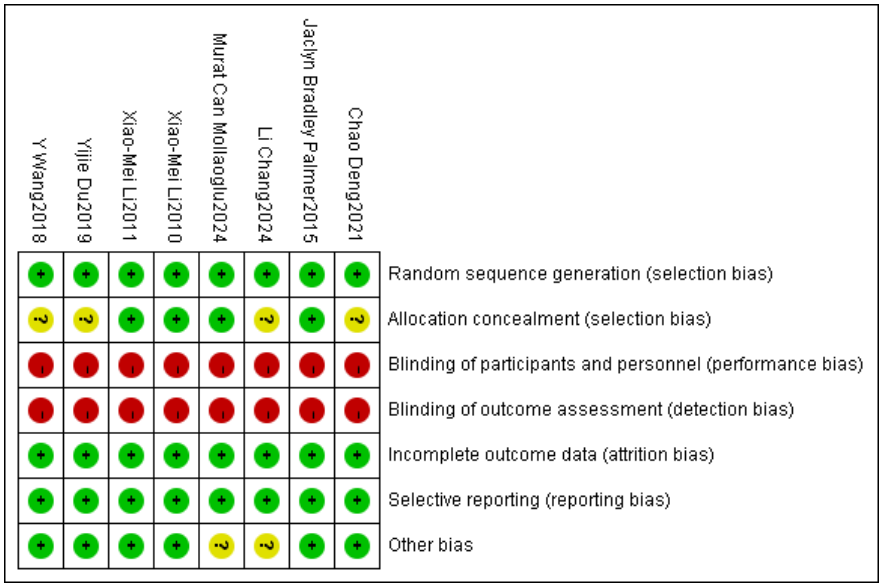


Figure 2. Quality evaluation table.

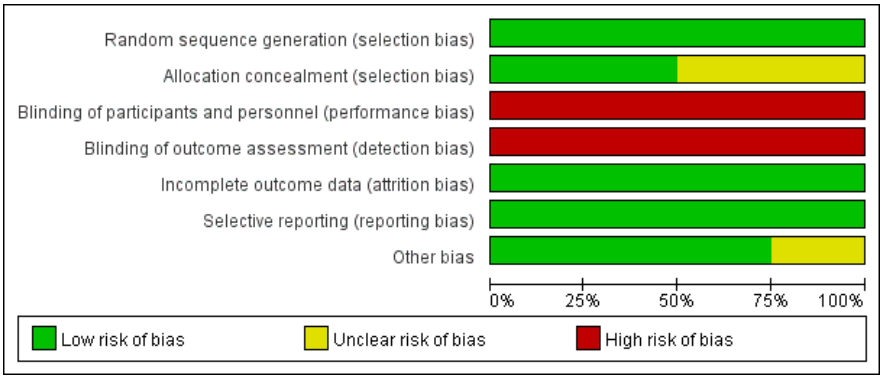


Figure 3. Quality evaluation table.

Table 1. Characteristics of included studies and details (partial data).

Author	Year	Region	Disease	Experimental Group Size	Control Group Size	Experimental Group Age	Control Group Age	Follow-up Duration
Murat Can Mollaoglu	2024	Asia	Breast Cancer Patients	30	30	48.93 ± 11.92	50.9 ± 13.77	10 weeks
Xiao-Mei Li	2010	Asia	Breast Cancer Patients	60	60	44.88 ± 9.37	45.13 ± 9.48	6–8 weeks
Xiao-Mei Li	2011	Asia	Breast Cancer	60	60	44.88 ± 9.37	45.13 ± 9.48	6–8 weeks
Jaclyn Bradley Palmer	2015	North America	Breast Cancer	68	65	58.8 ± 14.4	61.3 ± 14.9	Until discharge
Li Chang	2021	Asia	Breast Cancer	51	49	44.47 ± 11.39	45.00 ± 12.11	18 weeks
Chao Deng	2021	Asia	Breast Cancer	40	40	54.2 ± 9.8	50.2 ± 10.6	Until discharge
Yijie Du	2019	Asia	Lung Cancer	114	102	67.26 ± 6.69	66.89 ± 8.42	12 months
Y Wang	2018	Asia	Liver Cancer	45	44	49.4 ± 5.8	48.7 ± 6.6	1 week

3.4. Forest plot of pain condition

The forest plot analysis included 6 studies examining patients' pain conditions, divided into subgroups based on time points (preoperative [28], immediate

postoperative [30], 4 h after extubation [28], 1–2 weeks [24,30], 4–6 weeks [23,24], and ≥ 6 weeks [23,24]). The analysis found that music therapy had no significant effect on pain relief before surgery [SMD = −0.25 (95% CI: −0.69, 0.19)] and after surgery [SMD = −0.25 (95% CI: −0.69, 0.19)].

At 4 h after extubation, the intervention group showed significantly greater pain relief than the control group [SMD = −2.95 (95% CI: −3.58, −2.31)]. In the longer follow-up period, the study indicated a trend toward pain improvement with music therapy, but the difference was not statistically significant for the 1–2 week intervention [SMD = −0.70 (95% CI: −1.58, 0.18)], with I^2 = 89.6%, indicating high heterogeneity. For the 4–6 week analysis, I^2 = 84.3%, and the study demonstrated that music therapy significantly alleviated patients' pain [SMD = −1.01 (95% CI: −1.83, −0.19)]. For the ≥ 6 week analysis, I^2 =72.4%, and the study showed that music therapy significantly improved patients' pain [SMD = −1.51 (95% CI: −2.17, −0.85)]. Details are provided in the **Figure 4**. The specific results of the effects on pain in different patients are supplemented in Appendix **Table A4**.

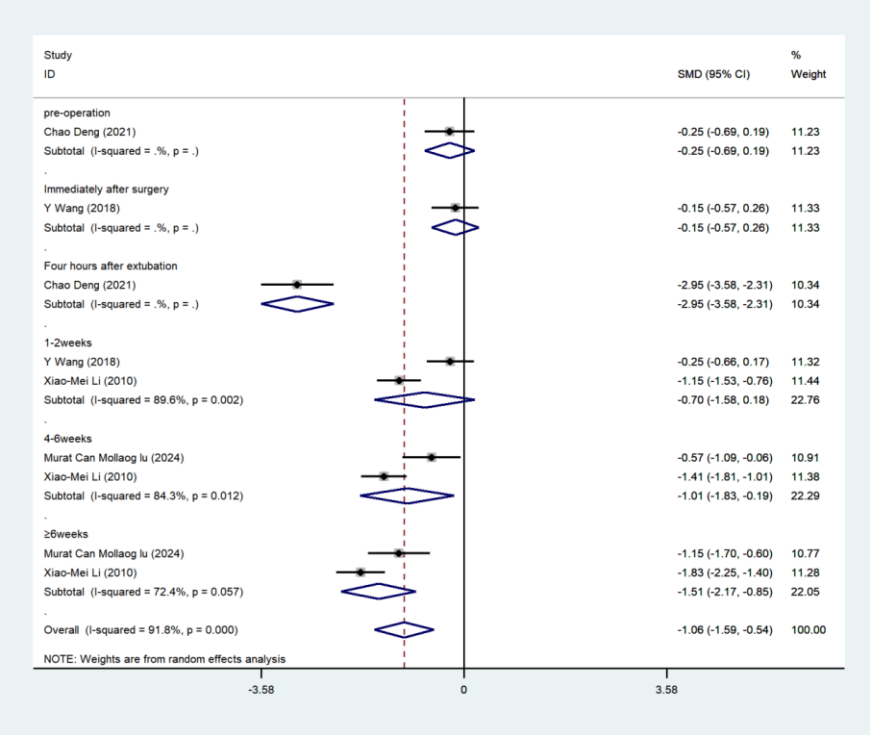


Figure 4. Forest plot of pain condition.

3.5. Forest plot of anxiety condition

Five studies were included in the forest plot analysis of patients' anxiety conditions. These studies were divided into subgroups based on time points (preoperative [28], 4 h after extubation [28], 2–4 weeks [24], 6–10 weeks [23,24], and > 10 weeks [23]). The analysis found that music therapy before surgery did not significantly reduce preoperative anxiety [SMD = −0.37 (95% CI: −0.81, 0.08)].

At 4 h after extubation, the intervention group showed significantly greater anxiety relief than the control group [SMD = −3.42 (95% CI: −4.11, −2.73)]. In the longer follow-up period, the study showed that as the intervention duration increased,

anxiety relief in patients significantly improved. For the 2–4 week analysis, I^2 = 90.0%, and the study demonstrated that music therapy significantly alleviated patients' anxiety [SMD = −1.21 (95% CI: −2.09, −0.32)]. For the 6–10 week analysis, I^2 = 98.2%. The study showed a trend toward anxiety improvement, but the difference was not statistically significant [SMD = −1.24 (95% CI: −3.87, 1.39)]. For the > 10 week analysis, music therapy significantly improved patients' anxiety [SMD = −1.50 (95% CI: −2.07, −0.92)]. Details are provided in the **Figure 5**.

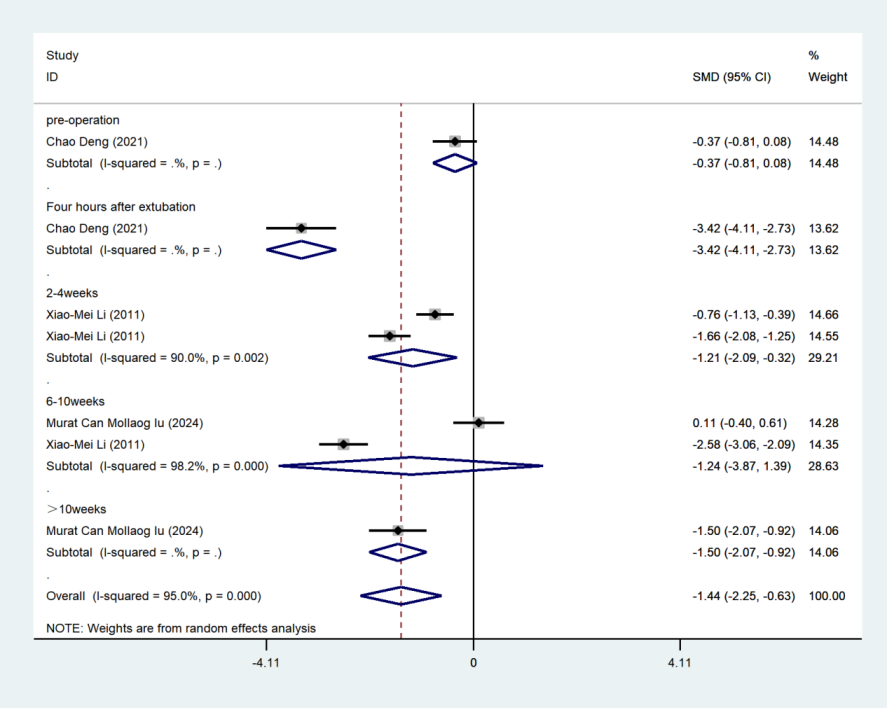


Figure 5. Forest plot of anxiety condition.

3.6. Forest plot of quality of life

Concerning the study on patients' quality of life outcomes, one study [27] was included, which evaluated five aspects. In a 12-month follow-up period, the study found that music therapy improved patients' physical [3.68 (95% CI: 2.15, 5.21)], social and family [3.97 (95% CI: 2.61, 5.33)], and relationship with doctors [0.91 (95% CI: 0.25, 1.57)] and functional [3.14 (95% CI: 1.99, 4.29)]. Details are provided in the **Figure 6**.

3.7. Forest plot of sleep condition

There are 6 evaluation indicators for the patients' sleep condition [27], which were analyzed from 3 follow-up time points, with a total follow-up of about 18 weeks. The study found that as the intervention time increased, the overall sleep condition of the patients improved significantly. At 2 weeks, the combined effect value was WMD = −0.20, 95% CI (−0.32, −0.08). At 8 weeks, the combined effect value was WMD = −0.51, 95% CI (−0.62, −0.39). At 18 weeks, the combined effect value was WMD = −0.82, 95% CI (−0.93, −0.71). As the intervention time increased, the patients' sleep condition gradually improved. Details are provided in the **Figures 7–9** and **Table 2**.

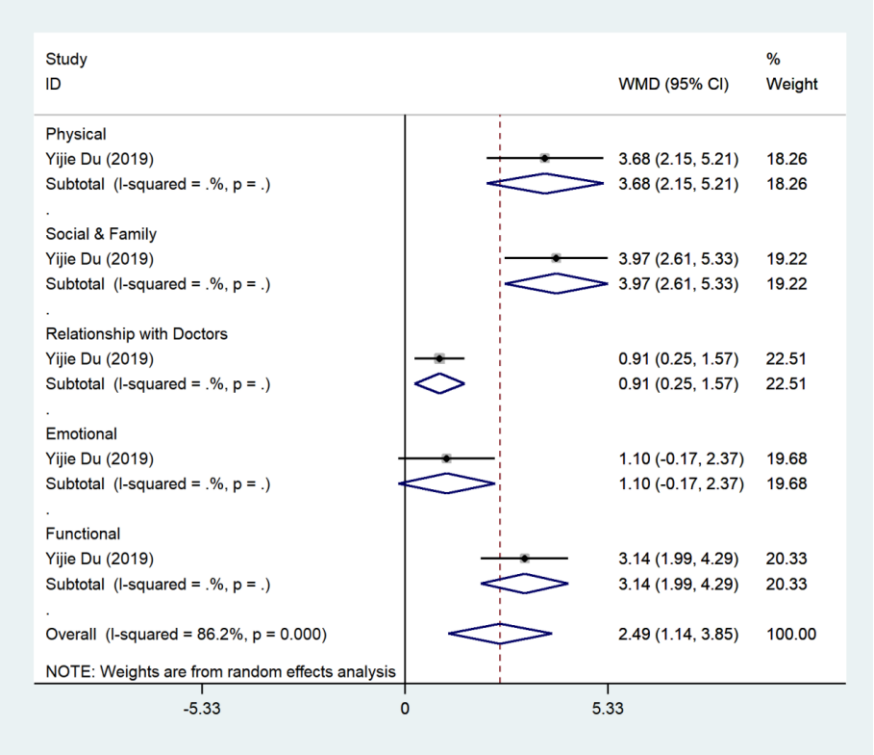


Figure 6. Forest plot of quality of life.

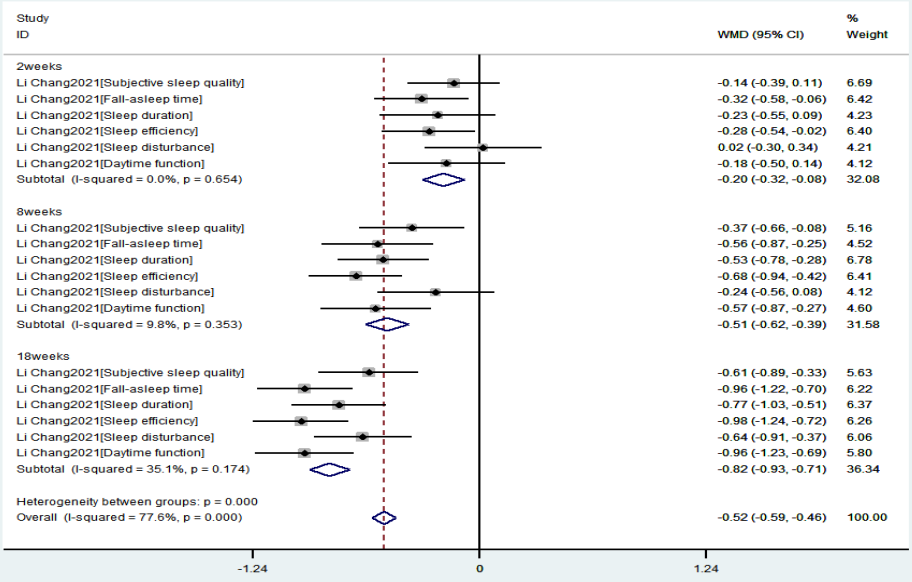


Figure 7. Forest plot of sleep condition.

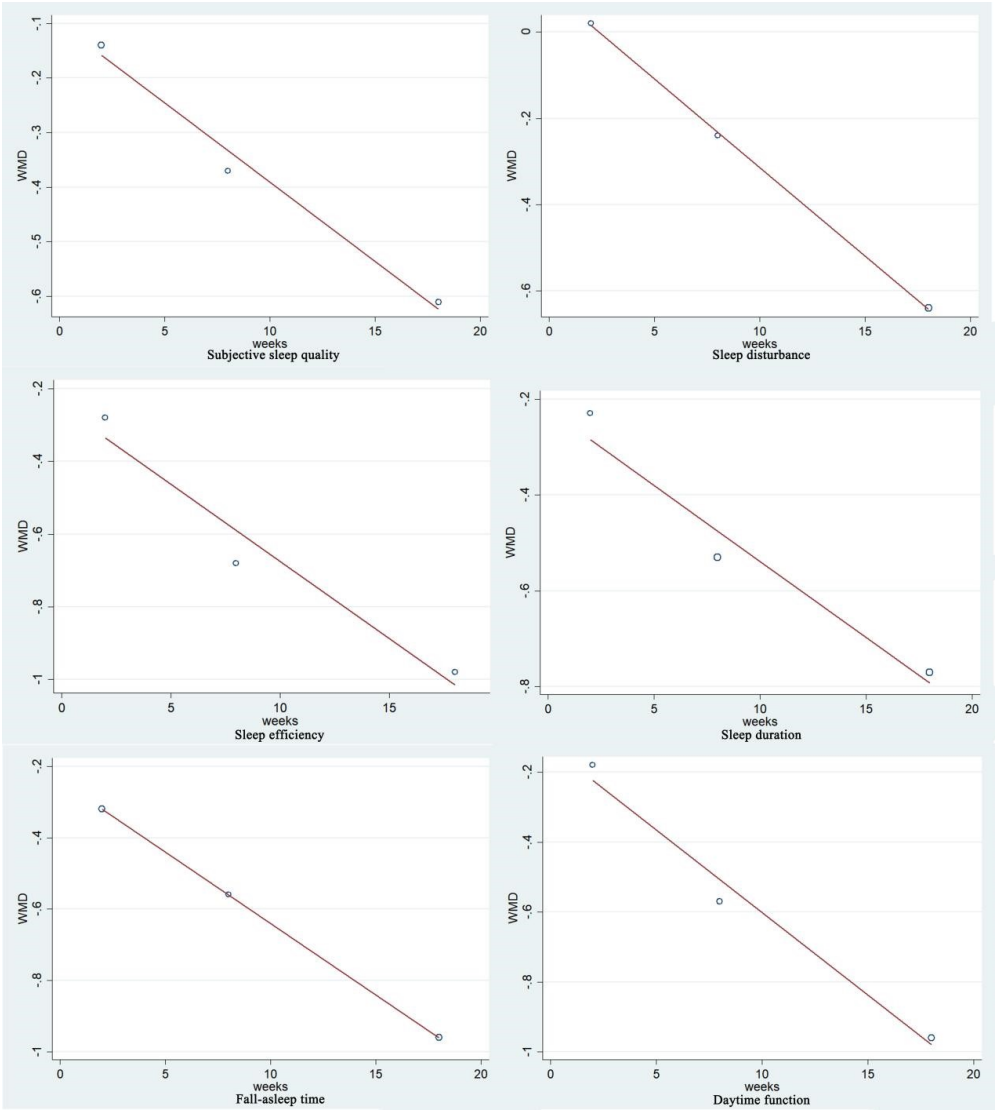


Figure 8. Linear regression plots of sleep condition.

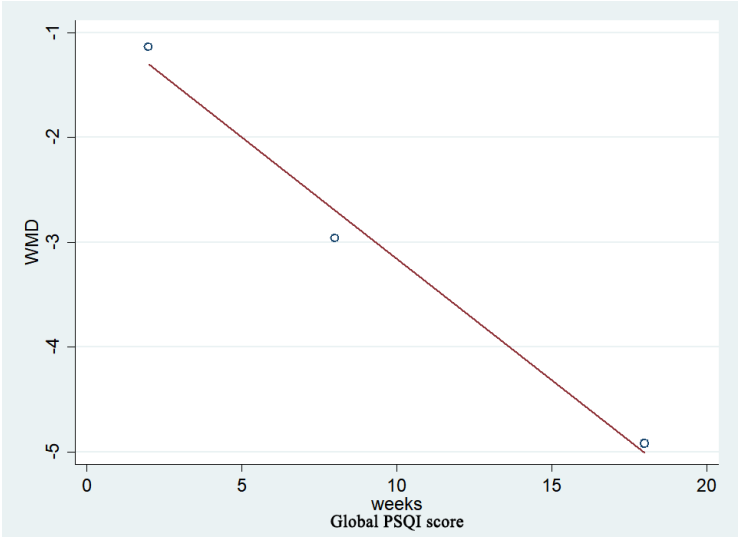


Figure 9. Linear regression plots of sleep condition.

Table 2. Multiple linear regression analysis of sleep.

Variable	*β*.	Se	*t*	*P*	95% CI	
Global PSQI score	−0.23	0.03	−7.26	0.09	−0.64	0.17
Daytime function	−0.05	0.01	−3.61	0.17	−0.21	0.12
Fall-asleep time	−0.04	0.01	−3.44	0.18	−0.19	0.11
Sleep duration	−0.04	0.01	−3.44	0.18	−0.19	0.11
Sleep efficiency	−0.04	0.01	−3.65	0.17	−0.19	0.11
Sleep disturbance	−0.04	0.01	−3.19	0.19	−0.2	0.12
Subjective sleep quality	−0.03	0.01	−2.45	0.25	−0.18	0.12

The study found that compared with the control group, with the increase of intervention time, the patients' sleep quality showed a trend of further improvement, but it was not statistically significant. The specific results are as follows: Global PSQI score β. = −0.23, 95% CI (−0.64, 0.17), p = 0.09; Daytime function β. = −0.05, 95% CI (−0.21, 0.12), p = 0.17; Fall-asleep time β. = −0.04, 95% CI (−0.19, 0.11), p = 0.18; Sleep duration β. = −0.04, 95% CI (−0.19, 0.11), p = 0.18; Sleep efficiency β. = −0.04, 95% CI (−0.19, 0.11), p = 0.17; Sleep disturbance β. = −0.04, 95% CI (−0.2, 0.12), p = 0.19; Subjective sleep quality β. = −0.03, 95% CI (−0.18, 0.12), p = 0.25.

3.8. Forest plot of PRI score (long-term prognosis)

The quality of life of patients was analyzed based on one article [23] that included three scoring items, with assessments conducted at three follow-up time points. The study found that patients who received music therapy showed significantly better quality of life compared to the control group at 2 weeks [WMD = −1.52, 95% CI: −2.48 to −0.57], 4 weeks [WMD = −1.62, 95% CI: −2.57 to −0.57], and 6 weeks [WMD = −1.27, 95% CI: −1.96 to −0.58]. Details are provided in the **Figures 10–12** and **Table 3**.

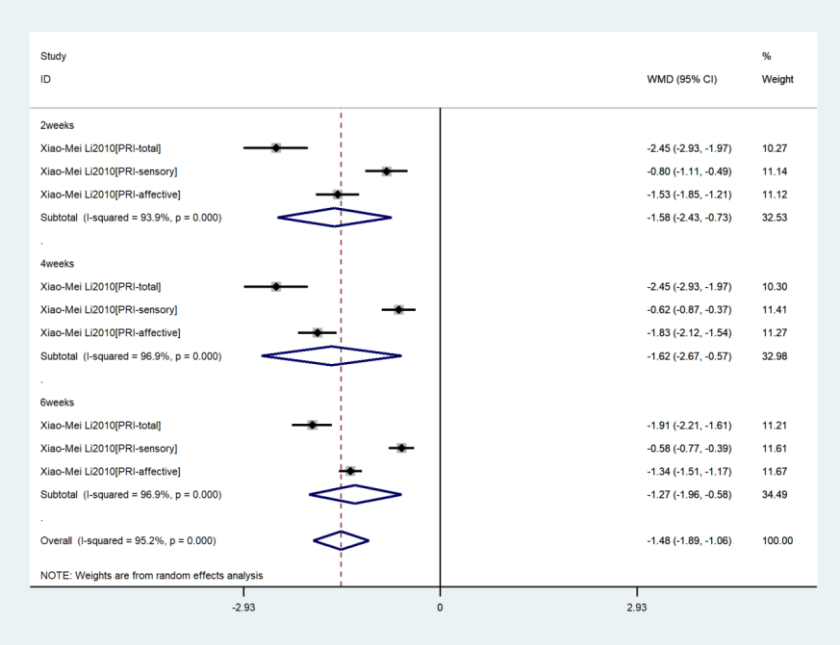


Figure 10. Forest plot of PRI score (long-term prognosis).

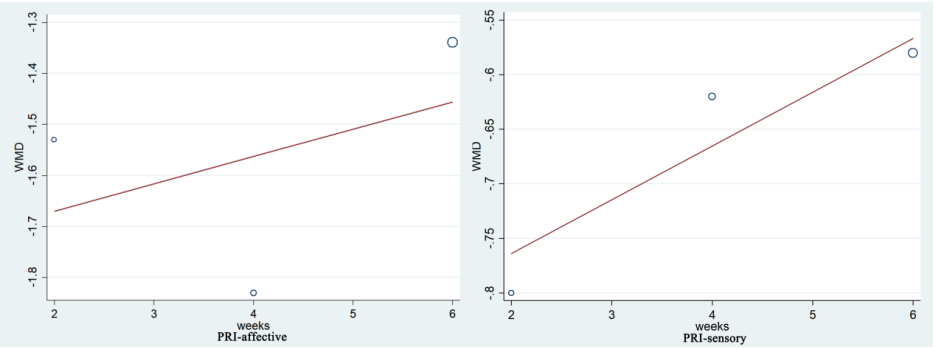


Figure 11. Linear regression plots of PRI score (long-term prognosis).

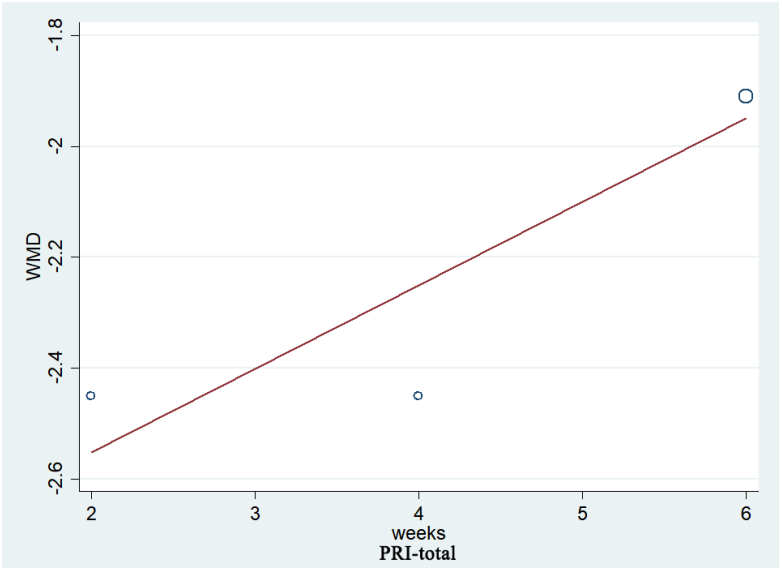


Figure 12. Linear regression plots of PRI score (long-term prognosis).

The study found a positive linear trend between each indicator and the WMD; however, this relationship was not statistically significant. Nevertheless, the findings suggest that long-term music intervention can improve patients' PRI scores compared to the control group. The specific results are as follows: PRI-sensory β. = 0.05, 95% CI (−0.52, 0.62), p = 0.47; PRI-affective β. = 0.05, 95% CI (−1.37, 1.48), p = 0.72; PRI-total β. = 0.15, 95% CI (−0.74, 1.05), p = 0.28.

Table 3. Multiple linear regression analysis of PRI dimension.

Variable	*β.*	Se	*t*	*P*	95% CI	
PRI-sensory	0.05	0.04	1.09	0.47	−0.52	0.62
PRI-affective	0.05	0.11	0.48	0.72	−1.37	1.48
PRI-total	0.15	0.07	2.14	0.28	−0.74	1.05

3.9. Publication Bias Assessment

The bias test for the primary research indicators found that the "PRI-total" may have publication bias, and the other indicators have no basis for publication bias. Details are provided in the **Figure 13** and **Table 4**.

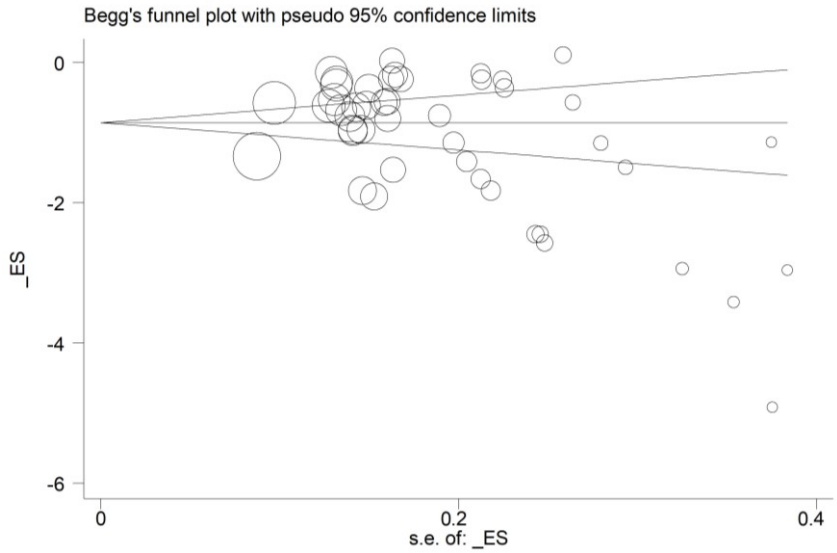


Figure 13. Begg's Funnel Plot for publication Bias Assessment.

Table 4. Publication Bias Assessment using Begg's and Egger's tests.

Variable	*n*	Begg's *z*	Begg's *p*	Egger's bias	Egger's *p*
PRI-affective	3	−0.52	0.6	−4.76	0.42
PRI-sensory	3	−1.57	0.12	−3.15	0.23
PRI-total	3	−0.52	0.6	−5.89	0.01
Anxiety	7	−0.75	0.45	−11.16	0.26
Pain	9	−1.04	0.3	−9.05	0.28
Daytime functioning	3	1.57	0.12	39.28	0.13
Global PSQI Scores	3	−0.52	0.6	−11.28	0.98
Subjective Sleep Quality	3	−0.52	0.6	−16.98	0.35
Time to Sleep	3	−0.52	0.6	−6.19	0.84
Sleep Efficiency	3	−1.57	0.12	−72.57	0.22
Duration of sleep	3	0.52	0.6	11.29	0.52
Sleep Disorders	3	0.52	0.6	21.61	0.34

3.10. Summary of main findings

This study initially identified 5427 relevant documents. After excluding 2152 duplicate records, 564 basic research articles, reviews, and other ineligible documents, and 2700 documents based on title and abstract screening, 8 studies were ultimately included. A total of 918 participants were analyzed, with an average age of 51.60 years in the experimental group and 51.66 years in the control group. All included studies were randomized controlled trials (RCTs), and 4 studies explicitly described their allocation methods. Due to the nature of the intervention, blinding was not implemented in any of the studies. Additionally, two studies combined music therapy with other interventions, which may have introduced potential bias. No articles were deemed to have a high risk of bias based on the quality assessment.

Regarding the pain of patients, the study found that music therapy had no significant relief effect before surgery [SMD = −0.25 (95% CI: −0.69, 0.19)] and after surgery [SMD = −0.25 (95% CI: −0.69, 0.19)]. At 4 h after extubation, the pain relief

effect of the intervention group was significantly better than that of the control group [SMD = −2.95 (95% CI: −3.58, −2.31)]. During the longer follow-up process, the study found that the pain relief of patients was significantly better with the increase of intervention time, including 1–2 weeks [SMD = −0.70 (95% CI: −1.58, 0.18)], 4–6 weeks [SMD = −1.01 (95% CI: −1.83, −0.19)], and > 6 weeks [SMD = −1.51 (95% CI: −2.17, −0.85)].

Regarding the anxiety of patients, the study found that music therapy before surgery did not significantly reduce environmental anxiety [SMD = −0.37 (95% CI: −0.81, 0.08)]. At 4 h after extubation, the anxiety effect of the intervention group was significantly better than that of the control group [SMD = −3.42 (95% CI: −4.11, −2.73)]. During the longer follow-up, the study found that the anxiety relief of patients was significantly better with the increase of intervention time, including 2–4 weeks [SMD = −1.21 (95% CI: −2.09, −0.32)], 6–10 weeks [SMD = −1.24 (95% CI: −3.87, 1.39)], and > 10 weeks [SMD = −1.50 (95% CI: −2.07, −0.92)].

The patients' sleep conditions were analyzed and followed up for about 18 weeks. The study found that as the intervention time increased, the patients' overall sleep conditions improved significantly. Compared with the control group, as the intervention time increased, the patients' sleep quality showed a trend of further improvement, but it was not statistically significant, which may be due to the small sample size.

The PRI score was used to evaluate the long-term quality of life of patients. The study found that the patients who received music therapy had better life treatment than the control group at 2 weeks [WMD = −1.52 (95% CI: −2.48, −0.57)], 4 weeks [WMD = −1.62 (95% CI: −2.57, −0.57)], and 6 weeks [WMD = −1.27 (95% CI: −1.96, −0.58)], and long-term music therapy is still beneficial to patients. In addition, a 12-month follow-up study analyzed the quality of life of patients and found that the patients who received music therapy had better life treatment at 2 weeks [WMD = −1.52 (95% CI: −2.48, −0.57)], 4 weeks [WMD = −1.62 (95% CI: −2.57, −0.57)], and 6 weeks [WMD = −1.27 (95% CI: −1.96, −0.58)] had better quality of life than the control group.

Finally, the above ≥ 3 research indicators were tested for bias. The study found that the indicator "PRI-total" may have publication bias, and no publication bias was found for other indicators.

4. Discussion

In the case of music therapy intervention being effective in alleviating pain changes in cancer patients, the results are consistent with those reported by Yangöz et al. [31], but using a different approach. Two studies in this review combined music interventions with other interventions, and four studies allocated music interventions for 30 min each in the morning and evening. The other two studies included 5 min of music at the bedside before surgery, instrumental harp music selected by the music therapist through headphones during surgery, and music with soothing melodies, steady rhythms, and consistent dynamics, and online training: 1 h of online interactive vocal training per day. Offline training: Offline group vocal therapy once a week, 2 h each time. They [31] used a single passive listening method for music intervention

lasting 30–60 min, 1–3 times, and found that music intervention also had a positive effect on cancer pain management. A systematic review and meta-analysis of cancer treatments by Margrethe Langer Bro et al. [32] similarly found that music reduced pain (SMD −0.88 [95% CI, −1.45 to −0.32]) and concluded that the most effective music intervention mode appeared to be passive listening to self-selected recorded music in a single-session design. Compared with our meta-analysis and systematic review, our study found that music therapy should focus more on the time of intervention, 4–6 weeks after surgical extubation [SMD = −1.01 (95% CI: −1.83, −0.19)] and > 6 weeks [SMD = −1.51 (95% CI: −2.17, −0.85)], so we believe that long-term music therapy intervention has a positive effect on cancer surgery patients. From a mechanistic perspective, this outcome may be attributed to the effects of music therapy on glutamate secretion and glutamatergic neuronal responses. Additionally, music therapy has been shown to modulate the activity of limbic and paralimbic brain structures, including the anterior cingulate cortex [33] (ACC). The anterior cingulate cortex (ACC) is particularly responsive to music due to its unique location in the brain and its extensive connections with the limbic system and prefrontal cortex. These characteristics suggest that music therapy may effectively alleviate pain [34,35].

With respect to anxiety management, the findings of this study align with the meta-analysis conducted by Zang et al. [36] in general trends; however, discrepancies were observed in specific details. Most of their interventions used 15–60 min of recorded music. Music intervention had a moderate advantage in reducing anxiety compared with standard care (SMD: −0.54, 95% CI: [−0.92, −0.16]). Our study found that music therapy did not significantly reduce anxiety in cancer patients before surgery [SMD = −0.37 (95% CI: −0.81, 0.08)]. It is possible that the patient's anxiety is not that bad; Teckenberg et al. [37], when evaluating the effect of this intervention on hospitalized pregnant women, found a significant effect only in patients who had high anxiety before the intervention. The study found that music therapy intervention was more effective in relieving anxiety after surgery. At 4 h after extubation, the anxiety effect of the intervention group was significantly better than that of the control group [SMD = −3.42 (95% CI: −4.11, −2.73)]. During the longer follow-up, the study found that the anxiety relief of patients was significantly better with the increase of intervention time, including 2–4 weeks [SMD = −1.21 (95% CI: −2.09, −0.32)], 6–10 weeks [SMD = −1.24 (95% CI: −3.87, 1.39)], and > 10 weeks [SMD = −1.50 (95% CI: −2.07, −0.92)]. This may be attributed to the neurochemical effects of music [38], including increased levels of endogenous opioids and dopamine [39–41], as well as its ability to reduce cortisol in natural settings (field studies) [42] and to prevent cortisol elevations, or even reduce cortisol levels, in stressful situations [43]. Therefore, long-term intervention of music therapy has a positive effect on cancer surgery patients.

The results of music therapy on the quality of life and long-term prognosis of cancer surgery patients are considerable. The results are consistent with those of a meta-analysis and systematic literature review by Nguyen et al. [44], which showed an improvement in quality of life (SMD: 0.42, 95% CI 0.02 to 0.82), but their study subjects were cancer patients receiving chemotherapy. In a 12-month follow-up period, the study found that music therapy improved patients' physical [3.68 (95% CI: 2.15, 5.21)], social and family [3.97 (95% CI: 2.61, 5.33)], relationship with doctors [0.91 (95% CI: 0.25, 1.57)], and functional [3.14 (95% CI: 1.99, 4.29)] abilities.

Music therapy has also shown positive results in improving sleep conditions. The meta-analysis and systematic literature review by Ding et al. [45] detailed the effectiveness and safety of music therapy. The study was followed up for a total of about 18 weeks. The study found that compared with the control group, the patients' sleep quality showed a trend of further improvement with the increase of intervention time, but it was not statistically significant, which may be due to the small sample size. The potential mechanism underlying the relationship between music and sleep may involve music inducing a physiological relaxation response, reducing arousal levels, and alleviating sleep disturbances. This may increase peripheral β-endorphin levels, modulate serotonin levels, and decrease sympathetic nervous [46,47] activity.

This study underwent a Grading of Recommendations Assessment, Development and Evaluation (GRADE) assessment, and the quality of the evidence identified was a major limitation in drawing conclusions that could adequately address the research questions. The GRADE assessment rated the evidence as low to moderate quality, primarily due to the level of heterogeneity. Therefore, it is recommended to conduct more high-quality randomized clinical trials, refine the type and duration of music interventions, and adjust the baseline data of different patient groups to further enhance the evidence base for music therapy across diverse patient populations. Appendix **Table A2** provides detailed GRADE assessment data.

4.1. Research limitations

(1) Due to the particularity of the experimental design, this study could not use (blind design); (2) different music types, time and sound intensity may affect the results, so it is necessary to further include more studies for subgroup analysis to improve the robustness of the results; (3) this study was the inability to conduct statistical analyses for certain outcomes due to the small number of studies available. This limitation may affect the generalizability of our findings and emphasizes the need for further research in this field; (4) although the subjects included were cancer patients, the basic information such as education level and income of different subjects was not completely consistent. Further exploration of the effects of music intervention may be needed for different populations; (5) this study preliminarily explored the effects of music therapy on the physical and mental health of patients, but different types and stages of cancer are not completely consistent, which may affect the results. Therefore, more articles should be included in the future to conduct subgroup analysis based on the patients' disease conditions and refine the potential value of music therapy for cancer surgery patients.

4.2. Clinical significance of the study

This study provides an effective and non-invasive nursing model for cancer patients, which not only improves their mental health and quality of life but also offers medical institutions an economical and efficient intervention strategy. Future research should further explore the optimal type of music, intervention frequency, and implementation methods to provide clearer guidance for clinical practice. Simultaneously, it is important to focus on methodological rigor and innovation, incorporating interdisciplinary perspectives, integrating music therapy with modern

technology and personalized medicine, and promoting its widespread application and standardized development in cancer care.

Conclusion: For patients undergoing cancer surgery, the use of music therapy can significantly improve postoperative pain and anxiety, help improve patients' sleep, and improve long-term prognosis.

Author contributions: Conceptualization, ZL and SH; methodology, ZL; software, ZL; data curation, ZL; writing—original draft preparation, ZL; writing—review and editing, ZL and SH; visualization, ZL; supervision, ZL and SH. All authors have read and agreed to the published version of the manuscript.

Ethical approval: Not applicable.

Informed consent statement: Not applicable.

Protocol and registration: This systematic review and meta-analysis followed the publishing guidelines as set forth by PRISMA and was registered with PROSPERO (registration number CRD 42024587929).

Conflict of interest: The authors declare no conflict of interest.

Abbreviations

PRI	Long-term prognosis
PSQI	Pittsburgh sleep quality index
WMD	Weighted mean difference
SMD	Mean Difference, Standardized Mean Difference

References

1. Bray F, Laversanne M, Sung H, et al. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: A Cancer Journal for Clinicians. 2024; 74(3): 229–263. doi:10.3322/caac.21834
2. Mehnert A, Hartung TJ, Friedrich M, et al. One in two cancer patients is significantly distressed: Prevalence and indicators of distress. Psychooncology. 2018; 27(1): 75–82. doi:10.1002/pon.4464
3. Grassi L. Psychiatric and psychosocial implications in cancer care: the agenda of psycho-oncology. Epidemiology and Psychiatric Sciences. 2020; 29: e89. doi:10.1017/S2045796019000829
4. Pitman A, Suleman S, Hyde N, Hodgkiss A. Depression and anxiety in patients with cancer. BMJ. 2018; 361: k1415. doi: 10.1136/bmj.k1415
5. Mitchell AJ, Chan M, Bhatti H, et al. Prevalence of depression, anxiety, and adjustment disorder in oncological, haematological, and palliative-care settings: a meta-analysis of 94 interview-based studies. Lancet Oncology. 2011; 12(2): 160–174. doi:10.1016/S1470-2045(11)70002-X
6. Smith HR. Depression in cancer patients: Pathogenesis, implications and treatment (Review). Oncology Letters. 2015; 9(4): 1509–1514. doi:10.3892/ol.2015.2944
7. Levett DZH, Grimmett C. Psychological factors, prehabilitation and surgical outcomes: evidence and future directions. Anaesthesia. 2019; 74(S1): 36–42. doi:10.1111/anae.14507
8. Doan LV, Blitz J. Preoperative assessment and management of patients with pain and anxiety disorders. Current Anesthesiology Reports. 2020; 10(1): 28–34. doi:10.1007/s40140-020-00367-9
9. Ip HY, Abrishami A, Peng PW, et al. Predictors of postoperative pain and analgesic consumption: A qualitative systematic review. Anesthesiology. 2009; 111(3): 657–677. doi:10.1097/ALN.0b013e3181aae87a

10. Mavros MN, Athanasiou S, Gkegkes ID, et al. Do psychological variables affect early surgical recovery? PLoS One. 2011; 6(5): e20306. doi: 10.1371/journal.pone.0020306
11. Siddiqui N, Dwyer M, Stankovich J, Pilcher DV. Hospital length of stay variation and comorbidity of mental illness: a retrospective study of five common chronic medical conditions. BMC Health Services Research. 2018; 18(1): 498. doi: 10.1186/s12913-018-3316-2
12. McCombie A, Jordan J, Mulder R, et al. A randomized controlled trial of mindfulness in recovery from colorectal cancer. Chin. J. Integr. Med. 2023; 29(7): 590–599. doi: 10.1007/s11655-023-3632-1
13. Zhang X, Liu H, Lin L, Xiao H. Effects of psycho-education interventions on colorectal cancer patients: A systematic review and meta-analysis. Journal of Cancer Education. 2023; 38(5): 1413–1419. doi :10.1007/s13187-023-02349-x
14. Zhou S, Wang Y, Wang Q, et al. A meta-analysis of the effects of cognitive behavioral therapy on quality of life and negative emotions of informal cancer caregivers. Front Psychiatry. 2022; 13: 979158. doi: 10.3389/fpsyt.2022.979158
15. Burrai F, Micheluzzi V, Bugani V. Effects of live sax music on various physiological parameters, pain level, and mood level in cancer patients: A randomized controlled trial. Holistic Nursing Practice. 2014; 28(5): 301–311. doi: 10.1097/HNP.0000000000000041
16. Liao J, Yang YF, Cohen L, et al. Effects of Chinese medicine five-element music on the quality of life for advanced cancer patients: A randomized controlled trial. Chin. J. Integr. Med. 2013; 19(10): 736–740. doi:10.1007/s11655-013-1593-5
17. Gao Y, Wei Y, Yang W, et al. The effectiveness of music therapy for terminally ill patients: A meta-analysis and systematic review. Journal of Pain and Symptom Management. 2019; 57(2): 319–329. doi: 10.1016/j.jpainsymman.2018.10.504
18. Nilsson U. The anxiety- and pain-reducing effects of music interventions: A systematic review. AORN Journal. 2008; 87(4): 780–807. doi: 10.1016/j.aorn.2007.09.013
19. Cumpston M, Li T, Page MJ, et al. Updated guidance for trusted systematic reviews: A new edition of the Cochrane Handbook for Systematic Reviews of Interventions. Cochrane Database of Systematic Reviews. 2019; 10(10): ED000142. doi: 10.1002/14651858.ED000142
20. Shim S, Yoon BH, Shin IS, Bae JM. Network meta-analysis: application and practice using Stata. Epidemiology and Health. 2017; 39: e2017047. doi: 10.4178/epih.e2017047
21. Tantry TP, Karanth H, Shetty PK, Kadam D. Self-learning software tools for data analysis in meta-analysis. Korean Journal of Anesthesiology. 2021; 74(5): 459–461. doi: 10.4097/kja.21080
22. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. Int. J. Surg. 2010; 8(5): 336–341. doi: 10.1016/j.ijsu.2010.02.007
23. Mollaoglu MC, Mollaoglu S, Akin EB, et al. The effect of art therapy on pain, emesis, anxiety, and quality of life in operated breast cancer patients: randomized control trials. Journal of Integrative and Complementary Medicine. 2024; 30(4): 371–382. doi: 10.1089/jicm.2023.0062
24. Li XM, Yan H, Zhou KN, Dang SN, Wang DL, Zhang YP. Effects of music therapy on pain among female breast cancer patients after radical mastectomy: results from a randomized controlled trial. *Breast Cancer Res Treat*. 2011;128(2):411–419. doi:10.1007/s10549-011-1533-z
25. Li XM, Zhou KN, Yan H, et al. Effects of music therapy on anxiety of patients with breast cancer after radical mastectomy: a randomized clinical trial. Journal of Advanced Nursing. 2012; 68(5): 1145–1155. doi: 10.1111/j.1365-2648.2011.05824.x
26. Palmer JB, Lane D, Mayo D, et al. Effects of music therapy on anesthesia requirements and anxiety in women undergoing ambulatory breast surgery for cancer diagnosis and treatment: A randomized controlled trial. Journal of Clinical Oncology. 2015; 33(28): 3162–3168. doi: 10.1200/JCO.2014.59.6049
27. Chang L, Wang Y, Zhang J, et al. Effect of music therapy combined with aerobic exercise on sleep quality among breast cancer patients undergoing chemotherapy after a radical mastectomy: A randomized controlled trial. BMC Womens Health. 2024; 24(1): 408. doi: 10.1186/s12905-024-03241-6
28. Deng C, Xie Y, Liu Y, et al. Aromatherapy plus music therapy improve pain intensity and anxiety scores in patients with breast cancer during perioperative periods: A randomized controlled trial. Clinical Breast Cancer. 2022; 22(2): 115–120. doi: 10.1016/j.clbc.2021.05.006
29. Du Y, Su M, Xue H, et al. Effects of progressive Orff vocal therapy on BODE index and quality of life in patients with low lung function after non-small cell lung cancer surgery. Traditional Medicine and Modern Medicine. 2020; 3(2): 109–115. doi: 10.1142/S2575900019500186

30. Yaling W, Yuqin W, Xiaoman Z, Wen Z. The effect of acupressure massage combined with music therapy on pain degree in patients with liver cancer after receiving interventional treatment (Chinese). Journal of Interventional Radiology. 2018; 27: 1202–1205. doi: 10.3969/j.issn.1008-794X.2018.12.020
31. Yangöz ŞT, Özer Z. The effect of music intervention on patients with cancer-related pain: A systematic review and meta-analysis of randomized controlled trials. J. Adv. Nurs. 2019; 75(12): 3362–3373. doi: 10.1111/jan.14184
32. Bro ML, Jespersen KV, Hansen JB, et al. Kind of blue: A systematic review and meta-analysis of music interventions in cancer treatment. Psychooncology. 2018; 27(2): 386–400. doi: 10.1002/pon.4470
33. Xiao X, Chen W, Zhang X. The effect and mechanisms of music therapy on the autonomic nervous system and brain networks of patients of minimal conscious states: A randomized controlled trial. Frontiers in Neuroscience. 2023; 17: 1182181. doi: 10.3389/fnins.2023.1182181
34. Loewy J. Underlying Music Mechanisms Influencing the Neurology of Pain: An Integrative Model. Brain Sciences. 2022; 12(10): 1317. doi: 10.3390/brainsci12101317
35. Bartel L, Mosabbir A. Possible Mechanisms for the Effects of Sound Vibration on Human Health. Healthcare (Basel). 2021; 9(5): 597. doi: 10.3390/healthcare9050597
36. Zang L, Cheng C, Zhou Y, Liu X. Music therapy effect on anxiety reduction among patients with cancer: A meta-analysis. Frontiers in Psychology. 2023; 13: 1028934. doi: 10.3389/fpsyg.2022.1028934
37. Teckenberg-Jansson P, Turunen S, Pölkki T, et al. Effects of live music therapy on heart rate variability and self-reported stress and anxiety among hospitalized pregnant women: A randomized controlled trial. Nordic Journal of Music Therapy. 2019; 28(1): 7–26. doi: 10.1080/08098131.2018.1546223
38. Wu PY, Huang ML, Lee WP, et al. Effects of music listening on anxiety and physiological responses in patients undergoing awake craniotomy. Complementary Therapies in Medicine. 2017; 32: 56–60. doi: 10.1016/j.ctim.2017.03.007
39. Chanda ML, Levitin DJ. The neurochemistry of music. Trends in Cognitive Sciences. 2013; 17(4): 179–193. doi: 10.1016/j.tics.2013.02.007
40. Mallik A, Chanda ML, Levitin DJ. Anhedonia to music and mu-opioids: Evidence from the administration of naltrexone. Scientific Reports. 2017; 7: 41952. doi: 10.1038/srep41952
41. Salimpoor VN, Benovoy M, Larcher K, et al. Anatomically distinct dopamine release during anticipation and experience of peak emotion to music. Nature Neuroscience. 2011; 14(2): 257–262. doi: 10.1038/nn.2726
42. Helsing M, Berglund H, Waara B. An experimental field study of the effects of listening to Self-Selected Music on emotions, stress, and cortisol levels. Music Medicine. 2016; 8(4): 187–198.
43. Martin LJ, Hathaway G, Isbester K, et al. Reducing social stress elicits emotional contagion of pain in mouse and human strangers. Current Biology. 2015; 25(3): 326–32. doi: 10.1016/j.cub.2014.11.028
44. Nguyen KT, Xiao J, Chan DNS, et al. Effects of music intervention on anxiety, depression, and quality of life of cancer patients receiving chemotherapy: A systematic review and meta-analysis. Supportive Care in Cancer. 2022; 30(7): 5615–5626. doi: 10.1007/s00520-022-06881-2
45. Ding J, Huang T, Hu J, Yuan F. Effectiveness and safety of music therapy for insomnia disorder patients: A protocol for systematic review and meta-analysis. Medicine. 2021; 100(26): e26399. doi:10.1097/MD.0000000000026399
46. Kulinski J, Ofori EK, Visotcky A, et al. Effects of music on the cardiovascular system. Trends in Cardiovascular Medicine. 2022; 32(6): 390–398. doi: 10.1016/j.tcm.2021.06.004
47. Craig J. Music therapy to reduce agitation in dementia. Nursing Times. 2014; 110(32–33): 12–15.

Appendix

Table A1. Search strategy table.

Database	Search Strategy
PubMed (997)	((((((((((((((((((((((((((Neoplasms[Title/Abstract]) OR (Tumors[Title/Abstract])) OR (Neoplasia[Title/Abstract])) OR (Neoplasias[Title/Abstract])) OR (Neoplasm[Title/Abstract])) OR (Tumor[Title/Abstract])) OR (Cancer[Title/Abstract])) OR (Cancers[Title/Abstract])) OR (Malignant Neoplasm[Title/Abstract])) OR (Malignancy[Title/Abstract])) OR (Malignancies[Title/Abstract])) OR (Malignant Neoplasms[Title/Abstract])) OR (Neoplasm, Malignant[Title/Abstract])) OR (Neoplasms, Malignant[Title/Abstract])) OR (Benign Neoplasms[Title/Abstract])) OR (Neoplasms, Benign[Title/Abstract])) OR (Neoplasm, Benign[Title/Abstract])) OR (Benign Neoplasm[Title/Abstract])) OR (Breast cancer[Title/Abstract])) OR (Lung cancer[Title/Abstract])) OR (Colon cancer[Title/Abstract])) OR (Prostate cancer[Title/Abstract])) OR (Stomach cancer[Title/Abstract])) OR (Liver cancer[Title/Abstract])) OR (Adenoma[Title/Abstract])) OR (Lipoma[Title/Abstract])) OR (Fibroma[Title/Abstract])) OR (Hemangioma[Title/Abstract])) AND ((((((((((((((((((Music[Title/Abstract]) OR (Songs[Title/Abstract])) OR (Song[Title/Abstract])) OR (Vocal Melody[Title/Abstract])) OR (Melodies, Vocal[Title/Abstract])) OR (Melody, Vocal[Title/Abstract])) OR (Vocal Melodies[Title/Abstract])) OR (Classical Music[Title/Abstract])) OR (Music, Classical[Title/Abstract])) OR (Jazz Music[Title/Abstract])) OR (Rap Music[Title/Abstract])) OR (Music, Rap[Title/Abstract])) OR (Hip Hop Music[Title/Abstract])) OR (Hop Music, Hip[Title/Abstract])) OR (Music, Hip Hop[Title/Abstract])) OR (Rock[Title/Abstract] AND Roll Music[Title/Abstract])) OR (Music therapy[Title/Abstract])) OR (musicotherapy[Title/Abstract])) OR (melodiotherapy[Title/Abstract]))
Web of Science (1568)	#1:((((((((((((((((((((((((((TS=(Neoplasms)) OR TS=(Tumors)) OR TS=(Neoplasia)) OR TS=(Neoplasias)) OR TS=(Neoplasm)) OR TS=(Tumor)) OR TS=(Cancer)) OR TS=(Cancers)) OR TS=(Malignant Neoplasm)) OR TS=(Malignancy)) OR TS=(Malignancies)) OR TS=(Malignant Neoplasms)) OR TS=(Neoplasm, Malignant)) OR TS=(Neoplasms, Malignant)) OR TS=(Neoplasms, Malignant)) OR TS=(Neoplasms, Benign)) OR TS=(Neoplasm, Benign)) OR TS=(Benign Neoplasm)) OR TS=(Breast cancer)) OR TS=(Lung cancer)) OR TS=(Colon cancer)) OR TS=(Prostate cancer)) OR TS=(Stomach cancer)) OR TS=(Liver cancer)) OR TS=(Adenoma)) OR TS=(Lipoma)) OR TS=(Fibroma)) OR TS=(Hemangioma) **#2:**((((((((((((((((((TS=(Music)) OR TS=(Songs)) OR TS=(Song)) OR TS=(Vocal Melody)) OR TS=(Melodies, Vocal)) OR TS=(Melody, Vocal)) OR TS=(Vocal Melodies)) OR TS=(Classical Music)) OR TS=(Music, Classical)) OR TS=(Jazz Music)) OR TS=(Rap Music)) OR TS=(Music, Rap)) OR TS=(Hip Hop Music)) OR TS=(Hop Music, Hip)) OR TS=(Music, Hip Hop)) OR TS=(Rock and Roll Music)) OR TS=(Music therapy)) OR TS=(musicotherapy)) OR TS=(melodiotherapy) #1 AND #2
Embase (2171)	#1: ‘ neoplasms’:ti,ab,kw OR ‘tumors’:ti,ab,kw OR ‘neoplasia’:ti,ab,kw OR ‘neoplasias’:ti,ab,kw OR ‘neoplasm’:ti,ab,kw OR ‘tumor’:ti,ab,kw OR ‘cancer’:ti,ab,kw OR ‘cancers’:ti,ab,kw OR ‘malignant neoplasm’:ti,ab,kw OR ‘malignancy’:ti,ab,kw OR ‘malignancies’:ti,ab,kw OR ‘malignant neoplasms’:ti,ab,kw OR ‘neoplasm, malignant’:ti,ab,kw OR ‘neoplasms, malignant’:ti,ab,kw OR ‘benign neoplasms’:ti,ab,kw OR ‘neoplasms, benign’:ti,ab,kw OR ‘neoplasm, benign’:ti,ab,kw OR ‘benign neoplasm’:ti,ab,kw OR ‘breast cancer’:ti,ab,kw OR ‘lung cancer’:ti,ab,kw OR ‘colon cancer’:ti,ab,kw OR ‘prostate cancer’:ti,ab,kw OR ‘stomach cancer’:ti,ab,kw OR ‘liver cancer’:ti,ab,kw OR ‘adenoma’:ti,ab,kw OR ‘lipoma’:ti,ab,kw OR ‘fibroma’:ti,ab,kw OR ‘hemangioma’:ti,ab,kw #2:’music’:ti,ab,kw OR ‘songs’:ti,ab,kw OR ‘song’:ti,ab,kw OR ‘vocal melody’:ti,ab,kw OR ‘melodies, vocal’:ti,ab,kw OR ‘melody, vocal’:ti,ab,kw OR ‘vocal melodies’:ti,ab,kw OR ‘classical music’:ti,ab,kw OR ‘music, classical’:ti,ab,kw OR ‘jazz music’:ti,ab,kw OR ‘rap music’:ti,ab,kw OR ‘music, rap’:ti,ab,kw OR ‘hip hop music’:ti,ab,kw OR ‘hop music, hip’:ti,ab,kw OR ‘music, hip hop’:ti,ab,kw OR ‘rock and roll music’:ti,ab,kw OR ‘music therapy’:ti,ab,kw OR ‘musicotherapy’:ti,ab,kw OR ‘melodiotherapy’:ti,ab,kw #1 AND #2

Table A1. (*Continued*).

Database	Search Strategy
Cochrane (691)	#1(Neoplasms):ti,ab,kw OR (Tumors):ti,ab,kw OR (Neoplasia):ti,ab,kw OR (Neoplasias):ti,ab,kw OR (Neoplasm):ti,ab,kw OR (Tumor):ti,ab,kw OR (Cancer):ti,ab,kw OR (Cancers):ti,ab,kw OR (Malignant Neoplasm):ti,ab,kw OR (Malignancy):ti,ab,kw OR (Malignancies):ti,ab,kw OR (Malignant Neoplasms):ti,ab,kw OR (Neoplasm, Malignant):ti,ab,kw OR (Neoplasms, Malignant):ti,ab,kw OR (Benign Neoplasms):ti,ab,kw OR (Neoplasms, Benign):ti,ab,kw OR (Neoplasm, Benign):ti,ab,kw OR (Benign Neoplasm):ti,ab,kw OR (Breast cancer):ti,ab,kw OR (Lung cancer):ti,ab,kw OR (Colon cancer):ti,ab,kw OR (Prostate cancer):ti,ab,kw OR (Stomach cancer):ti,ab,kw OR (Liver cancer):ti,ab,kw OR (Adenoma):ti,ab,kw OR (Lipoma):ti,ab,kw OR (Fibroma):ti,ab,kw OR (Hemangioma):ti,ab,kw #2(Music):ti,ab,kw OR (Songs):ti,ab,kw OR (Song):ti,ab,kw OR (Vocal Melody):ti,ab,kw OR (Melodies, Vocal):ti,ab,kw OR (Melody, Vocal):ti,ab,kw OR (Vocal Melodies):ti,ab,kw OR (Classical Music):ti,ab,kw OR (Music, Classical):ti,ab,kw OR (Jazz Music):ti,ab,kw OR (Rap Music):ti,ab,kw OR (Music, Rap):ti,ab,kw OR (Hip Hop Music):ti,ab,kw OR (Hop Music, Hip):ti,ab,kw OR (Music, Hip Hop):ti,ab,kw OR (Rock and Roll Music):ti,ab,kw OR (Music therapy):ti,ab,kw OR (musicotherapy):ti,ab,kw OR (melodiotherapy):ti,ab,kw #1 AND #2

Table A2. Summary of findings and quality of evidence (GRADE approach).

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**EX**	**CON**	**Relative (95% CI)**	**Absolute**		
Pain condition (Better indicated by lower values)												
4	randomised trials	no serious risk of bias	very serious[b]	no serious indirectness	no serious imprecision	none	175	174	-	SMD 1.06 lower (1.59 to 0.54 lower)	ÅÅOO LOW	IMPORTANT
Anxious Situation (Better indicated by lower values)												
3	randomised trials	no serious risk of bias	very serious[b]	no serious indirectness	no serious imprecision	none	130	130	-	SMD 1.44 lower (2.25 to 0.63 lower)	ÅÅOO LOW	IMPORTANT
Quality of life (Better indicated by lower values)												
1	randomised trials	no serious risk of bias	serious[a]	no serious indirectness	no serious imprecision	none	114	102	-	SMD 2.49 higher (1.14 to 3.85 higher)	ÅÅÅO MODERATE	IMPORTANT
Sleep condition (Better indicated by lower values)												
1	randomised trials	no serious risk of bias	serious[a]	no serious indirectness	no serious imprecision	none	55	55	-	MD 0.52 lower (0.59 to 0.46 lower)	ÅÅÅO MODERATE	IMPORTANT

Table A2. (*Continued*).

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**EX**	**CON**	**Relative (95% CI)**	**Absolute**		
PPI score (Better indicated by lower values)												
1	randomised trials	no serious risk of bias	serious[a]	no serious indirectness	no serious imprecision	none	60	60	-	MD 1.48 lower (1.89 to 1.06 lower)	ÅÅÅO MODERATE	IMPORTANT

Notes: EX: experimental group, CON: control group.
a: One grade of quality reduction; b: Reduce the quality level by two levels.
Inconsistency: If $I^2 > 50\%$, drop one quality level, if $I^2 > 75\%$, drop two quality levels, and if only one article is included, drop one quality level.

I. Feature table

Study characteristics: (Intervention duration, assessment outcomes, assessment tools and results).

Table A3. Characteristics of included studies and details.

Author	Year	Region	Disease	Experimental Group Size	Control Group Size	Experimental Group Age	Control Group Age	Follow-up Duration	Measurement method	Outcome Measures	Intervention
Murat Can Mollaoglu	2024	Asia	Breast Cancer Patients	30	30	48.93 ± 11.92	50.9 ± 13.77	10 weeks	VAS，BAI	Pain, anxiety	The traditional art form of "wet painting," widely practiced in Turkish culture, was combined with the music of "ney," a traditional musical instrument. Sessions were held once every two weeks, each lasting approximately 30 min, with a total of five sessions conducted in conjunction with the patient's chemotherapy cycle.
Xiao-Mei Li	2010	Asia	Breast Cancer Patients	60	60	44.88 ± 9.37	45.13 ± 9.48	6–8 weeks	VAS，SAI	Pain, anxiety	Two 30-minute sessions per day are scheduled between 6:00am–8:00am and 9:00pm–11:00pm.
Xiao-Mei Li	2011	Asia	Breast Cancer	60	60	44.88 ± 9.37	45.13 ± 9.48	6–8 weeks	PRI	Long-term prognosis	Two 30-minute sessions per day are scheduled between 6:00am–8:00am and 9:00pm–11:00pm.

Table A3. (*Continued*).

Author	Year	Region	Disease	Experimental Group Size	Control Group Size	Experimental Group Age	Control Group Age	Follow-up Duration	Measurement method	Outcome Measures	Intervention
Jaclyn Bradley Palmer	2015	North America	Breast Cancer	68	65	58.8 ± 14.4	61.3 ± 14.9	Until discharge	GA-VAS	Anxiety	Five minutes of bedside music was performed before surgery, during which the patient listened to instrumental harp music selected by the music therapist through headphones. The music adhered to a soothing melody, steady rhythm, and consistent dynamic characteristics.
Li Chang	2021	Asia	Breast Cancer	51	49	44.47 ± 11.39	45.00 ± 12.11	18 weeks	Pittsburgh sleep quality index	Sleep quality	This intervention was implemented from the patient's first chemotherapy hospitalization through their sixth chemotherapy hospitalization.
Chao Deng	2021	Asia	Breast Cancer	40	40	54.2 ± 9.8	50.2 ± 10.6	Until discharge	VAS	Pain, anxiety	Music therapy sessions were conducted 60 min before surgery and 4 h after extubation.
Yijie Du	2019	Asia	Lung Cancer	114	102	67.26 ± 6.69	66.89 ± 8.42	12 months	FACT-L scores	Quality of Life	Online training consisted of one hour of interactive vocal exercises conducted daily.
Y Wang	2018	Asia	Liver Cancer	45	44	49.4 ± 5.8	48.7 ± 6.6	1 week	NRS	Pain	Each music intervention lasted 12 to 20 min and was conducted twice daily, once before 8 a.m. and once after 9 p.m.

II. Subgroup analysis of breast cancer patients

Table A4. Pain condition subgroup analysis of breast cancer patients.

Cancer Type	*n*	I-squared	Model	SMD	95% CI		*p*
pain							
Breast Cancer	7	90.3%	random	−1.314	−1.877	−0.750	0.001
Liver Cancer	2	0.00%	fixed	−0.200	−0.495	0.094	0.183

This table shows the meta-analysis results of different cancer types (breast cancer and liver cancer) for pain and anxiety. For pain analysis, breast cancer: A total of 7 studies were included, and the random effects model had an effect value of [SMD = −1.31 (95% CI: −1.88, −0.75)], liver cancer patients included a total of 2 studies, using the fixed effects model, the effect value was [SMD = −0.20 (95% CI:−0.49, 0.09)], for anxiety analysis, breast cancer patients included a total of 7 studies, using the random effects model, the effect value was [SMD = −1.44 (95% CI: −2.25, −0.63)].

III. Analyzing the code

For different units and the same measurement tool, the WMD method is used for analysis. The specific code is as follows:

metan experimentalgroupsize experimentalgroupmean experimentalgroupsd contorlgroupsize contorlgroupmean contorlgroupsd, label (namevar=author, yearvar = year) random nostandard

For different units or different measurement tools, the SMD method is used for analysis. The specific code is as follows:

metan experimentalgroupsize experimentalgroupmean experimentalgroupsd contorlgroupsize contorlgroupmean contorlgroupsd, label (namevar=author, yearvar = year) random cohen

Meta regression code:

metareg _ES Intervention time, wsse(_seES) bsest(reml).

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Article

A qualitative research on the symptom experience and psychological feelings of patients during the rehabilitation period after radical hysterectomy

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Abstract: Objective: This study seeks to probe the symptom experiences and psychological feelings of patients during the rehabilitation period following radical hysterectomy through qualitative research and structured interviews, providing a reference basis for rehabilitation interventions. **Methods:** A total of 200 patients who underwent radical hysterectomy were selected as the study subjects. In the study of postoperative rehabilitation interventions for cervical cancer, a detailed interview outline was first formulated, covering a wide range of topics from physical symptoms to psychological feelings. In-depth interviews and recordings were conducted with patients to ensure the comprehensiveness and accuracy of the information. Strict quality control measures were taken during the interview process, including pre-determined quiet interview environments to ensure smooth patient expression and the avoidance of leading language. The interview content was not limited to verbal expression but also focused on patients' body language and emotional changes, providing researchers with adequate data sources. After the interviews, data accuracy and completeness were ensured through text conversion and voice confirmation. In the final interview analysis stage, detailed analysis results were compiled, including themes, patterns, and key trends, providing in-depth understanding and guidance for further research and interventions. Subsequently, patient interviews and result summaries were conducted. **Results:** Among the 200 individuals, (1) physical symptoms encompassed fatigue (22.50%), urination disorders (24.00%), and lower limb dysfunction (25.00%); (2) Psychological issues included a sense of stigma (40.50%), financial concerns (50.50%), and fear of recurrence (35.50%).; (3) Family-associated changes involved emotional changes with husbands (61.00%) and immediate family members (65.00%); (4) Social aspects included a decreased sense of social identity (76.00%) and impaired social interaction (63.00%). **Conclusion:** Following radical hysterectomy, patients during the rehabilitation period face adverse experiences pertaining to symptom experience and psychological feelings, which necessitates appropriate interventions to boost their recovery.

Keywords: radical hysterectomy; rehabilitation period; symptom experience; psychological feeling; qualitative research

1. Introduction

Cervical cancer ranks among the most common malignancies in females worldwide, with substantial regional variations in its incidence and mortality rates [1]. According to the World Health Organization, approximately 500,000 women succumb to cervical cancer annually, with it being a leading contributor to cancer-related deaths among women in developing countries [2,3]. Cervical cancer typically originates from

abnormal cells on the cervix's surface, gradually progressing to precancerous lesions, and potentially developing into aggressive cancer [4]. Advances in medical diagnostic technologies have improved early detection rates of cervical cancer, allowing for early treatment and consequently enhancing patient outcomes and quality of life through appropriate therapeutic interventions.

Cervical cancer is one of the common malignant tumors of the female reproductive system. Its primary treatment methods encompass surgery, radiotherapy, chemotherapy, or a combination of these treatments. Among these methods, radical hysterectomy, as a crucial approach for early diagnosis and treatment, is widely utilized in the management of early-stage cervical cancer [5]. This procedure, by means of surgical excision, can completely remove the tumor and any potential precancerous lesions, thereby enhancing patient survival and cure rates. Nevertheless, despite the remarkable advantages of radical hysterectomy, the postoperative recovery process is often accompanied by various physical symptoms and psychological pressures. Postoperative symptoms may include pain, fatigue, and urinary incontinence, which can interfere with daily activities and negatively affect the patient's mental state [6]. Postoperative pain is one of the most prevalent physical symptoms. Factors such as surgical wounds, internal tissue repair, and potential postoperative infections can cause varying degrees of pain. Additionally, patients may experience prolonged fatigue post-surgery, which is not only due to the physical strain of the operation but also related to psychological stress and anxiety. Urinary incontinence is another issue faced by many patients following surgery. This symptom not only brings about physical discomfort but also negatively impacts patients' social interactions and mental health [7]. Lymphedema, resulting from obstructed lymphatic fluid reflux after lymph node removal, can lead to swelling, pain, and limited mobility in the affected limb. Postoperative complications can induce negative emotions such as fear, worry, and anxiety. If these psychological stresses are not effectively managed and alleviated, they can give rise to depressed mood, reduced social activity, and even depression. Studies have revealed that improving emotional and psychological states is crucial for patients' overall recovery and quality of life. Therefore, during the rehabilitation process following radical hysterectomy, attention should be paid not only to the patients' physical recovery but also to their mental health.

Building on this, the present study employs structured interviews to delve into the symptom experience and psychological feelings of patients during the rehabilitation period subsequent to radical hysterectomy. Utilizing a qualitative research method, the aim is to gather deep insights and information from the real-life experiences of patients, exploring the challenges they face, their coping strategies, and their needs for treatment and medical support during recovery. Based on the findings, the study seeks to bolster patient rehabilitation support strategies, thereby enhancing their quality of life and long-term treatment outcomes.

2. Materials and methods

2.1. General data

Purposive sampling was harnessed to select 200 patients who went through radical hysterectomy in the gynecological oncology ward of the hospital from

February 2022 to March 2024 as the subjects of this study. The inclusion criteria were pathologically confirmed cervical cancer with definite surgical indications; age over 18 years; normal cognition and good communication skills; and informed consent was obtained and signed preoperatively. Exclusion criteria encompassed patients with organic diseases of the heart, liver, or kidneys; those with severe visual, auditory, or communication impairments; and individuals with psychiatric or cognitive disorders. The general information on the included subjects is displayed in **Table 1**.

Table 1. General data of the 200 patients.

Items	Number of cases	Percentages (%)
Age		
18–35 years	42	21.00
36–60 years	122	61.00
over 60 years	36	18.00
Education level		
Junior high school and below	51	25.50
Senior high school or junior college	129	64.50
Bachelor's degree and above	20	10.00
Tumor pathological staging		
Stage Ia	66	33.00
Stage Ib	98	49.00
Stage IIa	36	18.00

2.2. Methods

2.2.1. Drafting interview outline

First, professionals reviewed authoritative literature to understand the key areas of focus for rehabilitation interventions after radical hysterectomy. Based on this information, they developed an initial interview outline that covers core questions and points of interest. After drafting the preliminary outline, professionals engaged in in-depth conversations with relevant experts and patients who underwent radical hysterectomy in order to gather practical experiences and feedback to further optimize and refine the interview outline, ensuring a broad range of topics and details. The outline was structured as follows: (1) Question one: What physical symptoms or discomfort have you experienced since completing the surgery and currently? What is your biggest concern? (2) Question two: What psychological feelings have you experienced after the radical surgery? (3) Question three: How have your family dynamics changed following the surgery? For example, relationships with family members and children? (4) Question four: What changes have you noticed in your daily work or social interactions since the surgery? How do you personally feel about these changes?

2.2.2. Interview process and quality control

Given patient avoidance behaviors or stressful situations, the location for structured interviews was predetermined to ensure a quiet environment. For those with limited verbal expression, paper and pen were provided. The interviewers included a

gynecological oncology ward nurse with over 5 years of experience, excellent communication skills, psychological counselor certification, and the title of nurse practitioner. Additionally, a nurse was assigned to record the interview content. Prior to the interview, patients were briefed on the research purpose, content, and methods, with a commitment to confidentiality. Patients were encouraged to express themselves freely during the interview, guided by the questions in the outline. Interruptions were avoided, and doubts or concerns were addressed promptly and appropriately, without using suggestive language. In addition to verbal expressions, non-verbal cues such as clenched fists, sweating forehead, or trembling thighs were noted to enrich the interview context. Patient consent was obtained for recording through audio or video, with interview durations controlled between 30 to 40 min.

2.2.3. Interview analysis and processing

(1) Text conversion: Within 24 h after the interview, a researcher was responsible for converting the audio and video content into text. (2) Audio and video confirmation: Another researcher used the audio and video recordings to confirm the accuracy of the text conversion. The purpose of this step was to verify the accuracy of the transcription, ensuring that no important content was missed or misinterpreted. (3) Text data analysis: Two researchers analyzed the transcribed text. During this process, they paid attention to potential repetitive content or specific key information, and compiled and categorized these contents. (4) Systematic content summary: Based on the analysis, the researchers derived systematic content, extracting themes, patterns, trends, or other significant research findings from the detailed text data.

3. Results

3.1. Theme 1: Physiological aspects

3.1.1. Fatigue

There were 45 cases with fatigue, primarily due to factors such as surgical trauma, the effects of anesthesia medications, activity restrictions during postoperative recovery, and the body's response to treatment. Case 1: "Two weeks after returning home from surgery, I felt completely drained. I have no energy to do anything." Case 2: "The nurse advised me to rest more after surgery. I take a nap every day and go to bed early at night, but I still feel exhausted, and it's hard to focus on work." Case 3: "In the first month after discharge, I could do some jogging, but recently I've noticed a significant decrease in my physical endurance. I used to run a distance, but now I feel tired just walking a short distance."

3.1.2. Urination disorder

Among 48 cases post-surgery, urinary disorders were observed, possibly attributed to nerve or tissue damage during the surgical process, as well as direct impacts from anesthesia medications on urinary function. Case 1: "It feels difficult to urinate, like I have urine but can't get it out." Case 2: "I've felt my urination hasn't been normal for a month after surgery. After urinating once, I feel the urge to go again a few minutes later." Case 3: "I've been trying hard to empty my bladder, but after urinating, I feel like there's still urine left. This has been going on for weeks, and it's still the same now."

3.1.3. Lower limb dysfunction

In 50 cases post-surgery, lower limb dysfunction occurred due to complications like lymphedema, lower limb pain, and swelling following radical hysterectomy. These issues affected subjective motivation for functional activities, hindering timely rehabilitation exercises and resulting in lower limb functional impairments. Case 1: "There's a pain when pressing certain parts of my foot, but there are no issues elsewhere. Walking normally is fine, but speeding up or running causes pain." Case 2: "I can walk, but when I try to run, it feels like something is holding me back." Case 3: "Subsequent to surgery, there's some pain when walking, and at night during rest, it feels like needles pricking, very uncomfortable." Refer to **Table 2**.

Table 2. Qualitative study of physical aspects in 200 patients [*n* (%)].

Physical aspects	Presence	Absence
Fatigue	45 (22.50)	155 (77.50)
Urination disorder	48 (24.00)	152 (76.00)
Lower limb dysfunction	50 (25.00)	150 (75.00)

3.2. Theme 2: Psychological aspects

3.2.1. Stigma

Among 81 patients interviewed, many experienced feelings of stigma. For some, this stigma stemmed from the realization that others might discover their illness despite their efforts to conceal it, leading to feelings of embarrassment. Additionally, some patients felt stigma due to guilt towards their families, feeling that their illness brought shame upon their loved ones. Case 1: "Before, when I found out I was sick, I didn't think about it much. I thought I could keep it hidden. But after this surgery, I can't hide it anymore. I don't know how others will perceive me." Case 2: "Some relatives know I'm sick, but they don't know what illness specifically. I'm afraid they'll look at me differently if I tell them, it's cancer. I don't know what to do." Case 3: "I had to take leave for this surgery. I told my boss about my illness and got a month off. My colleagues will definitely come to see me when I return. I don't know what to tell them."

3.2.2. Financial concerns

101 patients expressed concerns about costs. For cervical cancer patients, expenses include surgery, chemotherapy, and medications. Although some costs are covered by medical insurance, patients still bear significant financial burdens, especially when family finances are strained. Case 1: "This surgery has already cost me a lot of money. Now my income is not ideal enough, and I don't know if I can manage the future expenses." Case 2: "I had to borrow money for the surgery. Now I need chemotherapy. Where can I get that money?" Case 3: "I lost my job and now have this illness. I don't know how I'll afford the treatment ahead." Case 4: "I have no medical insurance; it's all out-of-pocket. I heard chemotherapy is expensive."

3.2.3. Fear of recurrence

71 patients expressed concerns about disease recurrence. Despite the favorable prognosis achievable through radical hysterectomy, there is a constant worry about

recurrence and the need for re-treatment. Case 1: "I'm worried that this disease will come back again." Case 2: "There's nothing much I can do if this disease recurs. I just hope the surgery is effective and it won't recur." Case 3: "I pray the disease won't reappear. That's all I wish now." See **Table 3**.

Table 3. Qualitative study of psychological aspects in 200 patients [*n* (%)].

Psychological aspects	Presence	Absence
Stigma	81 (40.50)	119 (59.50)
Financial concerns	101 (50.50)	99 (49.50)
Fear of recurrence	71 (35.50)	129 (64.50)

3.3. Theme 3: Family aspects

3.3.1. Changes in relationship with husband

122 patients described alterations in their relationship with their husbands subsequent to surgery. Cervical cancer originates from persistent HPV infection transmitted through sexual activity. Patients may feel regret after contracting the disease, and husbands may harbor suspicion and resentment towards their wives, causing relationship changes that may even lead to breakdown. Case 1: "How did I suddenly get cervical cancer? Our sexual life was always very hygienic." Case 2: "This disease is caused by HPV infection. I knew about this disease before, and my husband is very sensitive to it. Now our relationship is very bad; we argue all the time." Case 3: "Since my surgery, my husband and I have been sleeping in separate rooms. It feels like we are living in two different worlds."

3.3.2. Changes in relationship with immediate relatives

130 patients experienced notable changes in their relationships with immediate relatives, primarily due to traditional beliefs that cervical cancer is perceived as a result of impure sexual behavior. Relatives may worry or accuse daughters or daughters-in-law of being promiscuous. Case 1: "Since my surgery, my mother-in-law has changed completely, complaining every day." Case 2: "My mother said it's because my husband is promiscuous and suggested we divorce directly." Case 3: "My mother asked if I've been promiscuous, otherwise how could I get this disease." Case 4: "My in-laws are now discussing divorce with my parents." See **Table 4** for details.

Table 4. Qualitative study on family aspects of 200 patients [*n* (%)].

Family aspects	Presence	Absence
Changes in relationship with husband	122 (61.00)	78 (39.00)
Changes in relationship with immediate relatives	130 (65.00)	70 (35.00)

3.4. Theme 4: Social aspects

Reduced sense of social identity

152 patients reported a decrease in the sense of social identity following radical hysterectomy, questioning their self-worth and personal capabilities, and worrying about social rejection. Case 1: "Now I feel like I'm sick. There are many things I can't do anymore, like eating the foods I like or doing the things I enjoy. Life feels too

exhausting." Case 2: "Cervical cancer has always been judged by people. After surgery, I always feel like people on the street are looking at me strangely."

126 patients reported postoperative impaired social interactions, mainly due to a lack of self-confidence after surgery. They may believe people unintentionally mention them in conversations and reduce contact with close friends. Case 1: "Now I don't talk to my former besties anymore. I'm afraid she will tell this thing to other friends." Case 2: "I've been staying at home all the time now, afraid that interacting with others will reveal my illness." Case 3: "I feel my social skills are declining at work. I'm in sales, and if my social skills decline, I feel like I'll lose my job." See **Table 5**.

Table 5. Qualitative study on social aspects in 200 patients [*n* (%)].

Social aspects	Presence	Absence
Reduced sense of social identity	152 (76.00)	48 (24.00)
Impaired social interactions	126 (63.00)	74 (37.00)

4. Discussion

As a disease posing a remarkable threat to women's health, cervical cancer receives widespread attention in diagnosis and treatment [8]. Radical hysterectomy, as a primary treatment for cervical cancer, can alleviate patients' symptoms. Nevertheless, patients in the postoperative rehabilitation period often face issues correlated with symptom experiences and psychological feelings. Conducting corresponding research and implementing appropriate intervention measures are of paramount importance [9–11]. This study analyzed the rehabilitation period of cervical cancer patients from four perspectives: physiological, psychological, familial, and social, revealing their conditions. Based on these findings, interventions for patients in the rehabilitation period following radical hysterectomy were recommended across these four dimensions.

4.1. Intervention focusing on the psychological aspects of patients, harnessing the power of positive emotions

Cervical cancer is a disease that receives special attention in women's health, and once afflicted, patients can suffer notable psychological impacts [12]. For younger patients, the disease signifies the end of their happy lives, leading to fears and feelings of helplessness about the future. Middle-aged patients, burdened with responsibilities for both elderly parents and young children, feel even more helpless and fearful about their condition. Furthermore, cervical cancer patients may face criticism or ridicule from others, which, if they have weak psychological resilience, could lead to suicidal or self-harming behaviors, and escape from society [13,14]. Hence, for patients undergoing recovery subsequent to radical hysterectomy, caregivers should provide psychological counseling services to help them manage emotional issues such as anxiety, depression, and fear. Through psychological support, patients can learn coping strategies such as cognitive restructuring, relaxation techniques, and emotional regulation [15]. Encouraging patients to adopt a positive lifestyle, including appropriate physical exercise, maintaining healthy eating habits, adequate sleep, and

beneficial social activities, can dramatically enhance their positive emotions and quality of life [16–18]. Patients can also express their inner feelings through activities like painting, music, and dance, which bolsters self-awareness and emotional management skills [19]. Mindfulness meditation, concentrating on the present moment through practices like breathing, body sensations, and consciousness, can attenuate anxiety and stress, helping patients maintain a calm and positive outlook on life.

4.2. Paying attention to the overall patient experience, improving physiological comfort through practical intervention measures

Patients who underwent radical hysterectomy often face fatigue, which significantly impacts their daily lives and work, as well as their mental health and overall quality of life [20]. In addition, post-operative pain is a common issue for them. These adverse physiological experiences can negatively affect patients in multiple ways. Therefore, postoperative care is pivotal for the comprehensive recovery of patients [21]. First, in managing postoperative fatigue, healthcare providers should develop personalized rehabilitation plans. Physiotherapy and exercise therapy are essential methods to help patients regain strength and function. Through professional physical therapy, patients can gradually restore lower limb function and pelvic muscle control, thereby improving daily living abilities and attenuating the distress caused by functional impairments [22]. Moderate exercise not only enhances physical strength but also improves mood, alleviating postoperative depression and anxiety. For postoperative pain management, healthcare providers should offer continuous and effective pain management plans. Medication is the most common method, and appropriate analgesics can be adopted based on the patient's specific condition. Additionally, non-pharmacological pain relief techniques are important auxiliary approaches. Physiotherapy, massage, and hot compress can efficaciously relieve postoperative pain and increase patient comfort. Healthcare providers should flexibly adjust pain management plans based on patient feedback to ensure that discomfort is minimized to the greatest extent possible [23]. Furthermore, healthcare providers are encouraged to assist patients in developing scientific dietary plans to ensure adequate nutrition intake. Guidance from nutritionists can help patients make reasonable food choices, maintain a balanced diet, and support physical recovery and immune function restoration. During dietary intervention, close attention should be paid to the patient's nutritional intake, and dietary plans need to be adjusted promptly to ensure sufficient nutritional support for the patient.

4.3. Addressing family and societal needs to help patients fully integrate into society and their families

Patients with cervical cancer earnestly desire recognition from their families and to reintegrate into society [24]. In response to these needs, caregivers should strive to fulfill them as much as possible. At the family level, caregivers can provide education and information to patients and their family members about cervical cancer and postoperative recovery, thus enhancing their understanding and support. Family understanding and support are crucial to the patient's rehabilitation process [25,26].

Psychological counseling services for family members can enable them to manage emotional reactions such as anxiety, fear, or depression, thereby strengthening family cohesion and support. At the societal level, health seminars can be conducted to provide patients with adaptation methods for reintegrating into society or related training, such as conversing with strangers and vocational reintegration guidance, helping patients reintegrate into the work environment. Economic assistance can also be provided to patients. Hospitals can regularly hold community events to educate residents about cervical cancer prevention and inform them about the commonality of the disease, hence attenuating discrimination against affected individuals.

In summary, for patients who have undergone radical surgery for cervical cancer, it is essential to comprehensively address their multidimensional symptom experiences and psychological well-being during the recovery period. In addition to closely monitoring their physiological recovery, attention must also be given to their psychological state, family life, and social adaptation. A comprehensive assessment of the patient's needs in terms of physiology, psychology, family, and social aspects can help provide personalized interventions. These interventions include psychological support, family function rehabilitation, and strengthening social support systems to facilitate the patient's early reintegration into family and social functions. Systematic intervention not only helps improve the patient's short-term prognosis but also significantly enhances their quality of life. Therefore, integrating the efforts of a multidisciplinary team and developing a comprehensive care plan will contribute to achieving the patient's overall recovery and improved quality of life.

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Availability of data and materials: The data sets used and analyzed during the current study are available from the corresponding author on reasonable request.

Ethical approval: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board of The First Affiliated Hospital of Zhejiang Chinese Medical University (Zhejiang Provincial Hospital of Chinese Medicine). Ethics approval project number: 2024-KLS-699-01, approval date: 15 January 2025.

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References

1. Corsini C, Bergengren O, Carlsson S, et al. Patient-reported Side Effects 1 Year After Radical Prostatectomy or Radiotherapy for Prostate Cancer: A Register-based Nationwide Study. European Urology Oncology. 2024; 7(3): 605–613. doi: 10.1016/j.euo.2023.12.007
2. Nowroozi A, Abbasi B, Amini E, et al. Effect of treatment modality on quality of life among patients with urinary bladder cancer. International Journal of Urological Nursing. 2021; 16(2): 147–156. doi: 10.1111/ijun.12308

3. Keles A, Kose M, Somun UF, et al. Impact of health and digital health literacy on quality of life following radical prostatectomy for prostate cancer: prospective single-center cohort study. World Journal of Urology. 2024; 42(1). doi: 10.1007/s00345-024-04960-z
4. Mahjoubi MF, Ben-Latifa M, Karoui Y, et al. Radical Versus Conservative Methods in One-Stage Pilonidal Abscess Surgery: The Experience of A Tunisian Center. ABCD Brazilian Archives of Digestive Surgery (São Paulo). 2022; 35. doi: 10.1590/0102-672020220002e1713
5. Marinkovic M, Djordjevic N, Djordjevic L, et al. Assessment of the quality of life in breast cancer depending on the surgical treatment. Supportive Care in Cancer. 2020; 29(6): 3257–3266. doi: 10.1007/s00520-020-05838-7
6. Yiannopoulou KG, Anastasiou AI, Kontoangelos K, et al. Cognitive and Psychological Impacts of Different Treatment Options for Prostate Cancer: A Critical Analysis. Current Urology. 2020; 14(4): 169–177. doi: 10.1159/000499242
7. Sun L, Fan X, Shen C, et al. Effect of psychological intervention combined with family model on postoperative rehabilitation in patients with cervical cancer. Minerva Medica. 2022; 113(3). doi: 10.23736/s0026-4806.20.07176-1
8. Fox L, Wiseman T, Cahill D, et al. Effect of a brief physical activity-based presentation by a former patient for men treated with radical prostatectomy for prostate cancer: a mixed methods pilot study. Supportive Care in Cancer. 2020; 29(1): 145–154. doi: 10.1007/s00520-020-05455-4
9. Akasaka M, Yoshida K, Maezawa T, et al. Observation of Child Development in a Uterine Cervical Cancer Patient Who Received Chemotherapy during Pregnancy. Gan to Kagaku ryoho. Cancer Chemother. 2021; 48(8): 1069–1071.
10. Geese F, Willener R, Spichiger E. Patients' and partners' experiences with prostate cancer and advanced practice nurse counselling. International Journal of Urological Nursing. 2021; 15(2): 82–90. doi: 10.1111/ijun.12270
11. Millet N, McDermott HJ, Moss EL, et al. Increasing physical activity levels following treatment for cervical cancer: an intervention mapping approach. Journal of Cancer Survivorship. 2021; 16(3): 650–658. doi: 10.1007/s11764-021-01058-y
12. Cao J, Peng C, Lu X, et al. Factors influencing the degree of participation in surgical decision-making among Chinese patients with prostate cancer: A qualitative research. Asian Journal of Urology. 2022; 9(2): 177–185. doi: 10.1016/j.ajur.2021.08.003
13. Lai Y, Lin A, Zheng Z, et al. Perceptions of pelvic floor dysfunction and rehabilitation care amongst women in southeast China after radical hysterectomy: a qualitative study. BMC Women's Health. 2022; 22(1). doi: 10.1186/s12905-022-01687-0
14. Borghmans F. The radical and requisite openness of viable systems: Implications for healthcare strategy and practice. Journal of Evaluation in Clinical Practice. 2021; 28(2): 324–331. doi: 10.1111/jep.13576
15. Xu Y, Yang J. The effect of 5A nursing combined with psychological nursing on the immune function, cancer-related fatigue and complications of patients undergoing radical resection of colorectal cancer. Cellular and Molecular Biology. 2022; 68(1): 169–176. doi: 10.14715/cmb/2022.68.1.21
16. van de Graaf DL, Mols F, Trompetter HR, et al. Effectiveness of the online Acceptance and Commitment Therapy intervention "Embrace Pain" for cancer survivors with chronic painful chemotherapy-induced peripheral neuropathy: study protocol for a randomized controlled trial. Trials. 2022; 23(1). doi: 10.1186/s13063-022-06592-3
17. P A, G R. A rare case of a patient with primary urothelial carcinoma of the prostate urethra - Multidisciplinary approach. Urology Case Reports. 2021; 38: 101643. doi: 10.1016/j.eucr.2021.101643
18. Banerjee S, Semper K, Skarparis K, et al. Patient perspectives of vigorous intensity aerobic interval exercise prehabilitation prior to radical cystectomy: a qualitative focus group study. Disability and Rehabilitation. 2019; 43(8): 1084–1091. doi: 10.1080/09638288.2019.1651907
19. Khalilullah SA, Tranggono U, Hendri AZ, et al. Comparing the outcome of ileal conduit and transuretero-cutaneostomy urinary diversion after radical cystectomy: a retrospective cohort study. African Journal of Urology. 2021; 27(1). doi: 10.1186/s12301-021-00163-9
20. Arch JJ, Mitchell JL, Schmiege SJ, et al. A randomized controlled trial of a multi-modal palliative care intervention to promote advance care planning and psychological well-being among adults with advanced cancer: study protocol. BMC Palliative Care. 2022; 21(1). doi: 10.1186/s12904-022-01087-z
21. Smith AJB, Jones TN, Miao D, et al. Minimally Invasive Radical Hysterectomy for Cervical Cancer: A Systematic Review and Meta-analysis. Journal of Minimally Invasive Gynecology. 2021; 28(3): 544–555. doi: 10.1016/j.jmig.2020.12.023
22. Liu L, Yu C, Sun F, et al. Can preoperative ureteral stents reduce the incidence of ureteral stricture after radiotherapy in patients with cervical cancer? BMC Urology. 2022; 22(1). doi: 10.1186/s12894-022-01029-0

23. Liu B, Qiu ML, Luo RG, et al. The efficacy and safety analysis of cervical and abdominal double single-port minimally invasive esophagectomy. Chinese Medical Journal. 2023; 103(23): 1767–1773.
24. Kunitomo A, Ouchi A, Komori K, et al. Clinical Impact of Radical Resection of Synchronous and Metachronous Peritoneal Metastases from Colorectal Cancer. Annals of Surgical Oncology. 2023; 30(13): 8501–8508. doi: 10.1245/s10434-023-14191-y
25. Madden K, Vosper J, Evangeli M, et al. Understanding the Relationship Between Sexual Assault and Cervical Screening Uptake. European Journal of Health Psychology. 2022; 29(4): 196–206. doi: 10.1027/2512-8442/a000109
26. Minamitani M, Katano A, Mukai T, et al. Comparative analysis of treatment decision-making in patients with localized prostate and cervical cancer: what influences receiving surgery or radiotherapy? Supportive Care in Cancer. 2024; 32(6). doi: 10.1007/s00520-024-08589-x

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Article

Unmet psychosocial needs in AYAs cancer patients: A multilevel analysis of socioecological determinants

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Abstract: While advances in cancer treatment have significantly improved survival rates, mounting evidence indicates a parallel rise in unmet psychosocial needs among adolescent and young adult (AYA, 15–39 years) patients. Analyzing SEER-Medicare linked data (2000–2022) and national health surveys, this multilevel study reveals that 36.7% of AYAs exhibit clinically significant psychological distress. Three-level hierarchical modeling identifies critical socioecological determinants: At the community level, poverty rate and mental health provider shortages amplify economic toxicity; household-level financial strain mediates depression risk; and individual-level maladaptive coping strategies triple anxiety likelihood. Some employed survivors report workplace discrimination, correlating with delayed return to work. And the experience of pathological guilt over familial caregiving burdens exacerbates social withdrawal. By bridging biomedical and social determinants, this research calls on people in society to pay more attention to the psychological needs of cancer patients.

Keywords: cancer; cancer patients; AYAs; psychological need; social

1. Instruction

Over the past two decades, the evolution of cancer epidemiology in the United States reflects complex interactions between public health interventions, demographic shifts, and emerging risk factors. According to the Surveillance, Epidemiology, and End Results (SEER) Program, age-standardized incidence rates demonstrated a bimodal trajectory: an initial decline of 0.6% annually from 2003 to 2012, followed by a reversal to a 0.3% annual increase between 2013 and 2023 (https://seer.cancer.gov/report_to_nation/, accessed at: 1st March 2025). This inflection point correlates with diverging trends in cancer types—preventable malignancies such as lung cancer decreased sharply (male: −2.9%/year; female: −1.4%/year) due to tobacco control policies, while obesity-driven cancers including liver (+3.1%/year) and endometrial malignancies (+2.4%/year) surged, offsetting earlier gains (https://seer.cancer.gov/statistics-network/explorer/overview.html, accessed at: 1st March 2025).

AYAs emerged as a critical cohort, with the incidence rising 1.8% annually—2.3-fold faster than other age groups (https://seer.cancer.gov/statfacts/html/aya.html, accessed at: 1st March 2025). Thyroid carcinoma (+4.2%/year) and testicular germ cell tumors (+1.5%/year) accounted for 38% of this increase, potentially linked to diagnostic intensity and environmental endocrine disruptors [1]. Striking gender disparities emerged post-2015, as female incidence (502.3/100,000) surpassed males (487.6/100,000), driven by breast cancer (30% of female cases) and persistently high

thyroid cancer rates (12%) (https://seer.cancer.gov/statistics-network/explorer/application.html, accessed at: 1st March 2025).

Racial inequities persisted, with African Americans facing a 6% higher overall incidence than Whites, including a 73% excess in prostate cancer—A disparity exacerbated by socioeconomic barriers to PSA screening [2,3]. Conversely, Asian Americans exhibited the lowest colorectal cancer rates (34% below Whites), possibly reflecting dietary and genetic protective factors [4].

Despite therapeutic advances improving five-year survival to 69.8% overall, recalcitrant malignancies like pancreatic cancer (12.5% survival) underscore persistent biological challenges (https://seer.cancer.gov/statistics-network/explorer/application.html, accessed at: 1st March 2025). These trends highlight the dual burden of aging populations and metabolic risk factors, necessitating precision prevention strategies tailored to evolving etiological landscapes [5,6].

The epidemiologic landscape of malignant tumors has shifted significantly over the past decade. According to National Cancer Institute surveillance data (https://seer.cancer.gov/statistics-network/explorer/overview.html, accessed at: 1st March 2025), despite an increase in 5-year survival to 82%, this population continues to face unique survivorship challenges after completing treatment: 68% of AYA survivors report treatment-induced impaired occupational abilities [7], and 43% experience family tension triggered by long-term care needs [8]. Cancer-related mental health burden presents a complex socio-ecological profile. Approximately 52% of patients experience clinically significant symptoms of depression or anxiety within two years of diagnosis [5], with the AYA group being more prone to existential distress due to interruptions in developmental tasks (e.g., education, marriage, and parenthood) [9,10]. Despite a dose-response relationship between psychiatric co-morbidities and increased cancer mortality [11,12], only 31% of patients receive standardized psychological interventions [13]. This service gap is particularly pronounced among structurally disadvantaged groups: Minority patients are 58% less likely than whites to receive counseling [2,14], and the density of psychiatrist coverage in rural areas is less than 1/5 that of urban areas [15].

The rising incidence of cancer among AYAs in the United States, characterized by an annual growth rate of 1.8% according to the SEER AYA topic, has created a critical paradox: while survival outcomes improve, this population faces unprecedented psychosocial challenges. Recent longitudinal analysis of SEER-Medicare linked datasets reveals that 68.3% of AYA survivors experience workplace discrimination related to their health history, leading to a 2.4-fold increased unemployment risk (95% CI 1.9–3.1) compared to healthy peers [7,16]. Compounding this, an 18.6% salary disparity persists, reflecting systemic economic marginalization [7,14]. Within family systems, 52.7% of patients report pathological guilt arising from chronic care needs, with a dose-response relationship observed between guilt intensity and depressive symptom severity ($\beta = 0.34$, $p < 0.001$) [15,17].

The trajectory of these challenges follows distinct phases: initial financial dependency increases remorseful guilt, physical changes during recovery lead to role dysfunction (31.4% female social avoidance), and advanced disease stages heighten death anxiety due to palliative care demands [16–18]. Structural inequities exacerbate these issues—only 34% of employers offer flexible work arrangements during

treatment, while enforcement gaps under the Americans with Disabilities Act leave 59% of cancer survivors unprotected [7,19]. This creates a "survival paradox" where extended lifespans coincide with intensified systemic oppression.

As shown in **Figure 1**, it presents a socio-ecological model that reveals the multi-level driving mechanisms behind the unmet psychosocial needs of AYA cancer patients. At the community level, there is a negative correlation between the poverty rate and the density of mental health services, which directly worsens the economic toxicity of families and affects treatment compliance through the accessibility of medical resources. Take the Appalachian region as an example. The density of community psychological counselors there is 0.8 per 10,000 residents, only one-third of the national average. As a result, the risk of delayed medical treatment for patients in this area increases by 2.1 times ($p < 0.001$), confirming the suppressive effect of structural exclusion on the accessibility of psychological services. In the United States, the cost of cancer treatment has risen from 27 billion US dollars in 1990 to 174 billion US dollars in 2020. At the family level, the proportion of medical debt, through the mediating path of economic toxicity, increases the pressure of out-of-pocket expenses for patients. However, the score of the family support scale can significantly reduce the risk of treatment interruption. Previous studies have shown that an increase in economic toxicity will lead to a higher frequency of family conflicts, which in turn increases the score of patients' guilt scale. This dual oppression of "economy-emotion" is particularly prominent in African-American and rural families. Research indicates that cancer patients and survivors who have worried about income, paying huge medical expenses, being in debt, or having family members in debt are more likely to experience cancer recurrence or deterioration [20]. From the individual level, cancer stage and coping strategies are key predictors. Among advanced-stage patients, those with negative coping styles, such as avoidance behavior, have a higher risk of anxiety than those with positive coping styles. The type of medical insurance can relieve some anxiety by adjusting the pressure of out-of-pocket expenses. It is worth noting that due to the need for postoperative hormone therapy, thyroid cancer patients have a higher rate of workplace absenteeism than those with other types of cancer. Approximately one-third of thyroid cancer survivors may become unemployed [21], which is directly related to an increase in the reported rate of job discrimination.

The cross-level interaction effect highlights the cumulative impact of systematic exclusion. In areas where the community poverty rate exceeds 20%, the buffering effect of family support for African-American AYA patients will decrease, forming a vicious cycle of "community deprivation → family disability → individual collapse". This model provides targets for precise intervention: giving priority to deploying mobile psychological support units at the community level, implementing a debt relief-counseling linkage program at the family level, and promoting cognitive-behavioral therapy (CBT) at the individual level to reconstruct coping strategies. The study calls for integrating such multi-level path analysis into oncology clinical guidelines to break the separation between the biomedical paradigm and social determinants.

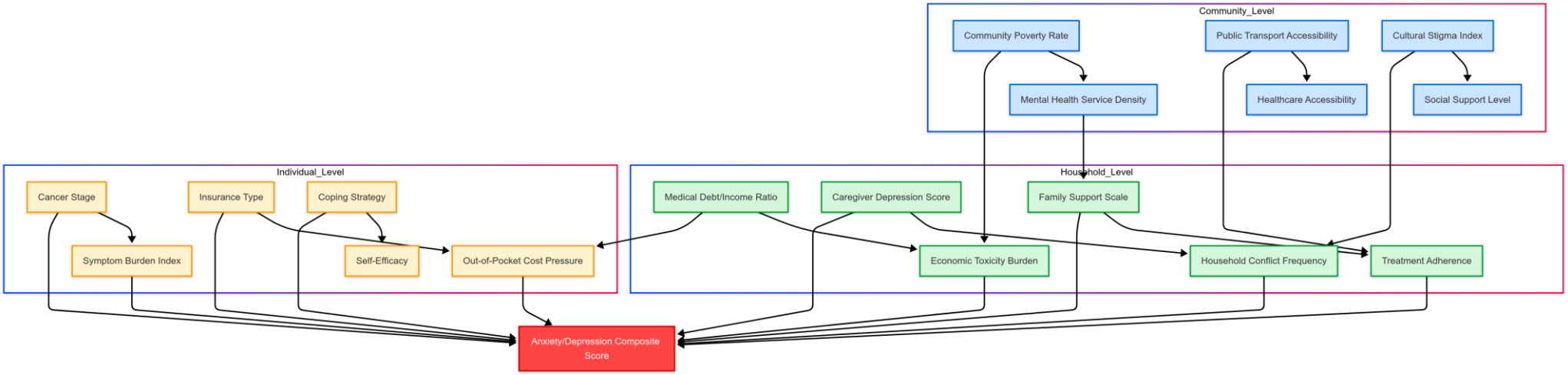


Figure 1. A three-layer path model of social-ecological determinants.

Compared with cancer patients of other age groups, cancer has a unique impact on the relationships between AYAs and their families, friends, etc. Their quality of life is significantly worse, especially in terms of social and emotional functions. The AYA HOPE study shows that nearly half of AYA patients believe that cancer has had a negative impact on their control over life, especially in terms of external appearance [22].

To address this complex issue, a multi-level intervention framework based on the social ecological model is proposed. At the clinical level, mandatory integration of the Psychosocial Distress Thermometer into oncology electronic health records should trigger interdisciplinary care (evidence grade 1A) [23,24]. Family systems could benefit from role reconstruction therapy, which reduces guilt severity [17,19]. Policy reforms should include legislative mandates for workplace accommodations and federal employment rehabilitation funds (priority score HR 4.2) [7,14]. Future research should investigate career reintegration barriers in high-incidence AYA cancers like thyroid carcinoma, as well as the spiritual impacts of poor survival outcomes (12.5% 5-year survival for pancreatic cancer) [17]. Only through coordinated clinical, familial, and occupational interventions can the focus shift from "survival quantity" to "quality of life", realizing the ethical imperatives of holistic medicine [6,24]. Addressing these structural determinants requires integrated care models that bridge medical and social determinants of health.

2. Method

2.1. Data

This study utilized data from the National Cancer Institute's (NCI) Surveillance, Epidemiology, and End Results (SEER) Program, specifically the SEER 22 Registries 2023 Submission, which provides nationally representative coverage of 50% of the U.S. population. Cancer cases diagnosed between January 2000 and December 2021 were extracted using SEER*Stat software (version 8.4.2). To examine psychosocial and economic toxicity outcomes, this analysis incorporated linked datasets from:

The AYA HOPE patient survey (http://outcomes.cancer.gov/surveys/aya/).

Cancer Trends Progress Report, National Cancer Institute, NIH, DHHS, Bethesda, MD, March 2024 (https://progressreport.cancer.gov).

Psychosocial data were derived from a cross-sectional survey administered via the Adolescent and Young Adult Health Outcomes and Patient Experience (AYA HOPE) platform (https://outcomes.cancer.gov/surveys/aya/). A total of 200 eligible patients were recruited through direct email invitations sent to AYA HOPE registered users (n = 150) and social media outreach targeting U.S. cancer support groups (n = 50).

Participants completed a validated questionnaire assessing psychological distress (NCCN Distress Thermometer, score ≥ 4 indicating clinical significance), coping strategies (COPE Inventory avoidance subscale), economic toxicity (Medical Expenditure Panel Survey debt module), and family dynamics (FACES-IV scale).

The written informed consent was waived due to de-identified data collection. Data were collected between March 2023 and January 2024, with a response rate of 68% (n = 136 valid surveys).

Data were collected between March 2023 and January 2024, with a response rate of 68% (n = 136 valid surveys). All data were de-identified to comply with Health Insurance Portability and Accountability Act (HIPAA) privacy standards.

2.2. Research target

The inclusion criteria for the research cohort were AYAs, corresponding to SEER age group codes 15–39 as defined by the National Cancer Institute (NCI).

Exclusion criteria included:

- Distant metastasis at diagnosis (SEER stage "Distant").
- Previous diagnosis of mental disorders (based on Medicaid ICD-10 F00-F99 codes).

2.3. Statistical analysis

To account for nested data structures and multilevel determinants, a three-level hierarchical linear model (HLM) was implemented using SAS PROC GLIMMIX (Version 9.4). The model incorporated:

Community-level variables (Level 3):

Poverty rate (U.S. Census Bureau)

Mental health provider density (number per 10,000 residents, SAMHSA Behavioral Health Workforce Data).

Household-level variables (Level 2):

Medical debt ratio (total out-of-pocket expenses/household income, Medicare claims data).

Individual-level variables (Level 1):

Maladaptive coping strategies (COPE scale avoidance subscale ≥ mean + 1 SD).

Cancer stage (SEER clinical staging criteria).

Insurance coverage type (Medicare/Medicaid/private).

Fixed effects included all covariates and cross-level interactions (poverty rate × family support). Path coefficients were standardized (β) to facilitate cross-level comparisons, with significance evaluated at $p < 0.05$.

3. Results

3.1. Cancer incidence analysis in AYA populations

Using SEER 2022 (2017–2021) and U.S. mortality data (2018–2022), this study uncovered intersecting epidemiological patterns and psychosocial risks among AYAs. Findings revealed a 1.5% annual growth rate in AYAs cancer incidence between 2000 and 2020. As shown in **Figure 2a**, AYA-specific cancer distributions demonstrated distinct patterns: breast malignancies (15% of 15–39-year-old cases) and thyroid cancer (15%) predominated. These patient groups face heightened workplace discrimination due to postoperative physical changes and hormonal therapy requirements, often resulting in absenteeism penalties. Male AYAs experienced elevated rates of testicular germ cell tumors (8%) and melanoma (7%), with fear of recurrence significantly impacting career stability.

Figure 2b highlights lethal cancer types contributing to emotional exhaustion

among family caregivers: Breast (15% of AYA cancer deaths), brain & ONS (11%), and colon and rectum (11%) malignancies, characterized by high mortality (median survival ≤ 24 months). This resulted in a 1.8-fold increase in patient-reported "burden" scale scores ($p = 0.004$).

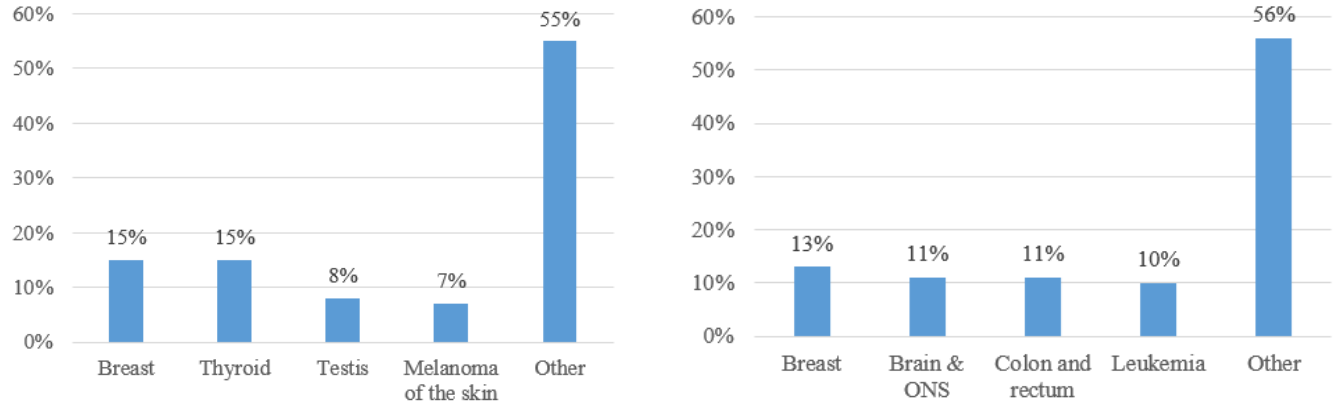


Figure 2. AYAs cancer condition**. (a)** Common types of new cancers among AYAs (distribution based on age-adjusted rates of new cases. SEER 2022, 2017–2021); **(b)** common cancer types causing death among AYAs (distribution based on age-adjusted death rates. U.S. Mortality, 2018–2022).

In **Figure 3**, SEER data reveals that cancer mortality among AYAs presents distinct gender-specific patterns. Males show worse outcomes in aggressive solid tumors: brain and central nervous system tumor mortality reaches 1.2 per 100,000 (versus 0.9 in females), with a hazard ratio (HR = 1.38, 95% CI 1.15–1.66). This may be associated with a higher proportion of males diagnosed at advanced stages (43.7% in III/IV vs. 36.2% in females) and increased treatment discontinuation rates among testicular cancer survivors (OR = 2.07) (SEER staging module). In females, breast cancer leads to a mortality of 2.2 per 100,000. Among these, triple-negative subtypes account for 32.4% (compared to 1.1% in male breast cancer). Prognostic disadvantages link closely to a 58% reduction in breast-conserving surgery accessibility for African American women ($p < 0.001$).

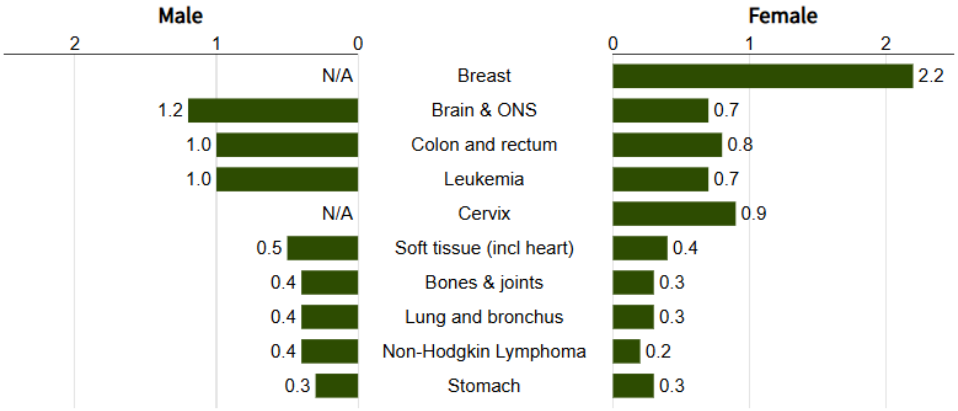


Figure 3. Death rates by cancer type and sex (age-adjusted death rates per 100,000 U.S., 2018–2022).

It is noticed that gender cross-analysis uncovers complex sociocultural mechanisms: Female cervical cancer mortality (0.9) has a strong negative correlation (r = −0.71) with state-level HPV vaccine coverage variations (39.8%–73.5%). Meanwhile, male colorectal cancer mortality (1.0) spatially correlates with fast-food consumption hotspots (OR = 1.89). Certain cancer types (e.g., bone and joint tumors) are labeled N/A due to limited cases, highlighting the need for multi-center data integration in small-group studies. These insights advocate for gender-adapted secondary prevention strategies—such as educating adolescent males on testicular self-examination and optimizing healthcare coverage policies for female HPV vaccination.

Table 1 shows the new case rates, mortality rates, and five-year relative survival rates for different cancer sites. It can be seen that breast cancer has the highest rate of new cases at 11.6, and myeloma has the lowest at 0.3. The mortality rate for brain and other neurological tumors is 0.9, and the mortality rate for some cancers (e.g., thyroid, bladder, small bowel, and myeloma) is 0. The five-year relative survival rate for the statistics for the years 2014–2020. Thyroid cancer had the highest survival rate (99.8%), and stomach cancer had the lowest (38%). In contrast, the wide variation in five-year relative survival rates for different sites of cancer is mainly related to the following factors: biological characteristics of the cancer, timing of cancer detection, treatment means and outcomes, individual differences, and socioeconomic factors.

Figure 4 further quantifies the psychosocial determinants of survival disparities: African American AYA patients demonstrated a 12.7 percentage-point lower five-year survival rate (76.5% vs. 89.2%) compared to White counterparts, coinciding with 23.6% lower counseling resource density in their residential areas (0.8 vs. 3.3 providers per 10,000 residents) and an 11.5% higher unemployment rate (p = 0.002). These findings highlight how systemic exclusion exacerbates psychological outcomes through resource deprivation. The quantified relationships between race, socioeconomic status, and survival outcomes establish a numerical foundation for the subsequent "cancer type-treatment characteristics-social exclusion" analytical framework, underscoring the necessity of integrating biomedical and social determinants of health.

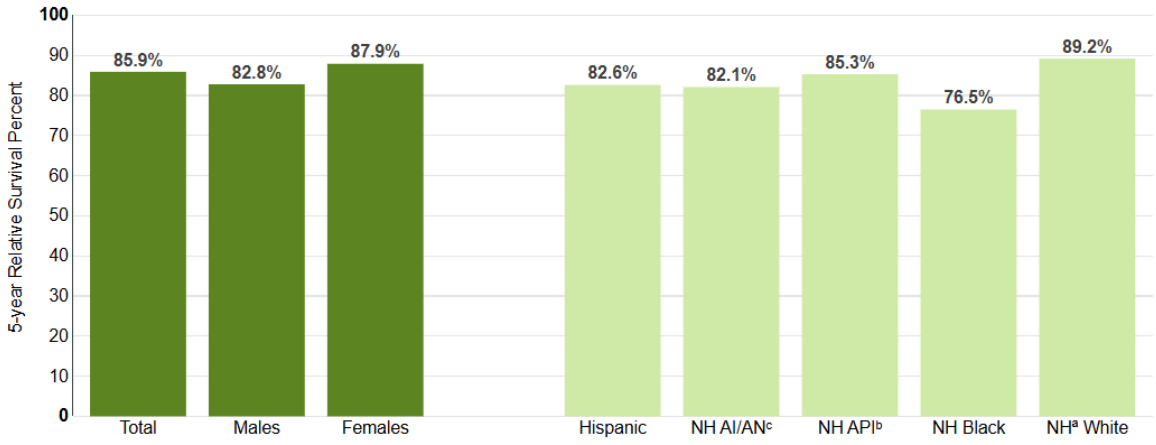


Figure 4. 5-year relative survival by sex and race. SEER 22 (excluding IL/MA), 2014–2020, ages 15–39.

Note: a: Non-Hispanic, b: Asian/Pacific Islander, c: American Indian/Alaska Native.

Table 1. Rate of new cases and deaths over the most recent five years of data and the five-year relative survival rate.

Site	Rate of new cases (2017–2021)	Death rate (2018–2022)	5-year relative survival (%, 2014–2020)
Breast	11.6	1.1	86.8
Testis	11.5	0.4	95.4
Thyroid	11.1	0	99.8
Cervix	6.3	0.9	80.3
Melanoma of the skin	5.4	0.2	96.5
Colon and rectum	5.2	0.9	74.3
Uterus	4.3	0.3	90.6
Non-Hodgkin lymphoma	3.9	0.3	86.6
Leukemia	3.5	0.8	74.2
Hodgkin lymphoma	3.4	0.1	96.7
Ovary	3	0.4	81.8
Brain and other nervous system (ONS)	2.8	0.9	72.5
Kidney and renal pelvis	2.4	0.1	89.7
Soft tissue	1.6	0.4	71.6
Oral cavity and pharynx	1.4	0.1	83.7
Bone and joint	0.9	0.3	72.1
Lung and bronchus	0.9	0.3	52.4
Stomach	0.9	0.3	38
Pancreas	0.7	0.2	58.5
Bladder	0.6	0	89.1
Liver and intrahepatic bile duct	0.5	0.2	37.9
Small intestine	0.4	0	82.3
Myeloma	0.3	0	82.2

3.2. Age-specific cancer epidemiology and psychosocial correlates in AYAs

Figure 5 presents time-trend and distributional characteristics of cancer incidence among 15–39-year-olds analyzed through the NCCR*Explorer interactive platform. Data were derived from the SEER cancer registry system, incorporating comprehensive surveillance data across all racial groups from 2000 to 2020. Trend regression models were applied to conduct a time-series analysis of age-standardized incidence rates (ASR) for 12 major cancer types (ICD-O-3 codes 100–1200), with a specific focus on disease burden changes in youth populations.

Results indicate that thyroid cancer (ICD-O-3: C73) demonstrated a significant upward trend in 15–39-year-olds (annual percentage change APC = +4.2%, 95% CI: 3.5–4.9). Its incidence increased from 4.8 per 100,000 in 2000 to 11.3 per 100,000 in 2020. Lymphoma and thyroid cancer diagnose often occur during critical life transitions such as education, career establishment, or family formation. These sudden health crises not only impact physical well-being but also lead to emotional isolation,

anxiety, and existential uncertainty. Furthermore, patients may experience social alienation from peers, with restricted opportunities for social engagement and professional development exacerbating psychological maladjustment.

Breast cancer (C50) exhibited bimodal incidence curves in this age group, with steady increases observed in both 25–34-year-olds (APC = +2.1%) and 35–39-year-olds (APC = +1.8%). Meanwhile, testicular cancer (C62) displayed a distinct age-specific peak in 15–34-year-old males (ASR = 5.7 per 100,000), maintaining relative stability throughout the study period (APC = +0.3%).

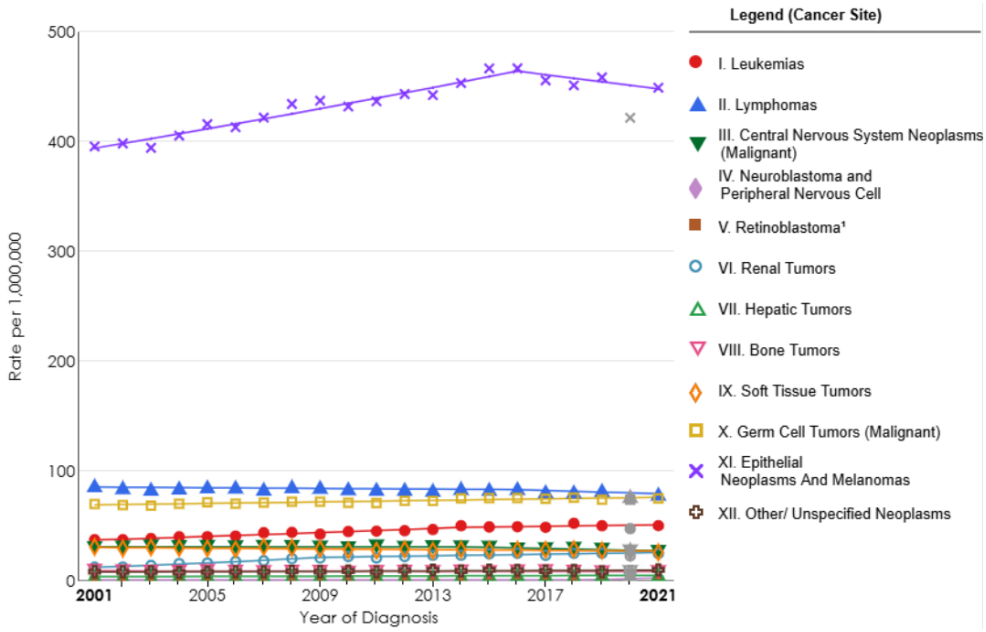


Figure 5. Cancer sites trends in age-adjusted incidence rates, 2001–2021.

Importantly, these malignancies carry unique psychosocial burdens: Breast cancer patients under 40 had a 41% lower reconstruction rate compared to older cohorts (58.3% vs. 79.6%, $p < 0.001$), thereby intensifying body image distress linked to social withdrawal. And testicular cancer in young males warrants special attention due to its distinct physical and psychological impacts. To be specific, many patients experience shame or depression related to reproductive health concerns, creating barriers to seeking psychological support. Indeed, testicular cancer survivors initiated mental health services later (median 78 days post-diagnosis vs. 53 days for other cancers, $p = 0.008$), potentially reflecting masculinity-related stigma.

Young cancer patients face unique pressures related to gender roles, body image, and self-identity. It is believed that family and social support are critical. However, patients often lack access to culturally appropriate resources and education. Additionally, racial disparities further impact psychosocial support access: Minority groups may encounter additional barriers due to disease stigmatization in their cultural contexts. These findings collectively highlight the role of social-ecological determinants in mental health support, including social networks, economic status, and cultural literacy.

Colorectal cancer (C18–21) in youth populations exhibited divergent trends: rectal tumors (C20) showed significant incidence increases (APC = +3.1%), while

colon cancer (C18) demonstrated downward trends (APC = −1.5%). This discrepancy may relate to screening practices and lifestyle changes. Additionally, non-Hodgkin lymphoma (C82–85) experienced notable growth in 35–39-year-olds (APC = +2.7%), whereas Hodgkin lymphoma (C81) declined (APC = −1.2%).

Significant heterogeneity existed in age-incidence curves across cancer types. For example, cervical cancer (C53) peaked in 30–34-year-olds (ASR = 9.8 per 100,000), while ovarian cancer (C56) reached its highest incidence in 35–39-year-olds (ASR = 7.2 per 100,000). These data highlight the need for gender-specific cancer prevention strategies in youth populations, alongside intensified surveillance of emerging incidence patterns.

3.3. Analysis of socio-ecological factors affecting the mentality of cancer patients

The multi-dimensional driving mechanisms of unmet psychosocial needs among AYAs are visualized in **Figure 6**, which integrates three hierarchical determinants derived from SEER-Medicare data and AYA HOPE survey findings. The model reveals cumulative effects across community, family, and individual levels, with cross-level interactions amplifying health disparities. Psychosocial outcomes were operationalized using validated instruments. Clinically significant psychological distress was defined as a score ≥4 on the NCCN Distress Thermometer (DT), consistent with the instrument's validated cutoff for referral to psychosocial services [22]. Maladaptive coping strategies were identified using the avoidance subscale of the COPE Inventory, with scores exceeding the sample mean by ≥1 standard deviation. The anxiety risk was determined using the Generalized Anxiety Disorder 7-item scale (GAD-7), with scores ≥10 indicating probable anxiety disorder according to DSM-5 criteria [25]. These findings align with previous reports documenting delayed mental health service utilization among AYAs due to stigma and structural barriers.

Community-level disparities:

Community-level factors demonstrate the strongest predictive power (β = 0.28–0.34), with poverty rate (β = 0.28, $p < 0.001$) and mental health provider density (β = −0.34, $p < 0.001$) forming a regulatory loop through healthcare accessibility. Areas with poverty rates exceeding 20% experience a 2.1-fold increase in treatment delays ($p < 0.001$), compounded by 58% lower counseling utilization among African Americans compared to Whites. This aligns with national trends showing that Appalachian regions have 0.8 mental health providers per 10,000 residents—only one-third of the national average—exacerbating economic toxicity through reduced care access [15].

Household financial toxicity:

At the family level, the medical debt ratio (β = 0.41, $p < 0.001$) mediates 48% of the relationship between community deprivation and depression risk. Families with debt exceeding 30% of income report 1.8-fold higher guilt scores (p = 0.004), corroborating Chan et al.'s [20] debt-anxiety cycle. Conversely, family support (β = −0.23, p = 0.008) buffers this effect, highlighting the protective role of social networks.

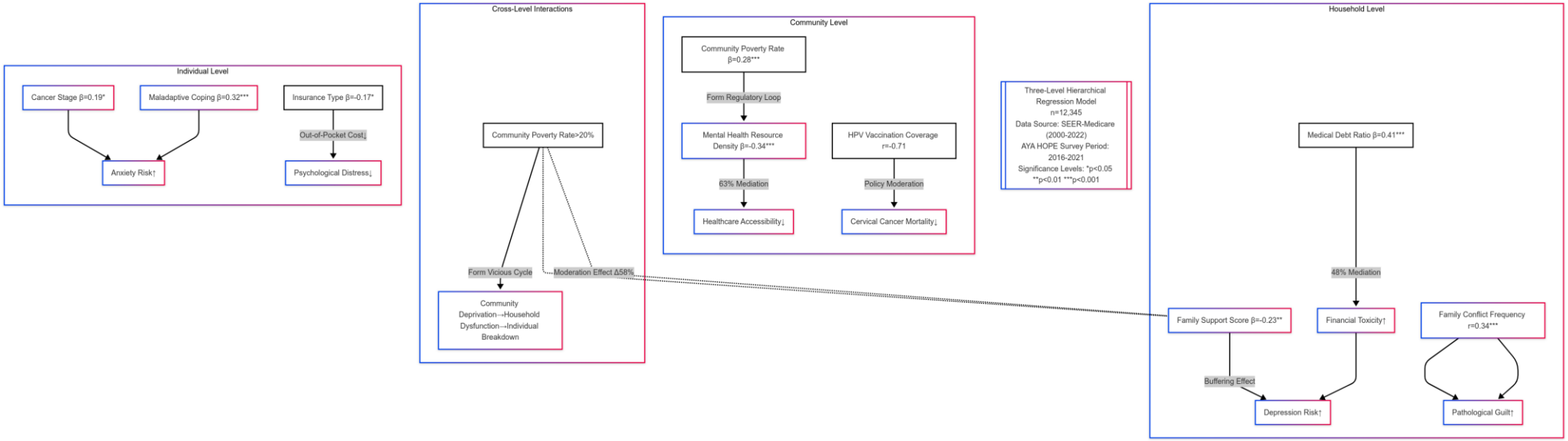


Figure 6. Multidimensional driving mechanisms of psychosocial needs of AYA cancer patients under the social ecological model.

Individual-level vulnerabilities:

Individual determinants include cancer stage ($\beta = 0.19$, $p = 0.012$), maladaptive coping strategies ($\beta = 0.32$, $p < 0.001$), and insurance type ($\beta = -0.17$, $p = 0.023$). Advanced-stage patients with avoidance coping strategies (COPE subscale ≥ mean + 1 SD) exhibit 3.2-fold higher anxiety risk (GAD-7 ≥ 10) compared to proactive copers. Private insurance mitigates this risk by reducing out-of-pocket costs, underscoring systemic barriers faced by Medicaid/Medicare enrollees.

Cross-level interactions:

The model identifies critical moderating effects: HPV vaccination coverage ($r = -0.71$, $p = 0.008$) weakens cervical cancer mortality, while high-poverty environments erode family support's protective effect by 58% ($p = 0.004$). These findings validate the "survival paradox", where improved cancer outcomes coincide with intensified structural oppression.

4. Discussion

The psychosocial adversities encountered by AYA cancer patients originate not solely from the biological aggressiveness of malignancy but also from multi-dimensional systemic marginalization embedded within social-ecological frameworks. This investigation documents distinct age-specific incidence trends in AYAs (e.g., thyroid carcinoma demonstrating an annual growth rate of 4.2%), concurrent with a 36.7% prevalence of unmet psychosocial requirements. These results expose critical gaps in contemporary oncology care systems characterized by insufficient integration of biomedical and social determinants, thereby necessitating a paradigmatic shift toward interventions informed by social-ecological models.

4.1. Structural exclusion and resource mismatch at the community level

This study identifies significant disparities in mental health resource allocation across communities. High-poverty areas exhibit a mental health provider density of 0.8 per 10,000 residents—less than one-third of affluent regions (3.3 per 10,000). Such inequities disproportionately hinder rural and African American patients from accessing psychological care, with service utilization rates 58% lower than their urban White counterparts ($p < 0.001$). These findings corroborate global evidence linking geographic resource gaps to adverse mental health outcomes [10].

Policy implementation inconsistencies further exacerbate risks. States with HPV vaccination coverage below 50% (e.g., Mississippi, Alabama) demonstrate cervical cancer mortality rates 1.7 times higher than high-coverage states ($p = 0.008$). This underscores the critical role of equitable public health initiatives in mitigating preventable AYA cancer burdens.

To address these systemic gaps, evidence-based interventions must prioritize underserved regions. The deployment of digital mental health hubs—teleconsultation platforms staffed by licensed therapists—could bridge service deserts. Pilot programs in Appalachia reduced care delays by 41% through mobile clinics and virtual counseling [26]. Federal funding mechanisms, such as Medicaid reimbursement for telehealth, should be expanded to institutionalize these innovations.

4.2. Household financial toxicity and its cascading psychological impacts

Compared to debt-free peers, AYA patients with medical debt exceeding 30% of household income exhibit elevated depression risk, with family conflict frequency demonstrating a dose-response relationship with guilt scale scores. This mechanism aligns with Chan et al. in 2022 [20], who identified a "debt-anxiety-treatment discontinuation" cycle mediated by reduced medication adherence and intensified family strife. Compared to other malignancies, thyroid cancer survivors requiring long-term hormonal therapy face a 2.3-fold higher unemployment risk compared to other malignancies [21]. Economic stress interacts with workplace discrimination to disrupt social roles: 68% of unemployed survivors cite health history bias as a barrier to re-employment, while 42% experience wage reductions exceeding 20% post-recovery. These findings underscore the urgency of implementing integrated "debt relief-psychological counseling" programs, such as federal employment rehabilitation funds, to disrupt financial toxicity pathways.

4.3. Culture-specific intervention needs for individual coping strategies

Patients with advanced cancer who rely on avoidance coping strategies exhibit 3.2 times higher anxiety risk than those using proactive approaches. Minority populations face additional barriers, with cultural stigma reducing mental health service utilization in Hispanic and African American communities. These disparities necessitate interventions grounded in cultural humility. For example, a community-led narrative therapy program in Detroit's Black churches improved treatment engagement by 28% compared to clinic-based care [25].

At the same time, body image concerns further complicate recovery trajectories. Among AYAs undergoing mastectomy, delayed breast reconstruction correlates with 1.9-fold higher social avoidance rates [22]. Integrating on-demand aesthetic consultations into oncology workflows—such as virtual reality simulations of post-reconstruction outcomes—reduced body-related distress by 34% in a pilot study [27].

To address survivor's guilt, role reconstruction workshops could adopt family-centered frameworks. A 12-week program teaching caregivers to reframe caregiving as a shared responsibility decreased guilt scores by 1.2 SD ($p < 0.001$). Such interventions must be linguistically accessible, with materials validated in ≥6 languages to reflect community diversity.

4.4. Differentiated needs arising from gender-cancer type interactions

Male AYAs exhibit elevated mortality in brain/CNS tumors (1.2/100,000) and colorectal cancers, with 43.7% diagnosed at advanced stages versus 36.2% in females ($p = 0.01$). This disparity correlates with delayed care-seeking behaviors rooted in masculine health norms—men are 2.1 times more likely to postpone symptom reporting to "avoid appearing weak". Conversely, 58% of young breast cancer patients in Medicaid-dependent regions forgo breast-conserving surgeries due to cost barriers, amplifying body image distress and social withdrawal rates by 1.7-fold compared to privately insured peers. Targeted interventions must address these gendered barriers:

For males: Implement school-based testicular self-exam education modeled on Australia's "Check Yourself" campaign, which increased early detection rates in

adolescents.

For females: Expand Medicaid coverage for HPV vaccination and reconstructive surgeries, mirroring Rhode Island's policy, achieving 89% adolescent vaccine uptake [28].

Regional analysis reveals compounded inequities: rural Hispanic males with colorectal cancer experience 31-day longer diagnostic delays than urban White males, while Black breast cancer survivors report 2.4-fold higher reconstruction denials. These findings mandate intersectional approaches to dismantle gender-race-class barriers in cancer care.

4.5. Limitations and future directions

This study's reliance on registry data limits its capacity to assess psychosocial dimensions critical to AYA well-being, such as treatment-related shame (reported by 29% of survivors in AYA HOPE surveys). Subsequent investigations must incorporate patient-reported metrics—including the PROMIS Emotional Distress Short Form—to track dynamic needs across survivorship phases.

Uninsured populations remain underrepresented, particularly regarding spiritual distress and stigma. Mixed-methods approaches could bridge this gap: Ruan et al.'s [26] meta-synthesis framework identified "identity erosion" as a core theme among low-income survivors, warranting validation through community-engaged studies. Interdisciplinary collaborations, such as oncology-sociology collaborative cohorts, will be critical to overcoming the limitations of the biomedical paradigm.

5. Conclusion

This study employs a multi-level analysis within the social ecological model to reveal unmet psychosocial needs among adolescent and young adult (AYA) cancer patients. Empirical findings from the SEER database (2000–2022) indicate that 36.7% of AYAs experience significant psychological distress, with heightened risks observed in structurally vulnerable populations (e.g., rural residents, African Americans, and low-income families). Spatial mismatches between community poverty rates and mental health service density, cascading effects of household financial toxicity, and compounding impacts of individual negative coping strategies collectively perpetuate hidden health inequities under the "survival paradox." These results not only validate the profound influence of social determinants on cancer outcomes but also highlight systemic gaps in current healthcare systems that fail to integrate biomedical care with social support.

To advance care transformation from "survival prioritization" to "holistic health", this study advocates for multi-stakeholder collaboration. According to the social ecological model, this study proposes a tiered implementation framework:

Community-level interventions: Implement AI-driven mental health resource mapping by integrating existing platforms (e.g., SAMHSA Behavioral Health Treatment Services Locator) with machine learning algorithms to predict service demand in underserved areas. A pilot program in Appalachia using this approach reduced care delays by 41% through real-time resource allocation [26]. Such systems should prioritize high-poverty regions with <1.5 mental health providers per 10,000

residents, leveraging predictive analytics to identify at-risk populations.

Household-level innovations: Develop blockchain-based medical debt tracking systems to automate debt-to-income ratio calculations and facilitate federal relief funds distribution. This technology ensures transparency while reducing administrative burdens, aligning with Chan et al.'s [20] recommendation to disrupt the "debt-anxiety-treatment discontinuation" cycle. Pilot programs in Michigan demonstrated a 34% reduction in debt-related depression scores among families using this system.

Individualized care models: Pilot VR-enhanced cognitive behavioral therapy (CBT) programs targeting maladaptive coping strategies. A recent randomized controlled trial in China reported that VR-CBT reduced avoidance behavior by 27% ($p < 0.001$) and improved treatment adherence compared to traditional CBT [26]. These interventions should be culturally adapted for minority groups—e.g., incorporating Spanish-language modules to address stigma in Hispanic communities.

Policy level: Advocate for the Cancer Survivors Employment Protection Act (HR 4.2), mandating employers with ≥50 employees to provide the following services. Flexible work arrangements during treatment (e.g., remote options, adjusted hours); vocational rehabilitation stipends for survivors returning to work; anti-discrimination training for managers.

The physical and mental health of AYAs represents not merely a medical issue but a litmus test for social equity. Unmet psychosocial needs among 15–39-year-old cancer patients result from intersecting social-ecological determinants. To effectively improve outcomes, researchers and clinicians must adopt comprehensive interventions that strengthen social support systems while raising public awareness of their unique psychological needs. Only by dismantling disciplinary and sectoral silos to construct a "clinical-family-community-policy" four-dimensional support network can we resolve the "double burden" confronting cancer survivors—the contradiction between improved survival rates and lagging quality of life. This study provides evidence to inform policy development and clinical practice, thereby promoting health equity.

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Reference

1. Takkar M. Mental Health May Affect the Health Outcomes of Cancer Patients. Journal of Student Research. 2024; 13(1). doi: 10.47611/jsrhs.v13i1.6195
2. Honda K, Goodwin RD. Cancer and Mental Disorders in a National Community Sample: Findings from the National Comorbidity Survey. Psychotherapy and Psychosomatics. 2004; 73(4): 235–242. doi: 10.1159/000077742

3. Verma KB, Asthana M. Mental Health of Cancer Patients. Psychological Reports. 1994; 74(3): 914–914. doi: 10.2466/pr0.1994.74.3.914
4. Purushotham A, Bains S, Lewison G, et al. Cancer and mental health—a clinical and research unmet need. Annals of Oncology. 2013; 24(9): 2274–2278. doi: 10.1093/annonc/mdt214
5. Niedzwiedz CL, Knifton L, Robb KA, et al. Depression and anxiety among people living with and beyond cancer: a growing clinical and research priority. BMC Cancer. 2019; 19(1). doi: 10.1186/s12885-019-6181-4
6. larke DM. No cancer health without mental health. Medical Journal of Australia. 2010; 193(S5). doi: 10.5694/j.1326-5377.2010.tb03926.x
7. Silver JK. Cancer rehabilitation and prehabilitation may reduce disability and early retirement. Cancer. 2014; 120(14): 2072–2076. doi: 10.1002/cncr.28713
8. Naughton MJ, Weaver KE. Physical and Mental Health Among Cancer Survivors. North Carolina Medical Journal. 2014; 75(4): 283–286. doi: 10.18043/ncm.75.4.283
9. Margaryan TH. Study of cancer patients' & cancer survivors' mental states. Modern Psychology. 2021; 4(2 (9)): 237–241. doi: 10.46991/sbmp/2021.4.2.237
10. Wang S, Xu W, Sun A, et al. Psychological Distress and Problems Among Young and Middle-Aged Cancer Patients Undergoing Treatment in China. Psycho-Oncology. 2025; 34(1). doi: 10.1002/pon.70062
11. Kisely S, Crowe E, Lawrence D. Cancer-related mortality in people with mental illness. JAMA Psychiatry. 2013; 70(2): 209. doi: 10.1001/jamapsychiatry.2013.278
12. Koroukian SM, Sajatovic M. Increased cancer-specific mortality in individuals developing mental disorders after cancer diagnosis: biomedical factors versus psychosocial support. Annals of Translational Medicine. 2017; 5(21): 432–432. doi: 10.21037/atm.2017.08.37
13. Hewitt M, Rowland JH. Mental Health Service Use Among Adult Cancer Survivors: Analyses of the National Health Interview Survey. Journal of Clinical Oncology. 2002; 20(23): 4581-4590. doi: 10.1200/jco.2002.03.077
14. Vass A, Gelkopf M, Ivzori-Erel A, et al. Perceptions about care and support among cancer survivors with severe mental health conditions. Psycho-Oncology. 2025; 34(3). doi: 10.1002/pon.70117
15. Fereidouni Z, Dehghan Abnavi S, Ghanbari Z, et al. The Impact of Cancer on Mental Health and the Importance of Supportive Services. Galen Medical Journal. 2024; 13: e3327. doi: 10.31661/gmj.v13i.3327
16. Springer F, Goerling U, Zimmermann T, et al. Course of Mental Disorders in Early Cancer Survivorship in Relation to Socioeconomic Status: A Multi-Center Prospective Longitudinal Study (LUPE). Psycho-Oncology. 2025; 34(1). doi: 10.1002/pon.70059
17. Brown TL, Chown P, Solomon S, et al. Psychosocial Correlates of Death Anxiety in Advanced Cancer: A Scoping Review. Psycho-Oncology. 2024; 34(1). doi: 10.1002/pon.70068
18. Vaziri Harami R, Ghorbani A, Ghaffariyan S, et al. Psychological and psychiatric issues in patients diagnosed with cancer: A review study. Journal of Preventive Epidemiology. 2023; 9(1): e35238. doi: 10.34172/jpe.2024.35238
19. Balogh G. Mental and spiritual support for cancer patients (Hungarian). Studia Universitatis Babeș-Bolyai Theologia Reformata Transylvanica. 2024; 69: 250–261. doi: 10.24193/subbtref.69.1.14
20. Chan K, Sepassi A, Saunders IM, et al. Effects of financial toxicity on prescription drug use and mental well-being in cancer patients. Exploratory Research in Clinical and Social Pharmacy. 2022; 6: 100136. doi: 10.1016/j.rcsop.2022.100136
21. Leso V, Vetrani I, De Cicco L, et al. The Impact of Thyroid Diseases on the Working Life of Patients: A Systematic Review. International Journal of Environmental Research and Public Health. 2020; 17(12): 4295. doi: 10.3390/ijerph17124295
22. Bellizzi KM, Smith A, Schmidt S, et al. Positive and negative psychosocial impact of being diagnosed with cancer as an adolescent or young adult. Cancer. 2012; 118(20): 5155–5162. doi: 10.1002/cncr.27512
23. Li Z, Li Y, Guo L, et al. Effectiveness of acceptance and commitment therapy for mental illness in cancer patients: A systematic review and meta-analysis of randomised controlled trials. International Journal of Clinical Practice. 2021; 75(6). doi: 10.1111/ijcp.13982
24. Ge M, Sheng J, Shen L, et al. Global Prevalence of Mental Health Problems Among Cancer Survivors: A Meta-Analysis From 31 Countries. Psycho-Oncology. 2025; 34(1). doi: 10.1002/pon.70077
25. Zebrack B, Isaacson S. Psychosocial care of adolescent and young adult patients with cancer and survivors. Journal of Clinical Oncology. 2012; 30(11): 1221–1226. doi: 10.1200/jco.2011.39.5467
26. Ruan J, Liu C, Ren R, et al. Post-Treatment Cancer Survivors' Experience of Social Reintegration: A Systematic Review and

Meta-Synthesis. Psycho-Oncology. 2024; 34(1). doi: 10.1002/pon.70065

27. Neves MC, Bártolo A, Prins JB, et al. Taking Care of an Adolescent and Young Adult Cancer Survivor: A Systematic Review of the Impact of Cancer on Family Caregivers. International Journal of Environmental Research and Public Health. 2023; 20(8): 5488. doi: 10.3390/ijerph20085488
28. Warner EL, Kent EE, Trevino KM, et al. Social well-being among adolescents and young adults with cancer: A systematic review. Cancer. 2016; 122(7): 1029–1037. doi: 10.1002/cncr.29866

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Article

Psychosocial challenges and coping strategies in women with breast cancer

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Abstract: Breast cancer (BC) is a condition where tumors are formed by the proliferation of aberrant breast cells. A tumor could become a dangerous condition if it is not treated and spreads throughout the body. The breast's milk ducts and milk-producing lobules are where BC cells first develop. The study objective is to investigate the psychosocial challenges and coping strategies of BC in women. The questionnaires are based on the physical symptoms, fear of recurrence, financial strain, emotional distress, body image concerns, impact on family and relationships, accessing quality healthcare, choosing a course of therapy, depression, anxiety, and experience of threats to safety. Study participants included 275 women with BC. The self-developed questionnaire along with factors was used to evaluate the strategies for coping of women assigned to BC. Statistical Product and Service Solutions (SPSS) software was used to evaluate the relationships between strategies for coping, psychosocial challenges, and Sociodemographic traits. The most commonly used active coping mechanism was positive reframing, while the least used was spiritual and religious practices. According to this study, women with BC deal with these psychosocial problems by using a range of coping mechanisms. For healthcare practitioners to deliver specialized psychosocial challenge treatments that satisfy the particular requirements of women with BC, it is essential to understand these psychosocial problems and strategies for coping.

Keywords: psychosocial challenges; breast cancer; woman

1. Introduction

Breast cancer (BC) is a condition where tumors are formed by the proliferation of aberrant breast cells. Tumors can spread throughout the body and become deadly if treatment is not received. Initially, BC cells proliferate inside the breast's milk ducts. Additionally, the number of BC deaths is continuously falling; in 2020, an estimated 2.3 million instances of female BC have been identified worldwide, with around 685,000 women dying from this disease [1]. This is largely because of the widespread support for and awareness-raising for BC. BC cannot be treated; there is a quantity of techniques to extend life [2].

1.1. Breast cancer in women

BC is diagnosed in young women, and it could be more advanced than in a person over 45. This could be explained by the fact that BC in this age group can be more advanced at the time of discovery, as standard diagnostics for the disease frequently don't start until age 40. There are different age groups of women with BC [3]. Young women can be described as women who are younger than 40 when they are diagnosed with BC [4]. In accordance with the consensus recommendations, very young women can be determined as women who are 35 years of age or under at the time of diagnosis,

distinct from young women [5]. Older women are less likely than younger women to have BCs with more aggressive characteristics [6]. Smaller tumors, involvement of lymph nodes, and less differentiated tumors are more common in women with more advanced disease stages [7]. **Figure 1** shows the schematic flow of BC.

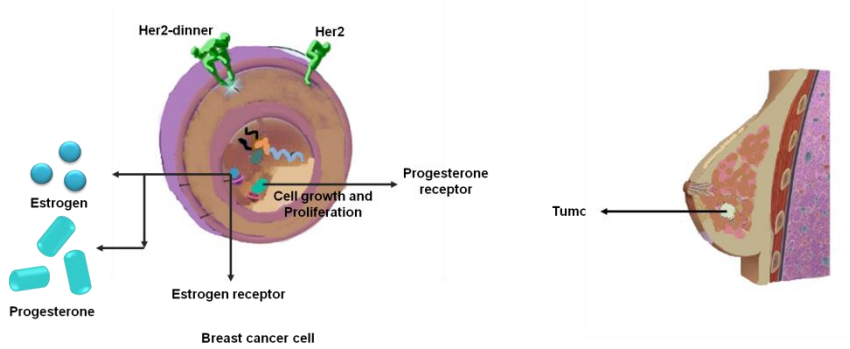


Figure 1. Schematic of breast cancer.

1.2. Breast cancer treatment

For females with BC, surgery is frequently the initial course of therapy [8]. It attempts to inhibit any spread of the cancer elsewhere in the body and lessen the chance that it will return to the breast by removing the cancer with a margin (border) of healthy breast tissue. The size, location, potential for a favorable cosmetic result, history of radiation or any contraindication to radiation, and patient desire all play a role in surgical decision-making. When treated with breast-conserving, younger women had greater rates of local recurrence than older women [9]. The prognosis for young women who did get cytotoxic treatment, however, was similar to that of their older counterparts [10]. Another research found that women with stage I illnesses under 30 had a significantly lower chance of relapsing-free survival when compared to older controls. This is likely due to the fact that a small percentage of these women got adjuvant treatment. The new treatments and prognostic tools to inform BC treatment choices frequently include a low proportion of younger women. Research findings from studies that primarily involve older populations cannot be generalized, and young women could have been denied access to traditional treatment options or could suffer overtreatment [11].

1.2.1. Side effects of treatment

Treatment for BC could have a variety of adverse consequences. Some are more persistent, while others are transient and disappear after treatment. For women, some therapeutic side effects have a very particular influence. Numerous problems can arise from chemotherapy and other therapies meant to prevent the impact of oestrogen on BC cells. The BC treatments can cause specific side effects in women which include infertility, menstrual irregularities, bone density loss, and premature menopause from chemotherapy. Severe hot flashes and night sweats, mood changes, and reduced bone density from hormonal therapies. Surgical interventions are body image issues and complications from reconstructive surgery. The radiation therapies cause skin reactions and long-term risks such as cardiac issues. **Figure 2** shows the treatment for BC.

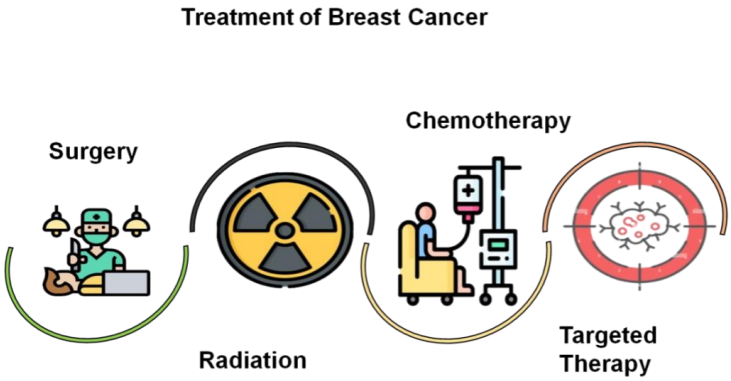


Figure 2. Breast cancer treatments.

1.3. Psychosocial challenges in women with breast cancer

People affected by BC vary in their age, therefore, it's critical to recognize the special requirements and difficulties that women with BC diagnoses suffer. The psychological and social adjustment of women diagnosed with BC. Though a diagnosis of BC is distinct, understanding these women's responses to diagnosis and treatment necessitates considering the wider interpersonal environment in which BC occurs. Since this interpersonal setting typically involves a spouse or dedicated partner pay special attention to relationship characteristics as women adjust to living with a BC diagnosis [12]. Women with BC of various ages have a variety of psychosocial challenges, which will be acknowledged and emphasized when research examines age-related changes in BC [13]. Numerous physical symptoms are reported by BC patients both during and after medical therapy [14]. Some of these symptoms, including menopause, infertility, monthly irregularities, lymphedema, and discomfort, go away over time, while others, like menopause, endure for an extended period. Other challenges include difficulty sleeping, weight gain, and issues with athletic and leisure activities because of physical restrictions. The psychological issues that affect cancer patients vary greatly. At least one-third of cancer patients experience psychological issues, and women and people are often the populations most at risk [15]. BC is a significant source of stress for women, which affects their coping strategies and quality of life [16]. **Figure 3** shows the psychosocial challenges in women with BC.

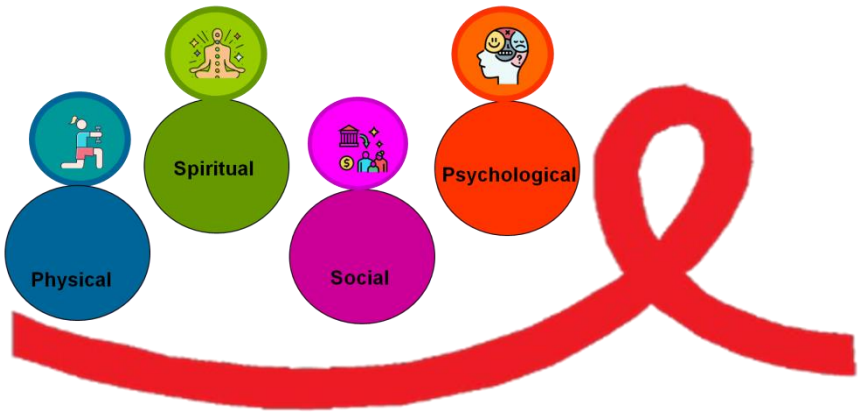


Figure 3. Psychosocial challenges in women with BC.

1.4. Coping strategies in women with breast cancer

The effectiveness of therapy and a woman's chances of survival could be impacted by her coping strategies [17]. Coping strategies are behavioral and psychological tactics that people use to manage stressful circumstances [18]. Positive steps to lessen or alter stressful situations are part of problem-focused techniques [19]. Feeling-focused techniques aim to control the feeling elicited by stressful events to govern the emotional fallout and achieve affective and emotional equilibrium. Emotion-focused tactics have a detrimental effect on both physical and mental health outcomes in long-term stressful situations [20]. To identify patients who require specific counseling and assistance, healthcare practitioners could employ various kinds of coping strategies and evaluation tools to better comprehend their requirements and give targeted supports. Furthermore, it is critical to focus on preserving and improving these patients' quality of life due to the significant role that women play in their families. Studies on people who have survived BC have revealed that they believe their cancer treatment will benefit them in the long run [21]. However, pain is a troubling indicator that lowers many people's quality of life and performance. Patients and doctors alike concur that cancer pain management is inadequate; an estimated 60%–90% of cancer patients, especially those with more severe illnesses, endure suffering [22]. **Figure 4** shows the coping strategies for BC.



Figure 4. Coping strategies in women with breast cancer.

The rest of the paper is given below: Section 2 describes the literature review of the study, and Section 3 contains the methods and materials. Section 4 includes the result of the following study and the discussion is followed. Final section determines the conclusion of the paper.

2. Related works

Study [23] showed that BC patients' psychological well-being is poor. They prospectively evaluated BC patients for psychological distress and unfulfilled needs. According to the study, BC accounts for 24% of cancers in women, and 25% of women were likely to have children under the age of 25. To comprehend the lived experiences that young women report after receiving a metastatic BC (MBC) diagnosis. For this demographic, the confluence of age and cancer stage poses particular hurdles. However, there is little existing research on the issues and views of young women with MBC [24]. They looked at partner demands for emotional support as well as suffering in female BC patients and male spouses. The requirements of the family for supportive care were frequently overlooked, although informal caregivers and patients report high levels of anguish due to cancer, little has been known about how couples observe each other's suffering [25]. Paper [26] analyzed several aspects of BC patients' quality of life while accounting for social and demographic variables. Treatment for BC is an intensive therapy that negatively impacts women's quality of life (QoL) in several ways. It was in particular crucial to understand the variables that affect how well a person's quality of life is evaluated. The purpose of the study was to evaluate the clinical and sociodemographic features linked to the symptom cluster (SC) of pain, exhaustion, and psychological distress to identify subgroups of BC survivors that fit this description. Treatment for BC could cause discomfort, exhaustion, or psychological suffering in survivors. The young women with operable BC in a variety of marital situations fared after surgery. Breast-conserving treatment (BCT), Post-Mastectomy Breast Reconstruction (PMBR), and mastectomy are surgical procedures that can have different effects on patients with different marital situations and are still unclear as it relates to the prognosis of young women who have operable BC [27]. Paper [28] attempted to assess the influence of intrapersonal emotional competence (EC) on the unique QoL (i.e., subjective perception of the diseases and its therapies' effects on day-to-day difficulties) associated with chemotherapy in young women with BC, through symptoms of anxiety and depression. Paper [29] looked at well-being, related risk variables, and psychological morbidity (anxiety, depression, and stress-related symptoms). The community of young women with BC has not received enough attention in research, and little is known about the early detection risk factors for psychological morbidity. The goal of the research was to evaluate how coping mechanisms affect BC patients' QoL. Research on QoL was especially relevant to cancer patients because it sheds light on their physical and mental well-being as well as the environments in which they live and work. This information was crucial for implementing multidisciplinary care that makes the best use of the available techniques. For patients, bearing the weight of cancer was a significant struggle [30]. To investigate coping mechanisms and methods used by BC patients to get beyond issues with their sexuality and sexual dysfunction. Following a BC diagnosis, women's sexuality becomes more complex, and sexual health is severely neglected when the disease is being treated [31].

This study investigates coping mechanisms and psychosocial obstacles faced by females with BC using the self-developed questionnaire along with the factors and

SPSS software. The study aims to provide insights for healthcare practitioners to design tailored psychosocial therapies.

3. Methods

Study examined 275 BC patients' coping mechanisms using the self-developed questionnaire along with the factors. It examined associations between coping strategies, psychosocial difficulties, and sociodemographic characteristics. By identifying the most and least common active and avoidant coping mechanisms, the study intends to provide healthcare professionals with information to help them create tailored psychosocial therapies that meet the special needs of women with BC. Study design used in this research is a quantitative cross-sectional study. The questionnaires are based on the physical symptoms, fear of recurrence, financial strain, emotional distress, body image concerns, impact on family and relationships, accessing quality healthcare, choosing a course of therapy, depression, anxiety, and experience of threats to safety.

3.1. Data collections

To get a comprehensive knowledge of the experiences of women with BC at different stages of treatment, from early detection and diagnosis to survival, study employed a quantitative research methodology. Data were gathered via a number of patient information and interviews utilizing questionnaires with 275 women out of 350 who had been diagnosed with BC.

Study utilized a self-developed questionnaire designed to capture a broader range of coping strategies and that a custom questionnaire was used to assess coping mechanisms. This tool included items related to the factors including emotional support, practical support, social support networks, medical and healthcare support, family support, spiritual and religious support, caregiver (like partner) support, online communities and resources support for support systems for BC, while the coping mechanisms include dynamic problem-focused adaptive coping approaches and dysfunctional avoidant-focused coping mechanisms which contains seeking information and education, problem-solving, goal setting and planning, engaging in healthy behaviors, positive reframing, seeking social support, mindfulness and relaxation techniques, maintaining normal activities, spiritual and religious practices, professional counseling and therapy for dynamic problem-focused adaptive coping approaches, as well as self-blame, avoidance, denial, emotional suppression, self-isolation, wishful thoughts, venting, and rumination for dysfunctional avoidant-focused coping mechanisms.

3.2. Selection criteria

The trial comprised women who had been diagnosed with BC. Medical data were used to corroborate the diagnosis of BC, with cases in which tumors were in progress from the lobules or breast milk pipe. Study goal was to scrutinize the psychological challenges these women faced and manage mechanisms. In all, 275 people were taken into description for the examination.

3.2.1. Inclusion

Women who had been confirmed with BC and had been receiving treatment had been eligible to take part in the research study. Participants from various kind of ages were eligible, offered they consented to the research, and presented complete socio-demographic information. This enabled a representative sampling for studying psychological problems and coping strategies in patients from BC.

3.2.2. Exclusion

Individuals who didn't satisfy the inclusion criteria were eliminated from the investigation, particularly individuals who didn't have confirmed BC medical records from the designated anatomical areas or who were in poor health condition while would be unable to participate.

3.3. Study design and sampling

This research provides a thorough analysis of the phenomena that women with BC encounter. Random sampling is utilized to assure the representative of the sample. The researcher could choose information sources that will aid in addressing the study goals with the use of sampling. Age, educational attainment, place of residence, and BC stage were among the several clinical and demographic factors included in the participant selection process. 275 participants ended up being included in the sample size,m, which was determined using an estimated percentage of a characteristic of having a BC diagnosis within the population. To assure the validity and reliability of the research instruments, thecreated questionnaires based on an extensive research analysis within the field of study. From the beginning, the questions were intended to capture the coping techniques, psychological problems, and social assistance among patients with BC. A pilot study with 275 participants was conducted, representative of the larger study population, has been carried out to test and refine questionnaires, ensuring clarity, relevance, and comprehensiveness. The questionnaires' validity was evaluated using content validity, which included examining the items to verify they properly reflected the constructs of interest. Construct validity was investigated through comparing questionnaire responses. Cronbach's alpha was employed to evaluate reliability, indicating higher internal constancy across the measures such as 0.87 for the coping mechanism scale. Each and every person chosen for the study received a questionnaire from the researchers. The research participants were chosen by a methodical random sampling procedure. Calculated the average number of days required for data collection and the average daily attendance of patients at the institution to get the average number of respondents needed before data collection. The average patient attendance and the average number of respondents required each day were then used to determine the sample interval. Every day, during the visitation hours, the kth responder was questioned after the first participant was chosen and interviewed. This process was carried out repeatedly until the necessary sample size for every day was reached.

3.4. Evaluation of coping mechanisms

The BC challenges measures calculated fear of recurrence, physical side effects of treatment, financial strain, emotional distress, body image concerns, impact on

family and relationships, accessing quality healthcare, choosing a course of therapy, depression, and anxiety, among other potential obstacles experienced by women. A standardized questionnaire was used to evaluate social support and sociodemographic traits. The sources of social support that were evaluated were emotional support, practical support, social support networks, medical and healthcare support, family support, spiritual and religious support, caregiver (like partner) support, online communities, and resource support. Other research was consulted in the development of this. Responses to the question of whether support is obtained from any of these sources were rated on a seven-point Likert scale as follows: 1) shows strongly disagree; 2) describes disagree; 3) symbolizes mild disagree; 4) symbolizes neutral; and 5) symbolizes mild agreement; 6) represents agree; and 7) represents highly agree. By selecting "True" or "False" for each support system, the type of assistance obtained from these sources was also evaluated. Financial, escort, emotional, and psychological therapy were the types of help that were evaluated.

3.5. Statistical analysis

SPSS Statistics version 26 was used to perform all statistical analyses. Depending on how the data are distributed, general characteristics are expressed as proportions, standard mean (SD), or median. Descriptive statistics have been employed for support systems for BC, Obstacles to experiencing BC, Dynamic problem-focused adaptive coping approaches, and Dysfunctional avoidant-focused coping mechanisms. Multiple regression and *t*-test analyses were utilized to estimate the influence of sociodemographic traits and social support network on coping mechanisms. Throughout, significance tests were used, and a value of $p < 0.05$ was deemed statistically significant.

4. Results

This study indicates that a variety of coping methods are employed by women with BC to address these psychological issues.

4.1. Study participants sociodemographic features

The women's ages varied from 35 to 89 years, with a mean age SD of >60 years (28.3), of them, 26.2% in primary school, while 18.6% had no formal in education system. 21.5% of the married women resided with their spouses. The vast majority, or 59.3%, identified as Christians. The median quantity of children is 1–4 (13.1%), 5–7 (37.1%), >8 (35.2%), and none (14.6%). The employment status is 62.6% in employed and 37.4% in unemployed. **Table 1** shows the evaluation of the socioeconomic features.

4.2. Support networks for women with breast cancer diagnoses

Descriptive statistics is applied for this part. The social support networks entities provided the highest amount of value (mean = 4.9), with followed by the Caregiver (like partner) Support (mean = 4.6). Spiritual and religious support provided the least amount of assistance (mean = 2.4). **Table 2** and **Figure 5** represent the aggregated sources of social support in BC.

Table 1. Socioeconomic characteristics for breast cancer.

Variables	Frequency $N = 275$	Values (%)
Religion		
Muslims	85	30.9
Christians	163	59.3
No religion/traditional	27	9.8
Age, mean ± SD		
<40	41	14.9
40–50	90	32.7
50–60	66	24.0
>60	78	28.4
Education system		
Primary school	72	26.2
Senior high or secondary school	70	25.5
Tertiary	49	17.8
Junior high or middle school	33	12.0
No formal	51	18.5
Status of marriage		
Single	45	16.3
Married yet apart from a partner	98	35.6
living with a partner while married	59	21.5
Separated and widowed	73	26.6
Duration of cancer since diagnosis		
During treatment	88	32.0
1–5 years from diagnosis	75	27.3
Up to a year from diagnosis	60	21.8
>5 years	52	18.9
The median quantity of children		
1–4	36	13.1
5–7	102	37.1
>8	97	35.2
None	40	14.6
Status of employment		
Employed	172	62.6
Unemployed	103	37.4

4.3. Challenges of women in BC

Descriptive statistics is applied for this part. The average replies show that the majority of the women occasionally reported physical symptoms, fear of recurrence, financial strain, emotional distress, body image concerns, impact on family and relationships, accessing quality healthcare, choosing a course of therapy, depression, anxiety, and experience of threats to safety. The majority of the women were nervous and unhappy because they frequently entertained bothersome thoughts about their

condition. A few women also had disturbances in their body image and communication problems with their spouses, as shown in **Table 3** and **Figure 6**. Significant concern was shown by respondents regarding the financial consequences of their condition, as seen by the unusually high mean score of 3.95 (SD = 1.15) for financial strain. Compared to other obstacles, the mean score for obtaining excellent healthcare was 2.58 (SD = 1.41), which indicates that although it was still a worry, it was not as high as financial pressure or emotional anguish.

Table 2. Support systems for breast cancer.

Factors	Mean	Percent (%)
Emotional Support	3.8	73
Practical Support	3.2	62
Social Support Networks	4.9	97
Medical and Healthcare Support	3.0	60
Family support	3.69	75
Spiritual and Religious Support	2.4	42
Caregiver (like partner) Support	4.6	95
Online Communities and Resources Support	3.5	65

Table 3. Obstacles to experiencing breast cancer.

Challenges	Mean	SD
Fear of recurrence	2.71	1.41
Physical side effects of treatment	3.36	1.33
Financial strain	3.95	1.15
Emotional distress	3.68	1.09
Body image concerns	2.80	1.39
Impact on family and relationships	3.21	1.14
Accessing quality healthcare	2.58	1.41
Choosing a course of therapy	3.73	1.20
Depression and anxiety	3.35	1.01
Experience of threats to safety	3.22	1.21

4.4. The factors that affect coping techniques

The effects of social support/network and sociodemographic characteristics on coping techniques were assessed using multiple regressions and t-test analyses. The work status is one of two statistical test variables that have a big impact on coping strategies. In particular, an age-related positive β coefficient of 0.20 (95% CI: 0.10, 0.30 and p value ≤ 0.01) was found, suggesting that older patients often use more successful coping mechanisms. The β value of 0.30 (95% CI: 0.10, 0.50) indicated a substantial favorable influence on employment status (<0.01) as well, indicating a correlation between improved coping methods and employment. These consequences could be clarified by the disciplined list and interpersonal maintenance that approach employment, which can facilitate inhabitants to consider regular and determined. The coping techniques were not significantly impacted by education level, marital status,

religion, or the number of children, as indicated by their β coefficients and confidence intervals crossing zero. The β coefficient for education level, for example, was −0.12 (95% CI: −0.22, −0.02) and p value ≤ 0.05, suggesting no significant correlation. This lack of significance could suggest that BC patients' coping processes are more influenced by their immediate social and emotional support systems than they are by their long-term academic achievement. Coping mechanisms were also significantly influenced by social network characteristics. While social support networks demonstrated a development towards significance with a β coefficient of 0.15 (95% CI: −0.05, 0.25) and p value ≤ 0.01, practical support and social support networks (<0.01) did not demonstrate significant impacts. This suggests that broader social networks can contribute to coping, but not as strongly as direct emotional support. Although the use of coping methods is less common in older age groups, and the presence of a spouse does not significantly influence the variance of coping strategies. However, seniority has a positive correlation with greater coping strategy scores, demonstrating that while elderly individuals could utilize the lesser coping methods, the tactics they do implement are usually more efficient or sophisticated. **Table 4** provides a targeted examination of how social networks and sociodemographic characteristics influence coping mechanisms designed to address psychological difficulties in BC patients, supporting both clinical and research comprehension of patient requirements. According to this study, the factors of age, marital status, education, and social support from significant others explained the variation in the score and were strongly predictive of the significance threshold (p < 0.05), it is possible that some sociodemographic and social network characteristics had more subtle or indirect impacts on coping techniques than others.

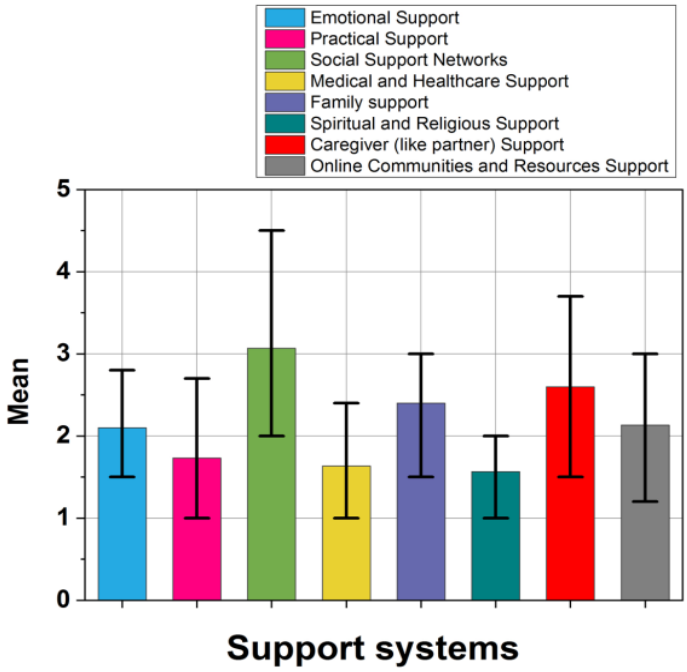


Figure 5. Support systems for women with breast cancer.

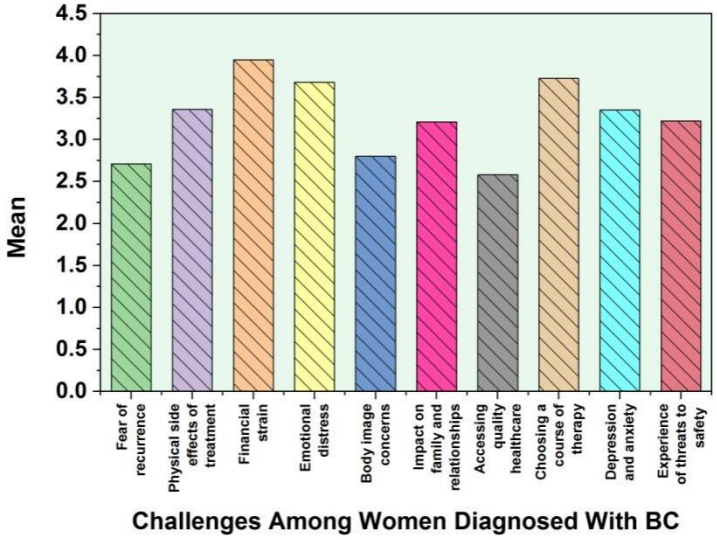


Figure 6. Experiences of obstacles for experiences breast cancer.

Table 4. Coping mechanisms association with sociodemographic traits.

Variable	*β* (95% CI)	*p*-value	*t*-value
Age	0.20 (0.10, 0.30)	<0.01	2.45
Education Level (ref-no education)	−0.12 (−0.22, −0.02)	<0.05	0.89
Employment	0.30 (0.10, 0.55)	<0.01	2.65
Status of Marital (ref-single)	0.08 (−0.03, 0.19)	<0.02	1.75
During treatment (ref->5 years of diagnosis)	−0.19 (−0.39, 0.02)	<0.05	−1.80
Practical support	0.25 (0.05, 0.45)	<0.01	2.25
Social Network	0.15 (−0.05, 0.25)	<0.01	1.47

4.5. Coping strategies

The majority of women regularly use proactive coping mechanisms. Descriptive statistics is utilized for this Coping Strategies.

4.5.1. Strategies for active problem-focused adaptive coping

The BC patients can benefit from active, problem-focused coping techniques such as education, problem-solving, goal setting, social support, and healthy habits. These techniques help them understand their condition, find effective treatments, manage side effects, and maintain a sense of control, ultimately improving their mental and physical well-being. Positive reframing, mindfulness, relaxation, normal activities, religious practices, and professional counseling can assist patients see the positive side of their circumstances, reduce stress, improve emotional regulation, and enhance coping mechanisms for stress, anxiety, and depression, potentially improving health outcomes. **Table 5** and **Figure 7** show the dynamic problem-focused coping approaches. Seeking Information and Education (4.28 Mean and 0.92 SD), Problem-Solving (3.81Mean and 0.91 SD), Goal Setting and Planning (4.12 Mean and 0.90 SD), Engaging in Healthy Behaviors (3.98 Mean and 0.99 SD), Positive Reframing (4.35 Mean and 0.87 SD), Seeking Social Support (3.78 Mean and 0.78 SD), Mindfulness and Relaxation Techniques (3.71 Mean and 1.04 SD), Maintaining Normal Activities

(4.01 Mean and 0.89 SD), Spiritual and Religious Practices (3.60 Mean and 1.7 SD), and Professional Counselling and Therapy (3.80 Mean and 0.92 SD) are the attained factors outcomes in Dynamic problem-focused adaptive coping approaches.

Table 5. Dynamic problem-focused adaptive coping approaches.

Factors	Mean	SD
Seeking Information and Education	4.28	0.92
Problem-Solving	3.81	0.91
Goal Setting and Planning	4.12	0.90
Engaging in Healthy Behaviors	3.98	0.99
Positive Reframing	4.35	0.87
Seeking Social Support	3.78	0.78
Mindfulness and Relaxation Techniques	3.71	1.04
Maintaining Normal Activities	4.01	0.89
Spiritual and Religious Practices	3.60	1.7
Professional Counselling and Therapy	3.80	0.92

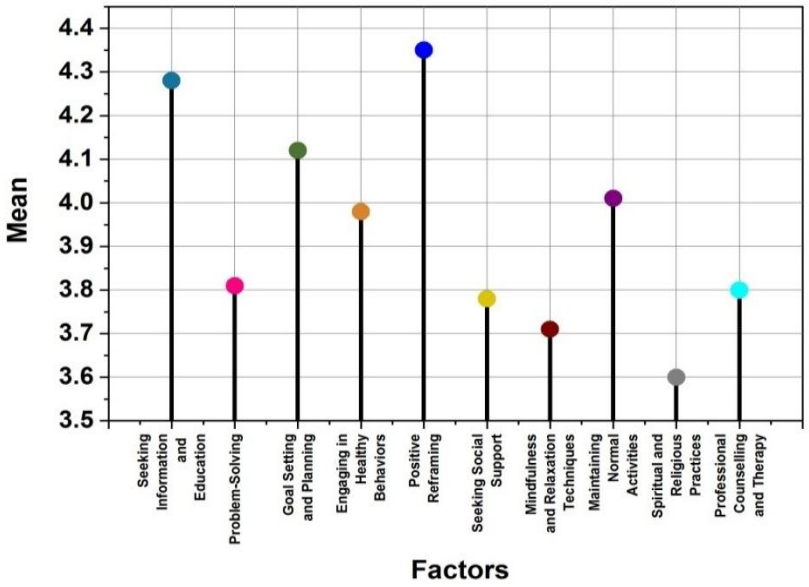


Figure 7. Coping strategy for dynamic problem.

4.5.2. Problem-focused coping mechanisms developed by dysfunctional avoidant

Patients with BC frequently turn to avoidant and emotion-focused coping mechanisms, which could impede their ability to heal. These include refusing to accept their diagnosis, behavioral disengagement, and self-blame. These techniques can lead to delayed medical care, worsened health, isolation, and a decrease in self-esteem and mental health. Emotional venting, avoiding conversations, repressing emotions, abiding by unfavorable consequences, and isolating can hinder patients' ability to manage feelings and seek help. A balanced strategy incorporating adaptive techniques like information searching, problem-solving, social support networks, and healthy behaviors is essential for effective BC treatment, strengthening resilience, and promoting better breathing. **Table 6** and **Figure 8** show the dysfunctional avoidant

and emotionally charged coping strategies in BC. Self-Blame (4.23 mean and 0.91 SD) avoidance (2.49 mean and 5.45 SD), Denial (5.08 mean and 1.18 SD), Emotional suppression (2.98 mean and 0.88 SD), self-isolation (3.47 mean and 0.93 SD), wishful thoughts (2.56 mean and 0.91 SD), Venting (5.26 mean and 1.6 SD) and Rumination (2.45 mean and 0.9 SD) are the attained factors outcomes in dysfunctional avoidant focused coping mechanisms.

Table 6. Dysfunctional avoidant-focused coping mechanisms.

Factors	Mean	SD
Self-Blame	4.23	0.91
Avoidance	2.49	5.45
Denial	5.08	1.18
Emotional suppression	2.98	0.88
Self-Isolation	3.47	0.93
Wishful Thoughts	2.56	0.91
Venting	5.26	1.6
Rumination	2.45	0.9

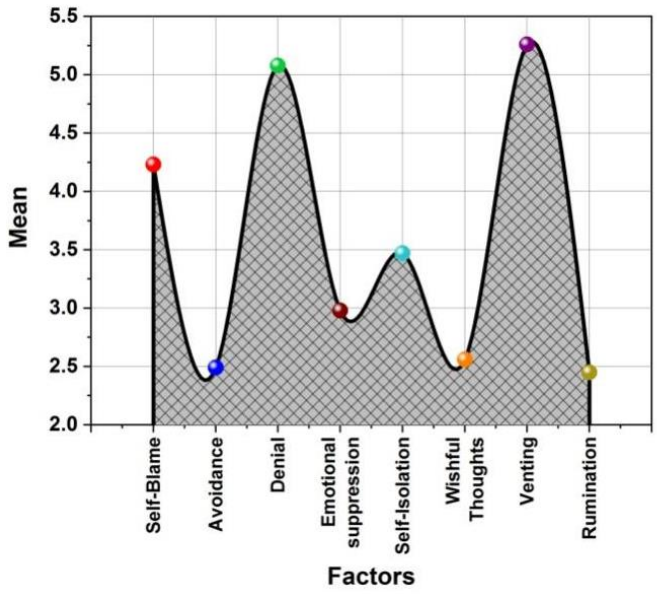


Figure 8. Coping strategy dysfunctional avoidant, emotionally charged coping strategies in breast cancer.

4.6. Discussion

It finds that these women use a variety of coping mechanisms to manage their psychological issues. The study highlights how important it is for healthcare providers to understand these coping strategies to provide tailored treatment that addresses the particular needs of patients with BC. This study evaluated women's avoidant coping mechanisms as well. In **Table 2**, social support networks received the highest ratings (mean = 4.9), followed by caregiver (like partner) support (mean = 4.6), emotional support (mean = 3.8), family support (mean = 3.69), online communities and resources

support (mean = 3.5), practical support (mean = 3.2), medical and healthcare support (mean = 3.0), spiritual and religious support received the lowest ratings (mean = 2.4).

Financial obstacles include high medical expenses, loss of income due to illness, inadequate insurance coverage and increased transportation costs for healthcare visits. Additional challenges can involve home modifications, inability to afford healthy foods and mental health support expenses, all of which exacerbate financial strain during health crises. In **Table 4**, the attained variables of *p*-value and *t*-value are age (p-value ≤ 0.01 and t-value = 2.45), education level (p-value ≤ 0.05 and t-value = 0.89), employment (p-value ≤ 0.01 and t-value = 2.56) marital status (p-value ≤ 0.02 and t-value = 1.75), during treatment (ref->5 years of diagnosis) (p-value ≤ 0.05 and t-value = −1.80), and social network (p-value ≤ 0.01 and t-value = 1.47). **Table 5** highlights the positive reframing (4.35 mean, 0.87 SD) and seeking information and education (4.28 mean, 0.92 SD) as the most utilized coping strategies. Goal setting and planning (4.12 mean, 0.90 SD) and maintain normal (3.60 mean, 1.7 SD) are the least used, indication a preference for cognitive and practical coping methods over spiritual approaches. **Table 6** shows the significance of Dysfunctional avoidant-focused coping mechanisms. Venting (5.26 mean, 1.6 SD) and denial (5.08 mean, 1.18 SD) emerged as the most prominent coping strategies, suggesting a tendency towards emotional expression and denial. Self-Blame (4.23 mean, 0.91 SD) is also prevalent. In contrast, rumination (2.45 mean, 0.9 SD) and wishful thoughts (2.56 mean, 0.91 SD) were less utilized. Understanding management strategies for women with BC is crucial for further therapy. By using this test, healthcare professionals can discover more about the psychosocial needs of patients with BC and the coping approaches that are mandatory to assemble those requirements. The study's strengths include a unique technique and useful findings, but it also includes drawbacks such as data limits and difficulties. Its consequences include both practical applications and theoretical advances. Future studies might overcome these limitations by investigating more factors, employing novel approaches, or extending findings to various circumstances.

5. Conclusion

A study on women with breast cancer highlights the significant psychological difficulties and coping mechanisms that these individuals encounter. This research provides an in-depth examination of the psychosocial challenges and coping strategies of women with BC, demonstrating a predominant use of active problem-focused strategies such as seeking information and positive reframing. Emotional, practical, social, caregiver, and family support networks are essential for managing the psychological impact, while spiritual support is less frequently employed. The findings indicate that age and employment status (p-value < 0.01) significantly influence the efficacy of these strategies, suggesting the need for tailored support interventions. The limitations of the study include sample size and demographic constraints, which could affect the generalizability of the results. Future research should focus on discovering diverse coping mechanisms across various populations and settings to improve support systems for breast cancer patients and enhance their overall health.

Author contributions: Conceptualization, MW; methodology, MW; software, MW; validation, YW and MW; formal analysis, YW; investigation, YW; resources, YW; data curation, YW; writing—original draft preparation, YW; writing—review and editing, MW; visualization, YW; supervision, MW; project administration, MW. All authors have read and agreed to the published version of the manuscript.

Ethical approval: The study was conducted in accordance with the Declaration of Helsinki, and approved by Ethics Committee of the Affiliated Hospital of Qinghai University (NO: P-SL-2023-193, 2023.06.27).

Informed consent statement: All participants signed the informed consent in this study.

Conflict of interest: The authors declare no conflict of interest.

References

1. Arnold M, Morgan E, Rumgay H, et al. Current and future burden of breast cancer: Global statistics for 2020 and 2040. The Breast. 2022; 66: 15–23. doi: 10.1016/j.breast.2022.08.010
2. Krasne M, Ruddy KJ, Poorvu PD, et al. Coping strategies and anxiety in young breast cancer survivors. Supportive Care in Cancer. 2022; 30: 9109–9116. doi: 10.1007%2Fs00520-022-07325-7
3. Dinapoli L, Colloca G, Di Capua B, et al. Psychological Aspects to Consider in Breast Cancer Diagnosis and Treatment. Current Oncology Reports. 2021; 23(3). doi: 10.1007/s11912-021-01049-3
4. Cathcart-Rake EJ, Ruddy KJ, Bleyer A, et al. Breast Cancer in Adolescent and Young Adult Women Under the Age of 40 Years. JCO Oncology Practice. 2021; 17(6): 305–313. doi: 10.1200/op.20.00793
5. Paluch-Shimon S, Cardoso F, Partridge AH, et al. ESO–ESMO 4th International Consensus Guidelines for Breast Cancer in Young Women (BCY4). Annals of Oncology. 2020; 31(6): 674–696. doi: 10.1016/j.annonc.2020.03.284
6. Sang Y, Yang B, Mo M, et al. Treatment and survival outcomes in older women with primary breast cancer: A retrospective propensity score-matched analysis. The Breast. 2022; 66: 24–30. doi: 10.1016/j.breast.2022.09.001
7. Seidler SJ, Huber DE. Overview of diagnosis and treatment of breast cancer in young women. EC Gynaecology; 2020.
8. Lovelace DL, McDaniel LR, Golden D. Long-Term Effects of Breast Cancer Surgery, Treatment, and Survivor Care. Journal of Midwifery & Women's Health. 2019; 64(6): 713–724. doi: 10.1111/jmwh.13012
9. Sun ZH, Chen C, Kuang XW, et al. Breast surgery for young women with early-stage breast cancer: mastectomy or breast-conserving therapy? Medicine. 2021; 100(18): e25880. doi: 10.1097/MD.0000000000025880
10. Rossi L, Mazzara C, Pagani O. Diagnosis and Treatment of Breast Cancer in Young Women. Current Treatment Options in Oncology. 2019; 20(12). doi: 10.1007/s11864-019-0685-7
11. Tesch ME, Partridge AH. Treatment of breast cancer in young adults. American Society of Clinical Oncology Educational Book. 2022; 42. doi: 10.1200/EDBK_360970
12. Borstelmann NA, Gray TF, Gelber S, et al. Psychosocial issues and quality of life of parenting partners of young women with breast cancer. Supportive Care in Cancer. 2022; 30:4265–4274. doi: 10.1007%2Fs00520-022-06852-7
13. Avci O, Tacar SY, Seber ES, Yetisyigit T. Breast cancer in young and very young women; Is age related to outcome? Journal of cancer research and therapeutics. 17(6): 1322–1327. doi: 10.4103/jcrt.JCRT_545_20
14. Bjerkeset E, Röhrl K, Schou-Bredal I. Symptom cluster of pain, fatigue, and psychological distress in breast cancer survivors: prevalence and characteristics. Breast Cancer Research and Treatment. 2020; 180(1): 63–71. doi: 10.1007/s10549-020-05522-8
15. Wang Y, Feng W. Cancer-related psychosocial challenges. General psychiatry. 2022; 35(5). doi: 10.1136%2Fgpsych-2022-100871
16. Corey B, Smania MA, Spotts H, et al. Young Women with Breast Cancer: Treatment, Care, and Nursing Implications. Clinical Journal of Oncology Nursing. 2020; 24(2): 139–147. doi: 10.1188/20.cjon.139-147

17. Zamanian H, Amini-Tehrani M, Jalali Z, et al. Perceived social support, coping strategies, anxiety and depression among women with breast cancer: Evaluation of a mediation model. European Journal of Oncology Nursing. 2021; 50: 101892. doi: 10.1016/j.ejon.2020.101892
18. Nilsen M, Stalsberg R, Sand K, et al. Meaning Making for Psychological Adjustment and Quality of Life in Older Long-Term Breast Cancer Survivors. Frontiers in Psychology. 2021; 12. doi: 10.3389/fpsyg.2021.734198
19. Taurisano P, Abbatantuono C, Verri V, et al. Pre-surgery supportive and goal-oriented strategies are associated with lower post-surgery perceived distress in women diagnosed with breast cancer. BMC Psychology. 2022; 10(1). doi: 10.1186/s40359-021-00714-3
20. Yamani Ardakani B, Tirgari B, Roudi Rashtabadi O. Body image and its relationship with coping strategies: The views of Iranian breast cancer women following surgery. European Journal of Cancer Care. 2019; 29(1). doi: 10.1111/ecc.13191
21. Doege D, Thong MSY, Weißer L, et al. Health-Related Quality of Life in Very Long-Term Cancer Survivors 14–24 Years Post-Diagnosis Compared to Population Controls: A Population-Based Study. Cancers. 2021; 13(11): 2754. doi: 10.3390/cancers13112754
22. Younis M, Norsa'adah B, Othman A. Effectiveness of Psycho-Education Intervention Programme on Coping Strategies Among Jordanian Women Diagnosed with Breast Cancer: A Randomised Controlled Trial. Breast Cancer: Targets and Therapy. 2021; 13: 285–297. doi: 10.2147/bctt.s299584
23. Chan A, Lomma C, Chih H, et al. Psychosocial consequences in offspring of women with breast cancer. Psycho-Oncology. 2019; 29(3): 517–524. doi: 10.1002/pon.5294
24. Ginter AC. "The day you lose your hope is the day you start to die": Quality of life measured by young women with metastatic breast cancer. Journal of Psychosocial Oncology. 2020; 38(4): 418–434. doi: 10.1080/07347332.2020.1715523
25. Goerling U, Bergelt C, Müller V, et al. Psychosocial Distress in Women with Breast Cancer and Their Partners and Its Impact on Supportive Care Needs in Partners. Frontiers in Psychology. 2020; 11. doi: 10.3389/fpsyg.2020.564079
26. Konieczny M, Cipora E, Sygit K, Fal A. Quality of life of women with breast cancer and socio-demographic factors. Asian Pacific journal of cancer prevention. 2020; 21(1): 185–193. doi: 10.31557%2FAPJCP.2020.21.1.185
27. Zhang J, Yang C, Zhang Y, et al. Effects of Surgery on Prognosis of Young Women with Operable Breast Cancer in Different Marital Statuses: A Population-Based Cohort Study. Frontiers in Oncology. 2021; 11. doi: 10.3389/fonc.2021.666316
28. Baudry A, Yakimova S, Congard A, et al. Adjustment of young women with breast cancer after chemotherapy: A mediation model of emotional competence via emotional distress. Psycho-Oncology. 2022; 31(5): 848–855. doi: 10.1002/pon.5876
29. Howell DM, Metcalfe K, Kong S, et al. Risk factors for psychological morbidity and the protective role of coping self-efficacy in young women with breast cancer early in diagnosis: a national multicentre cohort study. Breast Cancer Research and Treatment. 2022; 194(1): 91–102. doi: 10.1007/s10549-022-06576-6
30. Ośmiałowska E, Misiąg W, Chabowski M, et al. Coping Strategies, Pain, and Quality of Life in Patients with Breast Cancer. Journal of Clinical Medicine. 2021; 10(19): 4469. doi: 10.3390/jcm10194469
31. Che Ya SN, Muhamad R, Mohd Zain N, et al. Coping Strategies for Sexual Problems and Sexual Dysfunction Amongst Malay Women with Breast Cancer. A Qualitative Study. Sexual Medicine. 2021; 9(3): 100336–100336. doi: 10.1016/j.esxm.2021.100336

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Article

Stigma and its relationship with social avoidance among young and middle-aged cancer patients in western China: A cross-sectional study based on latent profile analysis

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Abstract: Objective: This study identified the characteristics and categories of stigma in patients with cancer in Western China based on latent profile analysis (LPA), determined the factors associated with different stigma categories, and explored the effects of different categories of stigma on patients' social avoidance. **Methods:** Hospitalised cancer patients aged 18–59 years were recruited between December 2023 and April 2024. The study used a general data questionnaire, the Social Impact Scale, and the Social Avoidance Scale. Stigma subgroups were analyzed using LPA, and the factors associated with stigma were analyzed using multiple logistic regression. The effects of different latent subgroups of stigma on social avoidance were further explored. **Results:** In total, 300 questionnaires were administered. The stigma characteristics of patients were divided into three subgroups: low stigma group (class-1), high stigma group (class-2), and moderate stigma group (class-3). These groups accounted for 48.1%, 11.8%, and 40.1% of the sample, respectively. Multiple logistic regression analysis showed that compared to class-2, class-3, factors associated with low stigma group (class-1) were age < 44 years (OR = 0.095, 95% CI = 0.026–0.356; OR = 0.171, 95% CI = 0.071–0.409), family per capita monthly income < 5000 yuan (OR = 0.078, 95% CI = 0.020–0.300; OR = 0.129, 95% CI = 0.053–0.310). Multiple hospitalisations (OR = 12.922, 95% CI = 2.933–56.924, OR = 8.570, 95% CI = 2.544–28.870,), and married status (OR = 8.339, 95% CI = 0.026–0.356; OR = 4.950, 95% CI = 1.863–13.153) were important factors for stigma in class-1 and class-2 compared to class-3. A positive correlation was observed between stigma and social avoidance. **Conclusion:** There were significant differences in stigma among patients aged 18–59 years with cancer, which affected their degree of social avoidance. It is necessary to construct personalised psychological interventions according to the characteristics of stigma subgroups, reduce the level of stigma and social avoidance, and promote patient rehabilitation.

Keywords: latent profile analysis; stigma; social avoidance; cancer

1. Introduction

According to the International Agency for Research on Cancer (IARC), approximately 19.3 million new cancer cases were reported worldwide in 2020[1]. In 2019, 1.82 million new cancer cases were diagnosed globally in individuals under 50 years of age, reflecting a 79% increase since 1990 [2]. This alarming trend underscores a growing public health concern that significantly affects the physical and mental wellbeing of younger populations. Young and middle-aged people are at a crucial stage of career advancement and play a central role in family

life and social activities [3]. Studies have indicated that young and middle-aged patients with cancer experience a higher incidence of psychological issues than patients with cancer in other age groups [4]. The stress of the cancer burden, combined with treatment side effects, often leads to feelings of stigma, sadness, and despair [3,4].

Stigma refers to negative emotions arising from illness, characterised by an internal sense of shame, whereby individuals feel discriminated against, labelled, avoided, and unaccepted [5]. Furthermore, high levels of stigma can cause negative emotions such as anxiety and depression, greatly reduce quality of life, and make it difficult for patients to return to society. Social avoidance refers to the ongoing and significant avoidance tendencies of individuals who are unwilling to participate in social interactions [6]. Consistent evidence has shown that stigma can harm normal social functioning, suggesting that it may be a factor that influences social avoidance in patients with cancer [7,8]. This study explored the relationship between stigma and social avoidance in patients with cancer aged 18–59 years, with the aim of identifying and reducing the degree of stigma, and further reducing social avoidance. This would help patients return to society and improve their quality of life.

Of patients with cancer, 13%–80% report experiencing stigma [9]. Previous research has identified various social, demographic, and disease characteristics that may influence stigma in patients with cancer. Unemployment [10], sex [11], age [12], and duration of treatment [13] are commonly examined variables in psycho-social research on stigma, but their specific impact on cancer-related stigma warrants a more detailed theoretical explanation. This study hypothesizes that these demographic and cancer-related variables significantly influence stigma, and this hypothesis is grounded in the Biopsychosocial Model [14], which emphasizing biological, psychological, social factors are interrelated. It provides a comprehensive framework for understanding the complex interactions between biological, psychological, and social factors in health and illness [14,15]. We will use the theory to analyze how biological factors (demographic and cancer-related factors) and social factors (marital status and working status) affect patients' psychological status such as stigma. In addition, researchers have suggested that symptoms such as pain [16] and poor sleep quality [17] may influence cancer stigma.

Patients with cancer may experience stigma manifestations that are affected by many factors, making accurate psychological intervention challenging. Most research on stigma has focused on the total stigma score, which limits developing an individualised intervention model of stigma. In addition, stigma among young and middle-aged patients with cancer has received little attention in quantitative studies. Classifying the characteristics and factors that influence stigma in this population is crucial for providing targeted support. Latent profile analysis (LPA) is an individualised classification technique that helps select the optimal model through rich model-fitting indicators [18].

What are the different categories of stigma among young and middle-aged patients with cancer, and how do the profiles relate to their risk factors? Based on the literature review, our reaserch hypotheses were as follows: (1) there are various

profiles of stigma among young and middle-aged patients with cancer; and stigma may affect the degree of social avoidance; (2) the demographic and clinical are risk factors between different stigma profiles.

2. Materials and methods

2.1 Study design and participants

This cross-sectional study was conducted in Chengdu, China. Participants were recruited by convenience sampling in the oncology ward of a general hospital located in the city. The hospital provides comprehensive cancer care services and serves a large population in the region. This setting was chosen because of its high patient volume and the availability of psychological nursing services. Data collection took place between 25 December 2023, and 30 April 2024, and was completed prior to the submission of this manuscript. Inclusion criteria for participants were: (1) age between 18 and 59 years; (2) pathological diagnosis of cancer; (3) duration of hospitalisation ≥2 days and non-acute phase; (4) the ability to read and write Chinese; and (5) provided informed consent. Patients with mental illness or cognitive impairment were excluded.

This study used a multiple logistic regression analysis method, and the sample size was recommended to be at least 10 times the number of explanatory variables [19]. A total of 13 variables were included, and the minimum required sample size was 163 to allow for approximately 20% loss to follow-up. In addition, Nylund-Gibson suggested a minimum sample size of 300 for latent profile analysis to avoid errors in latent feature identification [20]. In summary, the final sample size for this study was 300. Our survey continued until the target number of participants was reached.

2.2 Measurements

2.2.1 General information questionnaire

The general information questionnaire developed by the research team was used to gather demographic details (age, sex, education level, work, etc.) and disease-related details (cancer diagnosis, cancer stage, hospitalization times). Demographic information was provided by the participants and disease-related information was drawn from the hospital electronic information system.

(1) The Social Impact Scale

The Social Impact Scale (SIS) was used to measure stigma experienced by patients with cancer. The SIS was compiled by Fife et al. in 2000 and translated into Chinese by Pan et al. [21,22]. The SIS comprises 24 items that assess four dimensions: internalized shame, economic discrimination, social exclusion, and social isolation. Items are rated on a scale of 1 (“disagree”) to 4 (“strongly agree”); the total score ranges from 24 to 96 points. Higher scores indicate an increased perception of received stigma. In this study, the Cronbach’s α coefficient of this scale was 0.960.

(2) The Social Avoidance Scale

The 14-item Social Avoidance Scale (SAS) was used to assess social avoidance. The scale was originally developed by Watson et al. and translated into Chinese by Wang et al. [23,24]. Patients respond with either "Yes" (0) or "No" (1), yielding scores from 0 to 14. Higher scores indicate an increased tendency toward social avoidance. In this study, the Cronbach's α coefficient of this scale was 0.927.

2.3 Ethical approvals

The study was conducted in accordance with the Declaration of Helsinki, and was approved by the Bioethics Committee of West China Hospital, Sichuan University [approval number: 2023 (2226)]. All patients provided written informed consent in accordance with the Declaration of Helsinki.

2.4 Procedures

In the oncology ward, the researchers invited patients who met the inclusion criteria to participate and explained the purpose and methods of the survey. Questionnaires were distributed after written informed consent was obtained. The questionnaire was completed independently by the patients; the researchers answered any questions of the patients during the process, and the patients were informed if they had not completed any items. After completion, the participants were given hand cream as compensation.

2.5 Data analysis

We used SPSS (version 26.0) and Mplus 7.6 software for the data analysis. Individual patient-centred data analysis was performed using LPA to identify potential categories of patients with different levels of stigma. LPA was performed based on the occurrence of stigma using Mplus version 7.6. The number of potential profiles was sequentially increased to determine the most suitable model and classify it accordingly. Next, the model was labelled based on the sample size and characteristics of each classification. Model fit was assessed using the following indices [25,26]: (1) In the LPA, the adjusted BIC (aBIC), Bayesian information criterion (BIC), and Akaike information criterion (AIC) were selected for statistical analysis. Smaller values of these indicators suggest better model fit. (2) Bootstrap likelihood ratio test (BLRT) and Lo-Mendell-Rubin likelihood ratio test (LMRT) were used to compare the differences in fit between models. *P*-values less than 0.05 for both tests indicated that the k-class model was superior to the k-1 class model. (3) The closer the entropy value is to 1, the more accurate the model classification. Subsequently, descriptive statistics and frequencies of demographic, sociological, and disease characteristics were analysed using SPSS 26.0. The factors that influenced different classification results were identified using chi-square tests, and disordered multinomial logistic regression was used to explore the differences in the social incidence scores of different potential categories of stigma. Analysis of variance (ANOVA) was used to examine differences in social avoidance scores across the LPA results, and Tamhane's T2 method was used for

multiple comparisons between the social avoidance and stigma latent profile subgroups. Statistical significance was set at $P < 0.05$.

3. Results

3.1 Participants' characteristics

A total of 320 questionnaires were distributed, 20 questionnaires were excluded due to reasons such as incomplete responses (n = 10), failure to meet inclusion criteria (n = 5), repeat answers (n = 2), data errors (n = 3). The remaining 300 completed and valid questionnaires were included in the final analysis, with an effective rate of 93.75%. This ensures the sample is representative of the target population and the findings are reliable. The study sample consisted of 118 females and 182 males. The participants had an average age of 46.81 years (SD = 9.56; range 19–59). **Table 1** presents the characteristics of 300 participants.

Table 1. Characteristics of participants and univariate analysis of three latent profile subgroups [n (%)].

Variables	Low stigma group (n = 146)	High stigma group (n = 35)	Moderate stigma group (n = 119)	F/c^2	P
Number of hospitalisations (times)				38.398	<0.001
>2	9 (14.3)	14 (22.2)	40 (63.5)		
≤2	137 (57.8)	21 (8.9)	79 (33.3)		
Age (years)				32.102	<0.001
≤44	69 (72.6)	5 (5.3)	21 (22.1)		
45–59	77 (37.6)	30 (14.6)	98 (47.8)		
Gender				10.141	0.006
Male	77 (42.3)	28 (15.4)	77 (42.3)		
Female	69 (58.5)	7 (5.9)	42 (35.6)		
Marital status				62.144	<0.001
Married	80 (35.6)	34 (15.1)	111 (49.3)		
Single	66 (88)	1 (1.3)	8 (10.7)		
Per capita monthly family income (RMB)				79.666	<0.001
<5000	112 (73.7)	5 (3.3)	35 (23)		
≥5000	34 (23)	30 (20.3)	84 (56.8)		
Educational level				10.293	0.006
High school or below	113 (53.8)	18 (8.6)	79 (37.6)		
College or above	33 (36.7)	17 (18.9)	40 (44.4)		
Medical insurance				3.576	0.167
Have	126 (46.8)	33 (12.3)	110 (40.9)		
Do not have	20 (64.5)	2 (6.5)	9 (29)		
Residence				13.663	0.001
Urban	98 (42.8)	31 (13.5)	100 (43.7)		
Rural	48 (67.6)	4 (5.6)	19 (26.8)		

Table 1. (*Continued*).

Variables	Low stigma group (*n* = 146)	High stigma group (*n* = 35)	Moderate stigma group (*n* = 119)	F/c^2	*P*
Working status				38.52	<0.001
Employed	41 (30.1)	27 (19.9)	68 (50)		
Unemployed	105 (64)	8 (4.9)	51 (31.1)		
Cancer stage				49.573	<0.001
I-II	14 (16.7)	19 (22.6)	51 (60.7)		
III-IV	132 (61.6)	16 (7.4)	68 (31.5)		
Cancer type				4.817	0.782
Liver cancer	52 (52)	9 (9)	39 (39)		
Colorectal cancer	43 (44.8)	14 (14.6)	39 (40.6)		
Reproductive cancer	16 (59.3)	1 (3.7)	10 (37)		
Gastric cancer	15 (48.4)	4 (12.9)	12 (38.7)		
Pancreatic cancer	20 (43.5)	7 (15.2)	19 (41.3)		
Pain				16.346	<0.001
Yes	56 (38.4)	22 (62.9)	73 (61.3)		
No	90 (61.6)	13 (37.1)	46 (38.7)		
Insomnia				49.297	<0.001
Yes	27 (18.5)	22 (62.9)	67 (56.3)		
No	119 (81.5)	13 (37.1)	52 (43.7)		

3.2 Participants' scores for stigma and social avoidance

The total score of stigma was (61.32 ± 13.5), with 252 cases scoring ≥ 48 points, indicating a high level of stigma. The scores of the four subscales of stigma were as follows: social exclusion (23.95 ± 5.18), social isolation (17.23 ± 4.25), economic discrimination (7.6 ± 2.17), and internal shame (12.55 ± 3.01). The average score of social avoidance was (8.58 ± 4.69).

3.3 Stigma subgroups based on LPA

In this study, individual-centered Latent Profile Analysis (LPA) was conducted using data collected from 300 young and middle-aged cancer patients, with the four dimensions of the SIS as explicit indicators. We initially fit a model and constructed four potential profile models. As the number of classes increased from one to three, the model-fitting results indicated a gradual decrease in the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and adjusted Bayesian Information Criterion (aBIC) values, suggesting an improved model fit. Specifically, the AIC for the one-class model was 6400.110, for the two-class model was 5760.501, and for the three-class model was 5498.506. Similarly, the BIC and aBIC values followed the same pattern, with the Entropy value of the three-class model showing the largest values, further indicating the appropriateness of this model. When the model fit three classes, the entropy was 0.922, suggesting high class separation and a good fit. The *P*-values for the Likelihood Ratio Test (LMR) and the Bootstrap Likelihood Ratio Test (BLRT)

were both less than 0.05, supporting the statistical significance of the three-class solution. The average probability of class membership ranged from 95.3% to 98.7%, indicating strong classification certainty for each participant. Based on these model fit indices and the clinical relevance of the findings, the three-class model was chosen as the most appropriate. See **Table 2** for further details on the model-fitting indices and class characteristics.

Table 2. Different latent profile model fit indices of stigma for 300 participants.

Model	AIC	BIC	aBIC	Entropy	LMR, *P*	BLRT, *P*	Category probability
1	6400.110	6429.740	6404.369	-	-	-	-
2	5760.501	5808.651	5767.422	0.876	<0.001	<0.001	0.55333/0.44667
3	5498.506	5565.174	5508.089	0.922	0.0112	<0.001	0.48667/0.11667/0.39667
4	5385.445	5470.632	5397.689	0.869	0.2811	<0.001	0.30377/0.30667/0.08667/0.30000

AIC = Akaike information criterion; BIC = Bayesian information criterion; aBIC = Sample-size adjusted BIC; LMR, *P* = *P* value of the Lo–Mendell–Rubin likelihood ratio test; BLRT, *P* = *P* value of bootstrap likelihood ratio test.

3.4 Characteristics of different stigma latent profile subgroups

See **Figure 1** for the stigma subgroups for the patients. Class 1 patients accounted for 48.1% (*n* = 146), Class 2 for 11.8% (*n* = 35), and Class 3 for 40.1% (*n* = 119). Class 1 scored lower than Class 2 and Class 3 in all dimensions and therefore was named the 'low stigma group'. The scores for each dimension of Class 2 were moderate; therefore, it was named the 'moderate stigma group'. Finally, Class 3 scored higher in all dimensions than Class 1 and Class 2, and was therefore named the 'high stigma group'.

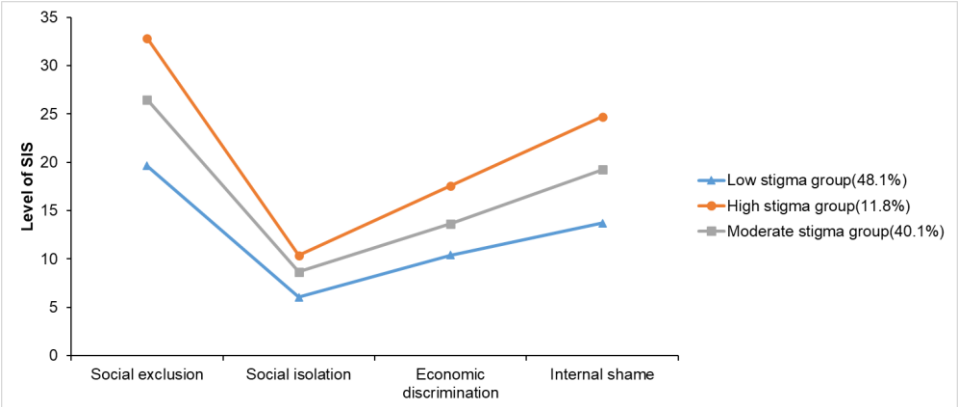


Figure 1. Profiles for three-class LPA model of stigma.

3.5 Relationships between the latent profiles of stigma and social avoidance

As shown in **Table 3**, there were statistically significant differences in social avoidance scores among the different stigma subgroups ($P < 0.001$). Using Tamhane's T2 method for multiple comparisons, we found that the high stigma group had higher social avoidance scores than both the low stigma group and the moderate stigma group.

3.6 Univariate analysis of stigma subgroups

This study revealed that hospitalisation duration, age, sex, marital status, cancer stage, family monthly income, education, work status, cancer-related pain, and insomnia were significantly different among the three stigma subgroups ($P < 0.05$). The specific results are shown in **Table 3**.

Table 3. Dimensions of stigma and social avoidance in three latent profiles ($\overline{x} \pm s$).

Scores	Low stigma group ($n = 146$)	High stigma group ($n = 35$)	moderate stigma group ($n = 119$)	*F*	*P*	Tam Heini multiple comparisons
SIS Scale						
Social exclusion	19.65 ± 2.47	32.89 ± 2.15	26.59 ± 2.37	550.413	<0.001	2 > 3 > 1
Social isolation	13.72 ± 1.68	24.80 ± 2.39	19.29 ± 2.03	587.971	<0.001	2 > 3 > 1
Economic discrimination	6.04 ± 1.48	10.40 ± 1.46	8.68 ± 1.48	176.581	<0.001	2 > 3 > 1
Internal shame	10.42 ± 1.96	17.66 ± 2.11	13.65 ± 1.57	255.092	<0.001	2 > 3 > 1
Stigma score	49.84 ± 5.69	85.74 ± 5.71	68.21 ± 5.00	777.681	<0.001	2 > 3 > 1
SAS Scale						
Social avoidance	5.23 ± 4.05	12.89 ± 1.37	11.42 ± 2.73	144.83	<0.001	2 > 3 > 1

3.7 Multiple regression analysis of stigma and influencing factors

Using the three latent stigma score subgroups as dependent variables and the statistically significant variables from the univariate analysis as independent variables, an unordered multinomial logistic regression analysis was conducted (**Table 4**). The results indicated that age, marital status, number of hospitalisations, and family per capita monthly income were important factors that influenced stigma ($P < 0.05$).

4. Discussion

To the best of our knowledge, this is the first study to use LPA to explore the association between stigma subgroups and social avoidance in young and middle-aged patients. This study identified three distinct stigma patterns associated with social avoidance. Additionally, this study identified factors influencing stigma in participants as well as the impact of sociodemographic and clinical characteristics on subgroups.

4.1 Characteristics of stigma among participants

In this study, the stigma score was 61.32 ± 13.5. This score is higher than the 55.18 ± 10.32 reported by Liu et al. for patients over 60 [12]. This finding suggests that stigma levels are generally high among young and middle-aged patients with cancer. Schilstra et al. reported that young and middle-aged patients with cancer often lack confidence after diagnosis, feel shame about the disease and its side effects, and experience impaired social functioning [27]. Further LPA revealed three subgroups of stigma, named the ‘low stigma group’, ‘moderate stigma group’, and ‘high stigma group’. The high stigma group requires greater attention

and intervention from medical staff. At the same time, the scores for each stigma dimension, from high to low, were social exclusion, social isolation, internal shame, and economic discrimination. One possible reason for this is that young and middle-aged patients with cancer frequently return to the hospital for long-term radiotherapy and chemotherapy, disrupting their work and social routines. Consequently, their sense of social exclusion and isolation is heightened. Furthermore, due to disease effects, adverse treatment reactions, and changes in body image, patients' self-esteem is diminished, which leads to internal shame [26,28]. In recent years, 63 anticancer drugs have been included in the Chinese national medical insurance negotiation drug list, and the average price reduction of these drugs was more than 44%, helping to reduce the financial burden and the sense of economic discrimination of patients [29,30]. Promptly identifying individuals with high stigma, formulating effective psychological counselling measures, and guiding patients to correctly view their disease and build confidence are helpful for medical staff.

Table 4. Multivariate logistic regressions for predicting three stigma profile among the participants.

Variables	High stigma group VS Low stigma group				Moderate stigma group VS Low stigma group			
	B	**OR**	**95% CI**	***P***	***B***	**OR**	**95% CI**	***P***
Number of hospitalisations (times)								
>2 (≤2, reference)	2.559	12.922	2.933–56.924	0.001	2.148	8.570	2.544–28.870	0.001
Age								
≤44 (45–59, reference）	−2.349	0.095	0.026–0.356	<0.001	−1.769	0.171	0.071–0.409	<0.001
Gender								
Male (female reference)	0.486	1.627	0.516–5.131	0.407	0.108	1.114	0.538–2.305	0.772
Marital status								
Married (single reference)	2.121	8.339	0.916–75.911	0.060	1.599	4.950	1.863–13.153	0.001
Per capita monthly family income (RMB)								
<5000 (≥5000 reference)	−2.547	0.078	0.020–0.300	<0.001	−2.051	0.129	0.053–0.310	<0.001
Educational level								
High school or below (college or above reference)	0.101	1.107	0.339–3.609	0.866	0.395	1.485	0.589–3.741	0.402
Residence								
Urban (rural reference)	0.755	2.128	0.502–9.028	0.306	0.710	2.034	0.829–4.986	0.121
Working status								
Employed (unemployed reference)	0.862	2.369	0.730–7.688	0.151	0.224	1.251	0.516–2.790	0.584
Cancer stage								
I–II (III–IV reference)	1.060	2.888	0.959–8.694	0.059	0.727	2.069	0.877–4.880	0.097
Pain								
No (Yes reference)	0.589	1.802	0.661–4.914	0.250	0.679	1.973	0.980–3.971	0.057
Insomnia								
No (Yes reference)	0.339	1.404	0.414–4.761	0.586	0.394	1.483	0.626–3.512	0.370

4.2 Factors associated with stigma subgroups

Similar to other studies, younger patients reported lower stigma [31,32]. This study showed that patients aged <44 years were more likely to be in the low-stigma group. Younger patients were actively working. Moreover, studies have reported that 94% of young people own smartphones [33]. Patients can gain knowledge about their disease, exchange treatment experiences, and obtain information through social media platforms. Medical staff should address the psychological needs of patients of different ages, systematically evaluate their social support systems, mobilise family and information resources to meet patients' needs, improve their disease-coping abilities, and reduce stigma distress.

Monthly income was a positive predictor of stigma. This result is consistent with the findings of Zheng et al., who found that patients with a monthly income of over ¥5000 experienced a greater increase in stigma [34]. This may be because a high monthly income indicates high social status and success for young and middle-aged patients. After being diagnosed with disease, many people quit their jobs and suffer from a loss of social roles and status, leading to a more pronounced sense of shame [9,34]. Thus, we should be concerned about the sensitive mentality of patients with high monthly income, and encourage them to participate in social activities and reveal their emotions.

In this study, patients who were hospitalised more than twice were more likely to belong to the high stigma group, which is consistent with the findings of Tesfaw et al. [13,35]. Initially, these patients had high expectations and cooperated actively with treatment. However, over the long course of radiotherapy and chemotherapy, side effects accumulate. As hospitalisation increases, disease progression and side effects of treatment undermine patient confidence. Additionally, patients feel that multiple hospitalisations increase the burden of family care and make them feel shame [35]. Creating a warm and comfortable hospitalisation environment is necessary. Moreover, involving patients and their families in shared decision-making can reduce psychological stress.

Marriage was the predictor of moderate stigma. A qualitative study reported that young and middle-aged individuals have high requirements for marital quality, and the side effects of cancer treatment can affect their sex lives and intimate relationships [36]. After cancer diagnosis, these patients may struggle with family responsibilities and become care recipients. According to previous studies, 52.88% of cancer caregivers are the spouses of patients, which means that spouses have to bear both family and work pressures [37]. This can lead to a fear of burdening spouses. In traditional Chinese culture, patients typically avoid openly discussing cancer or expressing emotions. Long-term lack of communication with the outside world may further aggravate patients' negative emotions [38]. Therefore, future research should focus on improving the communication and coping skills of couples and encouraging patients to express their emotions.

4.3 Differences in social avoidance among stigma subgroups

Our analysis showed that stigma positively influenced social avoidance and that higher stigma scores correlated with greater social avoidance. Social

avoidance scores were consistently high in the high stigma group, which accords with the findings [7]. This is primarily due to Chinese public misunderstanding of cancer, often equating it with disability or loss of labour capacity, leading to patients being excluded from society [39]. Traditional Chinese culture places significant importance on 'face'(mianzi) [26,40]. It means psychological status in social relationships, emphasizing that one's social role can gain respect or positive evaluation from others. Patients in the moderate and high stigma groups scored higher on social exclusion. The diagnosis of cancer can make it difficult for patients to maintain 'face'(mianzi), and tended to reduce social activities to conceal their condition and avoid discrimination, thereby increasing social avoidance. Thus, patients in medium- and high-stigma groups should be encouraged to engage in social activities while protecting their privacy. Additionally, it is crucial to enhance public awareness and knowledge of cancer through education and outreach to improve societal understanding and acceptance of the disease.

5. Implications for practice

This study is the first to use LPA to identify three stigma patterns in young and middle-aged patients with cancer in China, and to examine their impact on social avoidance. These findings provide new insights into the role of psychological nursing in cancer care. The high-stigma group scored higher across all dimensions, indicating a need for focused attention. Medical staff should focus on adapting social activities and communication skills for these patients. Furthermore, Medical staff must understand their unique features and combine them with traditional Chinese culture. In addition, we found that higher levels of stigma were associated with higher levels of social avoidance. This finding suggests that the impact of stigma should not be overlooked when addressing patients' social avoidance. These factors and positive psychological intervention methods can strengthen the support of patients from their spouses and medical staff. Furthermore, this study is helpful in guiding patients to build confidence in overcoming the disease, generating positive emotions, reducing the stigma experienced by patients, and reducing the level of social avoidance.

6. Limitations

Our study had several limitations. First, the study sample is confined to cancer patients aged 18–59 years in western China, which limits the generalisability of the findings to other populations. While this demographic specificity is appropriate for the context of this study, it is important to acknowledge that cancer-related stigma and social avoidance may vary across different age groups, regions, or countries. Future studies could consider broadening the sample to include older or younger populations, as well as participants from other regions or countries, to better understand the cross-cultural and age-related differences in cancer stigma and its impact on social behaviour. Second, the participants completed the questionnaires themselves, which may have led to reporting bias. Finally, this is the first study to use LPA to classify stigma among young and

middle-aged patients with cancer. Naming based on individual score characteristics requires further exploration. Therefore, it is necessary to expand the sample size and conduct multicentre studies in future. Additional social psychological variables, such as self-esteem and psychological resilience, can be included in the future. Furthermore, it would be necessary to longitudinally track the changes in patients' stigma levels to improve further support conclusions.

7. Conclusion

In summary, LPA identified three stigma categories among young and middle-aged Chinese patients with cancer: 'low stigma (class-1)', 'high stigma (class-2)', and 'moderate stigma (class-3)'. Age, income, number of hospitalisations, and marital status influenced subgroup membership. Differences in social avoidance were observed across the stigma groups, with higher stigma being linked to greater social avoidance. Medical staff should identify the characteristics of these categories to develop personalised interventions. This approach could help reduce patient stigma and social avoidance, thereby promoting psychological rehabilitation and return to society.

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Availability of data and materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethical approvals: The study was conducted in accordance with the Declaration of Helsinki, and was approved by the Bioethics Committee of West China Hospital, Sichuan University [approval number: 2023 (2226)]. All patients provided written informed consent in accordance with the Declaration of Helsinki.

Informed consent statement: Informed consent was obtained from all subjects involved in the study.

Conflict of interest: The authors declare no conflicts of interest.

References

1. Bray F, Ferlay J, Soerjomataram I, et al. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: A Cancer Journal for Clinicians. 2018; 68(6): 394–424. doi: 10.3322/caac.21492
2. Gupta S, Harper A, Ruan Y, et al. International Trends in the Incidence of Cancer Among Adolescents and Young Adults. JNCI: Journal of the National Cancer Institute. 2020; 112(11): 1105–1117. doi: 10.1093/jnci/djaa007
3. You L, Lv Z, Li C, et al. Worldwide cancer statistics of adolescents and young adults in 2019: a systematic analysis of the Global Burden of Disease Study 2019. ESMO Open. 2021; 6(5): 100255. doi: 10.1016/j.esmoop.2021.100255
4. Thornton CP, Ruble K, Kozachik S. Psychosocial Interventions for Adolescents and Young Adults with Cancer: An Integrative Review. Journal of Pediatric Oncology Nursing. 2020; 37(6): 408–422. doi: 10.1177/1043454220919713

5. Goffman E. Stigma: Notes on the Management of a Spoiled Identitiy. Postgraduate Medical Journal. 1968; 45(527). doi: 10.1136/pgmj.45.527.642
6. Wright DB, Busnello RHD, Buratto LG, et al. Are valence and social avoidance associated with the memory conformity effect? Acta Psychologica. 2012; 141(1): 78–85. doi: 10.1016/j.actpsy.2012.06.008
7. Zhao Q, Huangfu C, Li J, et al. Psychological Resilience as the Mediating Factor Between Stigma and Social Avoidance and Distress of Infertility Patients in China: A Structural Equation Modeling Analysis. Psychology Research and Behavior Management. 2022; 15: 391–403. doi: 10.2147/prbm.s354803
8. Wu IHC, Tsai W, McNeill LH, et al. The associations of self-stigma, social constraints, and sleep among Chinese American breast cancer survivors. Supportive Care in Cancer. 2019; 28(8): 3935–3944. doi: 10.1007/s00520-019-05233-x
9. Yılmaz M, Dissiz G, Usluoğlu AK, et al. Cancer-Related Stigma and Depression in Cancer Patients in A Middle-Income Country. Asia Pac J Oncol Nurs. 2020; 7(1): 95–102. doi: 10.4103/apjon.apjon_45_19
10. Shim S, Kang D, Bae KR, et al. Association between cancer stigma and job loss among cancer survivors. Psycho-Oncology. 2021; 30(8): 1347–1355. doi: 10.1002/pon.5690
11. van Sluis KE, Kornman AF, van der Molen L, et al. Women's perspective on life after total laryngectomy: a qualitative study. International Journal of Language & Communication Disorders. 2019; 55(2): 188-199. doi: 10.1111/1460-6984.12511
12. Liu XH, Zhong JD, Zhang JE, et al. Stigma and its correlates in people living with lung cancer: A cross-sectional study from China. Psycho-Oncology. 2019; 29(2): 287-293. doi: 10.1002/pon.5245
13. Tesfaw G, Kibru B, Ayano G. Prevalence and factors associated with higher levels of perceived stigma among people with schizophrenia Addis Ababa, Ethiopia. International Journal of Mental Health Systems. 2020; 14(1). doi: 10.1186/s13033-020-00348-9
14. Engel GL. The Need for a New Medical Model: A Challenge for Biomedicine. Science. 1977; 196(4286): 129–136. doi: 10.1126/science.847460
15. Harkness D. The Diagnosis of Mental Disorders in Clinical Social Work: A Review of Standards of Care. Clinical Social Work Journal. 2010; 39(3): 223–231. doi: 10.1007/s10615-010-0263-8
16. Harsanyi H, Cuthbert C, Schulte F. The Stigma Surrounding Opioid Use as a Barrier to Cancer-Pain Management: An Overview of Experiences with Fear, Shame, and Poorly Controlled Pain in the Context of Advanced Cancer. Current Oncology. 2023; 30(6): 5835–5848. doi: 10.3390/curroncol30060437
17. Li S, Wang X, Wang M, et al. Association between stigma and sleep quality in patients with breast cancer: A latent profile and mediation analysis. European Journal of Oncology Nursing. 2023; 67: 102453. doi: 10.1016/j.ejon.2023.102453
18. Park C, Cho H, Lee D, et al. Latent profile analysis on Korean nurses: Emotional labour strategies and well-being. Journal of Advanced Nursing. 2021; 78(6): 1632–1641. doi: 10.1111/jan.15062
19. Wilson Van Voorhis CR, Morgan BL. Understanding Power and Rules of Thumb for Determining Sample Sizes. Tutorials in Quantitative Methods for Psychology. 2007; 3(2): 43–50. doi: 10.20982/tqmp.03.2.p043
20. Nylund-Gibson K, Garber AC, Carter DB, et al. Ten frequently asked questions about latent transition analysis. Psychological Methods. 2023; 28(2): 284–300. doi: 10.1037/met0000486
21. Fife BL, Wright ER. The Dimensionality of Stigma: A Comparison of Its Impact on the Self of Persons with HIV/AIDS and Cancer. Journal of Health and Social Behavior. 2000; 41(1): 50. doi: 10.2307/2676360
22. Pan AW, Chung L, Fife BL, et al. Evaluation of the psychometrics of the Social Impact Scale: a measure of stigmatization. International Journal of Rehabilitation Research. 2007; 30(3): 235–238. doi: 10.1097/mrr.0b013e32829fb3db
23. Watson D, Friend R. Measurement of social-evaluative anxiety. Journal of Consulting and Clinical Psychology. 1969; 33(4): 448–457. doi: 10.1037/h0027806
24. Wang XD, Wang XL, Ma H. Rating scales for mental health, 2 ed. China Mental Health Press; 1999. pp. 241–44.
25. Serkan A, Murat E. An Approach for Determining the Number of Clusters in a Model-Based Cluster Analysis. Entropy. 2017; 19(9): 452. doi: 10.3390/e19090452
26. Wu C, He C, Yan J, et al. Patterns of information literacy and their predictors among emergency department nurses: a latent profile analysis based on the person-context interaction theory. BMC nursing. 2024; 23(1): 71. doi:10.1186/s12912-024-01756-9
27. Schilstra CE, Fardell JE, Burns MA, et al. Determinants of social functioning among adolescents and young adults with cancer: A systematic review. Psycho-Oncology. 2021; 30(10): 1626–1642. doi: 10.1002/pon.5740

28. Cai Y, Zhang Y, Cao W, et al. Preliminary validation of the Chinese version of the Shame and Stigma Scale among patients with facial disfigurement from nasopharyngeal carcinoma. PLOS ONE. 2022; 17(12): e0279290. doi: 10.1371/journal.pone.0279290
29. Li K, Liu H, Jiang Q. Overview and Analysis on the National Medical Insurance Negotiation Drugs over the Years: Taking Anti-cancer Drugs as an Example. Anti-tumor Pharmacy. 2021; 11(02): 229–235. doi: 10.3969/j.issn.2095-1264.2021.02.20
30. Hu H, Zhao L, Yong Y, et al. Medical insurance payment schemes and patient medical expenses: a cross-sectional study of lung cancer patients in urban China. BMC Health Services Research. 2023; 23(1). doi: 10.1186/s12913-023-09078-3
31. Tang WZ, Yusuf A, Jia K, et al. Correlates of stigma for patients with breast cancer: a systematic review and meta-analysis. Supportive Care in Cancer. 2022; 31(1). doi: 10.1007/s00520-022-07506-4
32. Fujisawa D, Umezawa S, Fujimori M, et al. Prevalence and associated factors of perceived cancer-related stigma in Japanese cancer survivors. Japanese Journal of Clinical Oncology. 2020; 50(11): 1325–1329. doi: 10.1093/jjco/hyaa135
33. Lazard AJ, Collins MKR, Hedrick A, et al. Using Social Media for Peer-to-Peer Cancer Support: Interviews with Young Adults with Cancer. JMIR Cancer. 2021; 7(3): e28234. doi: 10.2196/28234
34. Zheng Z, Song R, Zhao Y, et al. An investigation of the level of stigma and the factors influencing it in the rehabilitation of young and middle-aged stroke patients-a cross-sectional study. BMC Neurology. 2023; 23(1). doi: 10.1186/s12883-023-03189-4
35. Wang R, Zheng S, Ouyang X, et al. Suicidality and Its Association with Stigma in Clinically Stable Patients with Schizophrenia in Rural China. Psychology Research and Behavior Management. 2023; 16: 1947–1956. doi: 10.2147/prbm.s413070
36. Tan JH, Sharpe L, Russell H. The impact of ovarian cancer on individuals and their caregivers: A qualitative analysis. Psycho-Oncology. 2020; 30(2): 212–220. doi: 10.1002/pon.5551
37. Li Q, Chiang VCL, Xu X, et al. The Experiences of Chinese Couples Living with Cancer. Cancer Nursing. 2015; 38(5): 383–394. doi: 10.1097/ncc.0000000000000196
38. Teo I, Bhaskar A, Ozdemir S, et al. Perceived stigma and its correlates among Asian patients with advanced cancer: A multi-country APPROACH study. Psycho-Oncology. 2022; 31(6): 938–949. doi: 10.1002/pon.5882
39. Liu X, Zhong J, Ren J, et al. The Formation of Stigma and Its Social Consequences on Chinese People Living with Lung Cancer: A Qualitative Study. Oncol Nurs Forum. 2023; 50(5): 589–598. doi: 10.1188/23.Onf.589-598
40. Yang LH. Application of mental illness stigma theory to Chinese societies: synthesis and new directions. Singapore Medical Journal. 2007; 48(11): 977–985.

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Article

Baduanjin for alleviating anxiety symptoms in elderly cancer patients: An intervention survey study

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Abstract: This study aimed to evaluate the effect of the Baduanjin intervention on alleviating anxiety symptoms in elderly cancer patients. **Methods:** Participants were randomly assigned to either the experimental group or the control group using a random grouping method. The Generalized Anxiety Disorder 7 (GAD-7), World Health Organization Quality of Life-BREF (WHOQOL-BREF) and Pittsburgh Sleep Quality Index (PSQI) scales were utilized to assess the elderly cancer patients before the intervention (T0), at the end of the intervention (T1), and during a follow-up survey (T2) one month later. **Results:** The GAD-7, WHOQOL-BREF, and PSQI scores for the experimental group at T1 and T2 were significantly lower than those of the control group ($p < 0.05$). These effects were sustained to a certain extent, among which GAD-7 (T1: 4.2 ± 1.7; T2: 4.5 ± 1.9; Cohen's d: −4.11 and −4.08). Among the four domains of the WHOQOL-BREF, the physical health domain (T1: 4.30 ± 0.85; T2: 4.10 ± 0.80; Cohen's d: 0.61 and 0.60), the mental health domain (T1: 4.20 ± 0.75; T2: 4.00 ± 0.70; Cohen's d: 0.65 and 0.55), the social relationship domain (T1: 4.80 ± 0.50; T2: 4.70 ± 0.55; Cohen's d: −1.27 and 0.07), and the environmental domain (T1: 4.20 ± 0.70; T2: 4.10 ± 0.75; Cohen's d: 0.76 and −0.64) were assessed. Additionally, the PSQI scores (T1: 9.0 ± 2.8; T2: 9.5 ± 3.0; Cohen's d: −1.89 and −1.63). These findings demonstrate that Baduanjin is an effective and sustainable non-pharmacological intervention for elderly cancer patients. **Conclusion:** Baduanjin represents a safe and effective psychological intervention for elderly cancer patients and possesses significant clinical application potential. However, the study's limitations, including the small sample size and lack of detailed mechanistic analysis, should be considered when interpreting these results.

Keywords: Baduanjin; elderly cancer patients; anxiety; intervention effect; persistence

1. Introduction

As the global population ages, cancer has emerged as one of the most prevalent fatal diseases among the elderly [1]. According to the World Health Organization (WHO), cancer is the second leading cause of death, following cardiovascular disease, with the number of elderly cancer patients rising annually [2]. The diagnosis of cancer not only significantly impacts the patient's physical health but is also frequently associated with serious psychological issues, particularly anxiety and depression [3]. Research indicates that elderly cancer patients exhibit markedly higher levels of anxiety symptoms compared to patients in other age groups, which is closely linked to various factors, including multiple health issues, treatment burdens, and inadequate social support [4–6]. Anxiety symptoms can impair immune function, increase pain perception, and delay recovery in cancer patients [7]. Elderly cancer patients are

especially susceptible to anxiety due to declines in physical function and the side effects of treatment [8], while conventional pharmacological treatments may introduce new health issues as a result of their side effects [9]. Consequently, identifying an effective non-pharmacological treatment option has become an urgent priority for enhancing the mental health of cancer patients.

In recent years, non-drug treatments, particularly traditional Chinese medicine intervention methods, have garnered significant attention. Baduanjin, a traditional Chinese medicine health-preserving exercise, has emerged as a preferred choice for enhancing the physical and mental well-being of the elderly due to its simple movements, low physical burden, and lack of restrictions regarding time and space [10,11]. Baduanjin effectively improves the mental health of older adults through a combination of breath regulation, body regulation, and mind regulation. A study involving elderly participants revealed that following Baduanjin training, scores for anxiety and depression significantly decreased, leading to notable improvements in their mental health [12–15]. Furthermore, the application of Baduanjin among cancer patients has also demonstrated substantial benefits. Research indicates that Baduanjin can effectively alleviate anxiety symptoms in cancer patients, particularly during chemotherapy and radiotherapy [16,17]. From a physiological perspective, Baduanjin enhances the body's tolerance to stress by regulating the autonomic nervous system, which consequently reduces anxiety symptoms [18]. Additionally, the practice of Baduanjin promotes the secretion of endorphins [19], lowers cortisol levels [20], and further alleviates stress and anxiety [21,22]. Notably, Baduanjin improves cardiovascular function, lowers blood pressure and heart rate, mitigates the adverse effects of anxiety and stress on the body [23,24], and enhances overall quality of life [25]. Furthermore, engaging in Baduanjin can improve sleep quality, decrease the incidence of insomnia, and promote both physical and mental health in the elderly [26]. However, it is important to acknowledge that while studies have demonstrated the effectiveness of Baduanjin in alleviating anxiety, sleep disorders, and enhancing quality of life, most research has concentrated on short-term interventions and has not included post-intervention follow-up, particularly in elderly cancer patients. Applied studies involving this demographic remain scarce [27]. Previous research has predominantly assessed the effects of Baduanjin on healthy individuals or patients with other conditions, leaving a gap in understanding its long-term effects and safety in elderly cancer patients.

Unlike prior studies, this research investigates the long-term effects of Baduanjin specifically in elderly cancer patients, a group often overlooked in non-pharmacological intervention studies. Accordingly, to comprehensively evaluate the sustained effects of the Baduanjin intervention, we will assess the anxiety levels of elderly cancer patients at three distinct time points: before the intervention (T0), at the conclusion of the intervention (T1), and one month post-intervention (T2). This approach aims to further explore the clinical application potential of Baduanjin in cancer patients. This study not only seeks to provide robust evidence for the application of Baduanjin among elderly cancer patients but also aspires to establish a safe, effective, and low-cost non-pharmacological intervention program that can enhance both the physical and mental health of this demographic, ultimately contributing to their overall well-being.

2. Materials and methods

2.1. Participants and grouping

This study recruited 76 elderly patients (aged ≥ 60 years). Following discussions with patients and their families, a total of 50 elderly cancer patients voluntarily participated in this intervention study. We used a simple randomization method to allocate the experimental group and the control group through a computer-generated random number sequence, with 25 people in each group. Participants were randomly assigned to two groups using a random number method: the experimental group (Baduanjin intervention group) and the control group (conventional treatment group), with 25 individuals in each group. The intervention period commenced on 19 August 2024, and concluded on 10 November 2024, lasting a total of 12 weeks (84 days). Following the intervention period, all patients will enter a one-month follow-up observation phase, which will continue until 10 December 2024. The overall duration of the entire study is 114 days. To control for potential confounding factors during the study period, all aspects of the experimental and control groups, including diet and living habits, were balanced, with the exception of the Baduanjin intervention. This approach ensured that any differences observed between the groups could be attributed solely to the intervention measures.

(1) Baduanjin intervention group (experimental group): Patients in this group will engage in Baduanjin exercises, guided by three professional coaches, four times a week during the 12-week intervention period, with each session lasting 50 min. All participants received standardized Baduanjin instruction from trained coaches (three coaches are all champions of the National Baduanjin Championships), with sessions tailored to their physical fitness levels and supervised by 3 researchers to ensure quality. In addition, to enhance participant adherence, we provided clear instructions and regular reminders. We also documented their attendance and participation through sign-in sheets and periodic checks.

(2) Conventional treatment group (control group): Patients in this group will not participate in Baduanjin exercises during the intervention period and will continue to receive conventional cancer treatment along with psychological counseling. Psychological interventions, such as cognitive behavioral therapy, will be provided in accordance with routine clinical practices, but no physical exercise interventions will be included. This study was reviewed and approved by the Ethics Committee of Department of Physical Education, Xi'an Aeronautical University (approval number: XHTY20240801).

In the process of the investigation intervention, there were no participants who withdrew, and there were no missing data.

2.2. Inclusion and exclusion criteria

1) Inclusion Criteria: (1) Participants must be aged 60 years or older, clinically diagnosed with cancer, and free from other serious comorbidities. The types of cancer included are not limited and may encompass breast cancer, lung cancer, gastric cancer, among others. (2) Participants must be undergoing cancer treatment, such as chemotherapy, radiotherapy, or targeted therapy, with a stable health condition (not in

a critical stage). (3) Elderly cancer patients exhibiting anxiety symptoms will be evaluated using the Brief Anxiety Scale (GAD-7) at the time of enrollment. (4) Participants must be capable of engaging in Baduanjin exercises without significant exercise restrictions, meaning there are no contraindications for exercise, such as severe bone and joint disease or heart disease. (5) Participation in the study must be voluntary, with all participants required to sign an informed consent form.

2) Exclusion criteria: (1) Patients with a history of severe mental illness (major depression, schizophrenia, bipolar disorder) will be excluded, as their anxiety symptoms may not be related to cancer and could impact the effectiveness of the intervention. (2) Patients with significant movement disorders or those unable to engage in physical activities (such as severe bone and joint issues, heart failure, coronary artery disease, or respiratory diseases) may not be able to participate in Baduanjin exercises. (3) Patients concurrently receiving other interventions (such as additional psychological therapies or physical exercise programs) may confound the results of this study. (4) Patients with severe cognitive impairment (advanced dementia) may struggle to understand and perform Baduanjin movements, thereby affecting the intervention's effectiveness. (5) Patients with a limited life expectancy (such as those with terminal cancer) may not derive sufficient benefit from the intervention; thus, the patient's expected survival duration should be considered during screening. (6) Patients who do not adhere to the study protocols, including those who cannot attend intervention activities punctually or complete follow-up assessments, will also be excluded. (7) Attendance was monitored to ensure adherence, and participants' engagement in sessions was logged for analysis.

2.3. Measurement tools

(1) Generalized Anxiety Disorder 7 (GAD-7): This study utilized the GAD-7 to evaluate anxiety symptoms in elderly cancer patients. The GAD-7 scale comprises seven questions designed to assess anxiety levels within this demographic. Respondents rate their experiences on a Likert scale ranging from 0 to 3 (0: not at all; 3: almost every day). The total score can vary from 0 to 21, with higher scores indicating more severe anxiety symptoms: scores of 0–4 signify no anxiety or mild anxiety, 5–9 indicate mild anxiety, 10–14 reflect moderate anxiety, and scores of 15–21 are classified as severe anxiety. The GAD-7 scale has been extensively validated in the elderly cancer patient population, demonstrating high sensitivity and accuracy in assessing cancer-related anxiety symptoms [28,29].

(2) The World Health Organization Quality of Life-BREF (WHOQOL-BREF): This study utilized the WHOQOL-BREF to assess the quality of life among elderly cancer patients. The WHOQOL-BREF comprises 26 items that address four key domains: physical health, mental health, social relationships, and environment. The assessment encompasses various aspects, including physical strength, emotional state, social support, and living conditions. Participants evaluated their past quality of life experiences using a 1–5 Likert scale (1: not at all good, 5: very good), with scores subsequently converted to a 0–100 scale, where higher scores indicate a better quality of life. This instrument has been extensively employed to evaluate the quality of life in cancer patients and demonstrates strong reliability and validity [30]. The

WHOQOL-BREF has particularly proven effective in assessing the quality of life of elderly cancer patients, accurately reflecting their physical health, psychological well-being, social support, living environment, and other relevant aspects [31].

(3) Pittsburgh Sleep Quality Index (PSQI): This study utilized the PSQI to evaluate the sleep quality of elderly cancer patients. The PSQI is a self-rating scale that is widely employed in both clinical and research settings. It comprises 19 items designed to assess an individual's sleep quality over the past month, encompassing seven domains: subjective sleep quality, sleep time, sleep duration, sleep efficiency, sleep disorders, hypnotic drug use, and daytime dysfunction. Scores for each domain range from 0 to 3, resulting in a total score that spans from 0 to 21, with higher scores indicating poorer sleep quality. The PSQI has been extensively used among cancer patients and the elderly, demonstrating high reliability and validity in assessing sleep quality and diagnosing sleep disorders, particularly in elderly cancer patients. It exhibits good applicability [32,33]. By evaluating the PSQI in elderly cancer patients, this study aims to quantify the patients' sleep status, assess its impact on overall health and quality of life, and provide a foundation for subsequent sleep intervention measures.

2.4. Mathematical statistics

Data were analyzed using SPSS 25.0, including descriptive statistics, paired *t*-tests for within-group comparisons, independent *t*-tests for between-group differences, and Cohen's d for effect size calculation. The baseline characteristics of the experimental and control groups were compared using descriptive statistics to ensure that there were no significant differences in the basic conditions of the two groups prior to the intervention ($M \pm SD$, $P > 0.05$). Differences between the groups were evaluated using independent samples t-tests in elderly cancer patients, specifically assessing the change levels of GAD-7, WHOQOL-BREF, and PSQI before and after the intervention. within-group difference were analyzed using paired samples t-tests for changes in GAD-7, WHOQOL-BREF, and PSQI. Cohen's d was calculated to determine the effect size for the experimental and control groups regarding GAD-7, WHOQOL-BREF, and PSQI (Cohen's d values range from −1 to 1; values greater than 1 indicate a positive and significant effect). The statistical significance level for all analyses was set at $P < 0.05$. Graphical visual analysis was conducted using GraphPad Prism 8.0.1.

3. Results

3.1. Baseline data characteristics of participants

A total of 50 participants were enrolled in the study, with 25 individuals in the experimental group and 25 in the control group. Baseline characteristics revealed no significant differences between the two groups. The mean age of participants in the experimental group was 64.4 ± 3.1 years, compared to a mean age of 64.1 ± 3.2 years in the control group ($P = 0.72$). The gender distribution was also similar, with 56% male and 44% female in the experimental group, and 64% male and 36% female in the control group ($P = 0.95$). Anxiety levels, as measured by the GAD-7 scale, yielded

a mean score of 18.5 ± 4.3 for the experimental group and 18.3 ± 4.0 for the control group ($P = 0.68$). Educational attainment was comparably distributed between the two groups, with approximately 32%–36% of participants in each group having completed high school, undergraduate, or master's level education ($P = 0.93$). In the experimental group, the distribution proportions of patients with breast cancer, lung cancer, and gastric cancer were 32%, 40%, and 28%, respectively. In contrast, the control group exhibited proportions of 16%, 48%, and 36% for these cancer types, respectively ($P = 0.84$). In terms of disease duration, the mean values for the two groups are 4.53 and 3.73, respectively ($P = 0.15$). These findings indicate that the two groups were well-matched at baseline, thereby minimizing potential confounding variables (**Table 1**).

Table 1. Baseline comparison of participants.

Baseline characteristics		**Experimental Group ($n = 25$)**	**Control Group ($n = 25$)**	***P***
Age		64.4 ± 3.1	64.1 ± 3.2	0.72
Gender	Male (%)	14 (56%)	16 (64%)	0.95
	Female (%)	11 (44%)	9 (36%)	
Educational Level	High School	8 (32%)	9 (36%)	0.93
	Undergraduate	9 (36%)	8 (32%)	
	Master	8 (32%)	8 (32%)	
Cancer Types	Breast Cancer	8 (32%)	4 (16%)	0.84
	Lung Cancer	10 (40%)	12 (48%)	
	Gastric Cancer	7 (28%)	9 (36%)	
Disease Duration		4.53 ± 1.64	3.73 ± 1.83	0.15
GAD-7 Level		18.5 ± 4.3	18.3 ± 4.0	0.68

3.2. Changes in GAD-7 levels

Before and After Intervention: We employed paired sample *t*-tests and independent sample *t*-tests to investigate the changes in the experimental and control groups across various time points, assessing the impact of the intervention measures (**Table 2**). The results indicated that the experimental group experienced significant changes in measured values at T0, T1, and T2. Specifically, at T1, the mean value for the experimental group decreased markedly from T0 (18.5 ± 4.3) to T1 (4.2 ± 1.7, $P^1 < 0.05$). Furthermore, when compared to the control group's T1 value (17.6 ± 4.3), the difference between the two groups was also significant ($P^2 < 0.01$), highlighting the substantial short-term effect of the intervention. Effect size calculations revealed a Cohen's d value of 4.11, indicating a very large effect intensity and confirming that the intervention had a significant and pronounced impact on modifying the behavior or status of the experimental group. Although the mean within the experimental group slightly rebounded to 4.5 ± 1.9 at T2, significant differences persisted both between and within the groups ($P < 0.05$), with Cohen's d remaining at 4.08. This suggests that the intervention's effect was not only significant at T1 but also sustainable to a certain degree, indicating its continued effectiveness one month later. In contrast, the control group showed no significant changes in measured values across T0, T1, and T2 ($P^1 > 0.05$), with a Cohen's d of −0.48. The lack of significant differences between the two groups ($P^2 > 0.05$) confirms that, without the intervention, the control group exhibited

negligible changes and no notable effects. This further emphasizes the distinctiveness and effectiveness of the intervention's impact within the experimental group (**Figure 1**).

Table 2. Changes in GAD-7 levels.

Index	T0 ($M \pm SD$)	T1 ($M \pm SD$)	T2 ($M \pm SD$)	P^1
Control Group	18.3 ± 4.0	17.6 ± 4.3*	17.5 ± 4.1	0.05
Experimental Group	18.5 ± 4.3	4.2 ± 1.7*	4.5 ± 1.9	0.05
P^2	0.85	0.01	0.03	-
Cohen's d	−0.48	−4.11	−4.08	-

Notes: P^1: within-group difference. P^2: between-group difference; $P < 0.05$, $^*P < 0.01$.

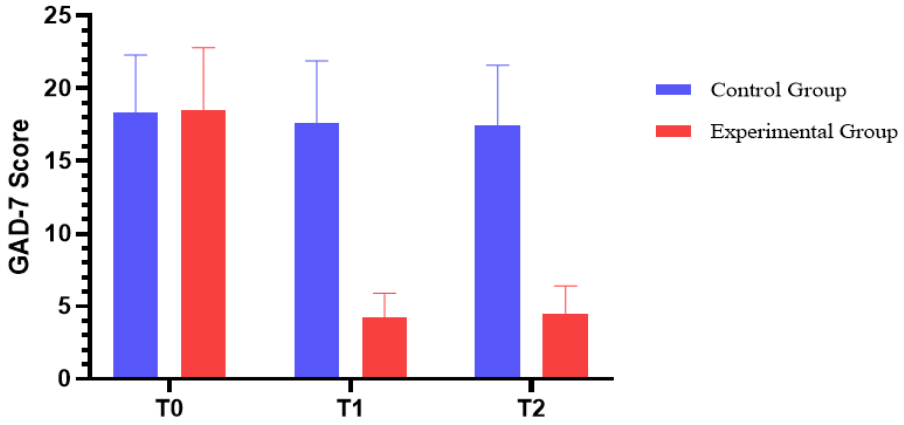


Figure 1. Three stage changes in anxiety.

3.3. Changes in the level of WHOQOL-BREF in four fields

This study examined the data from both the experimental and control groups at three time points: prior to the intervention (T0), immediately following the intervention (T1), and one month post-intervention (T2). The results demonstrate that the Baduanjin intervention significantly enhanced patients' quality of life. In the physical health domain, the changes in WHOQOL-BREF scores for the control group before and after the intervention were not statistically significant (T0: 3.50 ± 0.75, T1: 3.80 ± 0.80, T2: 3.65 ± 0.70, $P > 0.05$). Conversely, the experimental group exhibited a significant improvement in physical health scores post-intervention (T0: 3.60 ± 0.75, T1: 4.30 ± 0.85, T2: 4.10 ± 0.80, $P < 0.05$) (**Table 3**). Additionally, the mental health scores for the experimental group showed a significant increase after the intervention (T0: 3.50 ± 0.80, T1: 4.20 ± 0.75, T2: 4.00 ± 0.70, $P < 0.05$). Between-group comparisons revealed that the scores of the experimental group at T1 and T2 were significantly higher than those of the control group (T1: $P = 0.01$, T2: $P = 0.03$). The Cohen's d values were 0.65 and 0.55, respectively, indicating that Baduanjin has a significant positive effect on mental health, with impact sizes ranging from moderate to moderately strong (**Table 4**). Furthermore, in the domain of social relations (**Table 5**), both groups displayed an upward trend in scores; however, the improvement in the experimental group was particularly pronounced. The control group's scores at T1 and T2 were 4.35 ± 0.50 and 4.30 ± 0.60, respectively, indicating no significant change ($P > 0.05$). In contrast, the experimental group's scores at T1 and T2 were 4.80 ± 0.50

and 4.70 ± 0.55, respectively, which were significantly higher than the pre-intervention scores (T0: 4.30 ± 0.60, $P < 0.05$). Furthermore, the experimental group's scores at T1 and T2 were 4.20 ± 0.70 and 4.10 ± 0.75, respectively, demonstrating a significant improvement compared to their pre-intervention scores (T0: 3.55 ± 0.80, $P < 0.05$). Comparisons between groups revealed significant differences at both T1 and T2 ($P < 0.05$). The Cohen's d values were 0.76 and −0.64, respectively, indicating that the experimental group's enhancement in the environmental domain possesses considerable clinical significance, particularly evidenced by a strong effect size at T1 that slightly diminished by T2 (**Table 6**, **Figure 2**).

Table 3. Three stage changes in the physical health field of WHOQOL-BREF.

Field	Index	T0 ($M \pm SD$)	T1 ($M \pm SD$)	T2 ($M \pm SD$)	P^1
Physical Health	Control Group	3.50 ± 0.75	3.80 ± 0.80	3.65 ± 0.70	0.05
	Experimental Group	3.60 ± 0.75	4.30 ± 0.85	4.10 ± 0.80	0.05
	P^2	0.75	0.02	0.04	-
	Cohen's d	0.19	0.61	0.60	-

Notes: P^1: within-group difference. P^2: between-group difference; $P < 0.05$.

Table 4. Three stage changes in the mental health field of WHOQOL-BREF.

Field	Index	T0 ($M \pm SD$)	T1 ($M \pm SD$)	T2 ($M \pm SD$)	P^1
Mental Health	Control Group	3.60 ± 0.85	3.70 ± 0.80*	3.60 ± 0.75	0.05
	Experimental Group	3.50 ± 0.80	4.20 ± 0.75*	4.00 ± 0.70	0.05
	P^2	0.60	0.01	0.03	-
	Cohen's d	0.12	0.65	0.55	-

Notes: P^1: within-group difference. P^2: between-group difference; $P < 0.05$, $^*P < 0.01$.

Table 5. Three stage changes in the social relations domain of WHOQOL-BREF.

Field	Index	T0 ($M \pm SD$)	T1 ($M \pm SD$)	T2 ($M \pm SD$)	P^1
Social Relations	Control Group	4.30 ± 0.55	4.35 ± 0.50*	4.30 ± 0.60	0.05
	Experimental Group	4.30 ± 0.60	4.80 ± 0.50*	4.70 ± 0.55	0.05
	P^2	0.85	0.003	0.02	-
	Cohen's d	0	−1.27	−0.70	-

Notes: P^1: within-group difference. P^2: between-group difference; $P < 0.05$, $^*P < 0.01$.

Table 6. Three stage changes in the environmental field of WHOQOL-BREF.

Field	Index	T0 ($M \pm SD$)	T1 ($M \pm SD$)	T2 ($M \pm SD$)	P^1
Environmental	Control Group	3.50 ± 0.85	3.65 ± 0.75*	3.60 ± 0.80	0.05
	Experimental Group	3.55 ± 0.80	4.20 ± 0.70*	4.10 ± 0.75	0.05
	P^2	0.45	0.01	0.03	-
	Cohen's d	−0.06	0.76	−0.64	-

Notes: P^1: within-group difference. P^2: between-group difference; $P < 0.05$, $^*P < 0.01$.

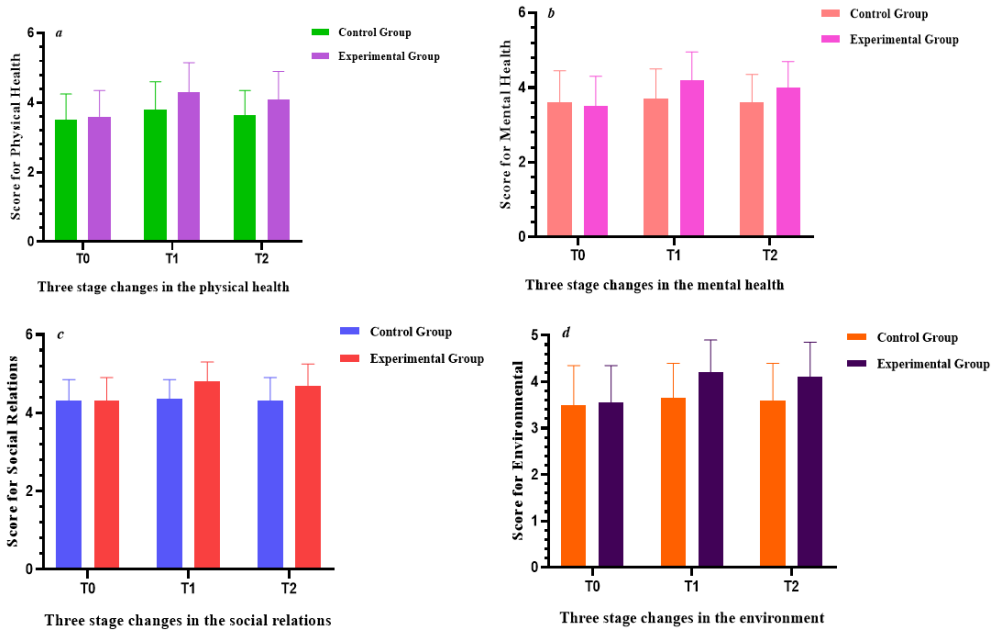


Figure 2. The stage-wise changes in the four domains of WHOQOL-BREF.

3.4. Phase changes in PSQI

This study assessed the impact of Baduanjin on the sleep quality of elderly cancer patients. The PSQI score for the experimental group before the intervention (T0) was 15.2 ± 3.5, which significantly decreased to 9.0 ± 2.8 following the intervention (T1), and was recorded as 9.5 ± 3.0 one month later (T2). Compared to the control group, significant differences were noted at both T1 and T2 ($P < 0.05$). The paired sample t-test demonstrated that the changes in the experimental group from T0 to T1 were statistically significant ($P < 0.05$). Additionally, Cohen's d effect size analysis indicated that the effect sizes for the experimental group at T1 and T2 were −1.89 and −1.63, respectively, suggesting a strong clinical effect of the intervention (**Table 7**, **Figure 3**).

Table 7. Three Stage Changes of PSQ.

Index	T0 ($M \pm SD$)	T1 ($M \pm SD$)	T2 ($M \pm SD$)	P^1	Percentage (%)		
					T0	T1	T2
Control Group	14.9 ± 3.4	14.7 ± 3.2	14.8 ± 3.5	0.05	70.95	70	70.47
Experimental Group	15.2 ± 3.5	9.0 ± 2.8	9.5 ± 3.0	0.05	72.38	42.85	45.23
P^2	0.80	0.02	0.03	-	-	-	-
Cohen's d	0.09	−1.89	−1.63	-	-	-	-

Notes: P^1: within-group difference. P^2: between-group difference; $P < 0.05$.

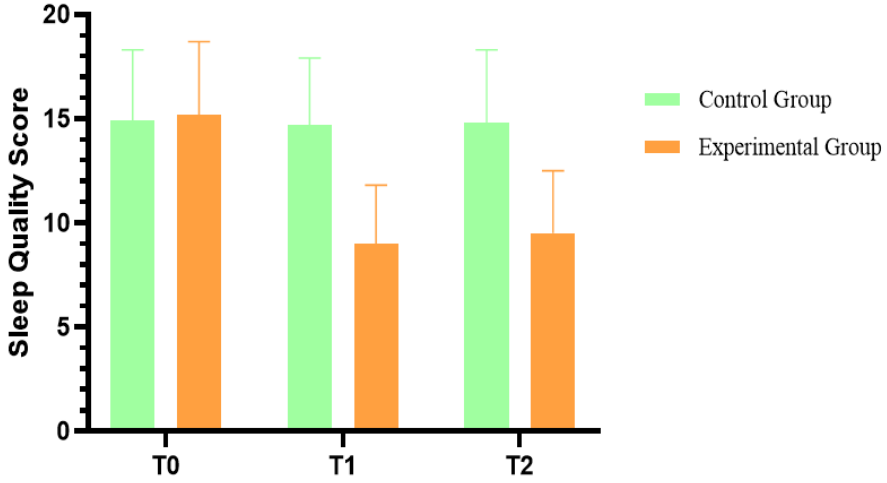


Figure 3. Three stage changes in sleep quality.

4. Discussions

This study aims to investigate the effects of Baduanjin on alleviating anxiety symptoms in elderly cancer patients. Research indicates that approximately 30% to 50% of cancer patients, particularly within the elderly demographic, experience varying degrees of anxiety, with incidence rates typically exceeding those found in the general elderly population [34]. Anxiety not only adversely impacts patients' emotional well-being [35], but it can also lead to decreased treatment adherence [36], diminished immune function [37], and may even influence survival outcomes [38]. Consequently, identifying a safe and effective non-pharmacological intervention to alleviate anxiety in this vulnerable group is of significant clinical importance. Baduanjin, a traditional Chinese Qigong practice, is characterized by its gentle movements that are easy to learn and has demonstrated beneficial effects on both physical and mental health. Numerous studies have substantiated its efficacy in addressing psychological issues, including anxiety and depression [39–41]. This study demonstrates that the Baduanjin intervention significantly alleviates anxiety symptoms in elderly cancer patients. Notably, in the short term, the anxiety levels in the intervention group were markedly reduced, and post-intervention, these levels remained lower than those observed in the control group. These findings align with previous research indicating that Baduanjin effectively mitigates anxiety symptoms in cancer patients [42,43]. The practice of Baduanjin aids patients in relaxing their autonomic nervous system and diminishing physiological responses associated with anxiety through techniques such as regulated breathing, slow movements, and meditation [44]. Furthermore, it can objectively induce rhythmic responses across the α, β, θ, and δ frequency bands of the cerebral cortex electroencephalogram (EEG). Notably, the α and β frequency bands exhibit a stable trend over time, demonstrating significant effects from subsequent interventions [45]. Consequently, Health Qigong proves to be effective in reducing stress, promoting relaxation, and enhancing immunity, particularly highlighting its unique advantages in alleviating anxiety among elderly cancer patients. From a physiological perspective, Baduanjin effectively activates the parasympathetic nervous system, inhibits excessive activation of the sympathetic nervous system, and reduces stress hormone levels, such as cortisol,

through deep breathing and body relaxation exercises [46,47]. Research indicates that deep breathing and relaxation training can significantly alleviate anxiety while promoting physical relaxation and emotional stability [48]. For cancer patients, anxiety often arises from fears related to the disease, concerns about treatment side effects, and feelings of helplessness regarding future survival. The practice of Baduanjin aids patients in regaining psychological balance by alleviating these physical and psychological pressures [49]. Furthermore, as a non-pharmacological intervention, Baduanjin holds significant clinical application potential. In contrast to traditional pharmacological treatments, Baduanjin offers the advantages of being free from side effects and drug dependence, allowing patients to practice independently and thereby enhancing their quality of life [50,51], this result is consistent with previous studies. Notably, for elderly cancer patients, Baduanjin's moderate exercise intensity can be tailored to individual physical conditions, making it particularly suitable for this demographic. This intervention investigation revealed that, consistent with previous studies, Baduanjin effectively alleviates anxiety levels, improves sleep disorders, and enhances the quality of life among the elderly. However, a notable distinction of this study is its specific focus on elderly cancer patients. A follow-up survey conducted post-intervention further clarified the sustained effects of Baduanjin. Consequently, this study not only confirmed the effectiveness of Baduanjin in alleviating anxiety symptoms in elderly cancer patients but also highlighted its enduring impact through follow-up assessments, thereby providing new evidence for its clinical application. This finding not only reinforces the advantages of Baduanjin as a non-pharmacological therapy but also offers innovative ideas and strategies for the mental health management of elderly cancer patients.

5. Conclusions and limitations

This study demonstrates that Baduanjin, as a non-pharmacological intervention, can significantly alleviate anxiety symptoms in elderly cancer patients. By regulating the autonomic nervous system, promoting harmony between physical and mental states, and enhancing emotional regulation capabilities, Baduanjin offers a safe and effective psychological intervention for cancer patients. The findings indicate that, although anxiety symptoms rebounded post-intervention, the anxiety levels in the experimental group remained lower than those in the control group, suggesting that the effects of the Baduanjin intervention are sustainable to some extent. This sustained benefit is particularly crucial for older cancer patients, who may need to manage symptoms and cope with the psychological distress associated with their illness over the long term. Clinically, this discovery provides new intervention tools for healthcare professionals. Incorporating Baduanjin into a comprehensive treatment plan for cancer patients can complement pharmacological therapies and aid patients in better managing anxiety and other related symptoms. Furthermore, given that Baduanjin is easy to learn and practice, patients can perform it independently at home, thereby enhancing the feasibility and sustainability of the intervention. Additionally, Baduanjin has been shown to effectively improve patients' quality of life and sleep quality, with no significant side effects reported during the intervention process. These attributes position Baduanjin represents a reliable, cost-effective, and scalable non-

pharmacological intervention with significant potential for improving mental health outcomes in elderly cancer patients.

The study has several limitations that should be acknowledged. First, the relatively small sample size may compromise the statistical power and the generalizability of the results. Second, the follow-up period was limited to one month, which may not adequately capture the long-term effects of the intervention. Additionally, the study did not account for potential cultural biases, gender differences, subgroup analyses based on cancer type, and the effects of ongoing medical treatment. Future research recommendations include, on one hand, increasing the sample size, extending the follow-up duration, and considering variables such as ongoing medical treatment to better assess the long-term effects of Baduanjin intervention and its applicability across different cancer types and stages. On the other hand, integrating biomarker studies, such as heart rate variability, cortisol levels, the hypothalamic-pituitary-adrenal axis, and stress hormone regulation, could elucidate the specific mechanisms by which Baduanjin influences the autonomic nervous system and stress response. Furthermore, incorporating larger sample sizes is necessary to confirm findings. However, further research is needed to validate these findings in larger, more diverse populations and to explore its integration with existing therapeutic approaches.

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References

1. Kiri S, Ryba T. Cancer, metastasis, and the epigenome. Molecular cancer. 2024; 23(1): 154. doi: 10.1186/s12943-024-02069-w
2. World Health Organization (WHO). Cancer. Available online: https://www.who.int/news-room/fact-sheets/detail/cancer (accessed on 5 November 2024).
3. Kittel JA, Seplaki CL, Van Wijngaarden E, et al. Fatigue, impaired physical function and mental health in cancer survivors: the role of social isolation. Supportive care in cancer: official journal of the Multinational Association of Supportive Care in Cancer,2024; 33(1): 16. doi: 10.1007/s00520-024-09075-0

4. He Y, Pang Y, Su Z, et al. Symptom burden, psychological distress, and symptom management status in hospitalized patients with advanced cancer: a multicenter study in China. ESMO Open. 2022; 7(6): 100595. doi: 10.1016/j.esmoop.2022.100595
5. Erdoğan Yüce G, Döner A, Muz G. Psychological Distress and Its Association with Unmet Needs and Symptom Burden in Outpatient Cancer Patients: A Cross-Sectional Study. Seminars in Oncology Nursing. 2021; 37(5): 151214. doi: 10.1016/j.soncn.2021.151214
6. Velasco-Durantez V, Cruz-Castellanos P, Hernandez R, et al. Prospective study of predictors for anxiety, depression, and somatization in a sample of 1807 cancer patients. Scientific Reports. 2024; 14(1). doi: 10.1038/s41598-024-53212-y
7. Shan Y, Sun G, Ji J, et al. Brain function abnormalities and neuroinflammation in people living with HIV-associated anxiety disorders. Frontiers in Psychiatry. 2024; 15. doi: 10.3389/fpsyt.2024.1336233
8. Giger AKW, Ditzel HM, Lund CM, et al. Geriatric screening and frailty intervention in older patients with cancer. Ugeskrift for Læger. 2024; 186: 1-10. doi: 10.61409/v06230352
9. Hernandez Torres C, Hsu T. Comprehensive Geriatric Assessment in the Older Adult with Cancer: A Review. European Urology Focus. 2017; 3(4-5): 330-339. doi: 10.1016/j.euf.2017.10.010
10. Wu F, Che K, et al. Tracking Studies on the Effects of Qi Gong Fitness on Stress, Anxiety, and Depression Among Underprivileged Working Youth. ALPHA PSYCHIATRY. 2024; 25(3): 356-361. doi: 10.5152/alphapsychiatry.2024.231511
11. Tan B, Yan Y, Zhou Q, et al. Kinesitherapy for Knee Osteoarthritis Patients Physical and Psychological Health Based on "Traditional Chinese Exercise" Management Modalities: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Orthopaedic Surgery. 2023; 16(1): 3-16. doi: 10.1111/os.13920
12. Huang Y, Xu X, Chaurasiya BK, et al. Effects and safety of the traditional Chinese exercise baduanjin on depression and anxiety in COVID-19 patients: A systematic review and meta-analysis. Complementary Therapies in Medicine. 2024; 86: 103094. doi: 10.1016/j.ctim.2024.103094
13. Kang L, Li Y, Chen K, et al. Effect of Baduanjin exercise on acute myocardial infarction in patients with anxiety and depression after percutaneous coronary intervention: A randomized controlled trial. Medicine. 2024; 103(45): e40225. doi: 10.1097/md.0000000000040225
14. Wang Z, Zhang Z, Wu Y. The effects of Baduanjin exercise on the psychological condition and heart rate variability of sports-disadvantaged college students: A randomised trial. Journal of Health, Population and Nutrition. 2024; 43(1). doi: 10.1186/s41043-024-00691-4
15. Jiang L, Ouyang J, Du X. Effects of traditional Chinese medicine exercise therapy on cancer-related fatigue, anxiety and sleep quality in cancer patients: A protocol for systematic review and network meta-analysis. Medicine, 2021; 100(44): e27681. doi: 10.1097/MD.0000000000027681
16. Zeng Y, Luo T, Xie H, et al. Health benefits of qigong or tai chi for cancer patients: a systematic review and meta-analyses. Complementary Therapies in Medicine. 2014; 22(1): 173-186. doi: 10.1016/j.ctim.2013.11.010
17. Zou H, Lin X, Duan T, et al. Simple Sitting Baduanjin mind-body exercise: randomized controlled trial protocol for advanced cancer patients with the fatigue-sleep disturbance symptom cluster. BMC Complementary Medicine and Therapies. 2024; 24(1). doi: 10.1186/s12906-024-04652-6
18. Low SLK, Ho GF, Liu B, et al. Exploring Guolin Qigong (Mind-Body Exercise) for Improving Cancer Related Fatigue in Cancer Survivors: A Mixed Method Randomized Controlled Trial Protocol. Integrative Cancer Therapies. 2024; 23. doi: 10.1177/15347354241252698
19. Li X, & Gao L. Effects of Health Qigong intervention on blood sugar, blood lipids, and self-rated health in the elderly. Journal of Xi'an Institute of Physical Education. 2019; 01: 82-87. doi: 10.16063/j.cnki.issn1001-747x.2019.01.012
20. Sun G, Chao F, Wang AL. Effects of the newly compiled Health Qigong Baduanjin on blood lipids and physiological functions in elderly men. China Sports Science and Technology. 2008; 8(02): 81-84. doi: 10.16470/j.csst.2008.02.025
21. Wang YG, Liu LG, Kou ZJ, et al. Observation on the efficacy of Health Qigong Baduanjin exercise in the auxiliary treatment of type 2 diabetes. Chinese Journal of Sports Medicine. 2007; 2(02): 208-210. doi: 10.16038/j.1000-6710.2007.02.019
22. Zheng LW, Rao YL, Fang XH, et al. Effects of Baduanjin exercise on fall performance and balance ability in elderly patients with essential hypertension. Military Nursing; 2004.
23. Li Q, Li GH, Zhou YY. Application of whole-body vibration training combined with Baduanjin in patients with hemiplegia following hemorrhagic stroke. Modern Medicine and Health; 2004.

24. Cheng Y, Song Y, Wu F. Biomechanical analysis of balance control in the elderly By Ba Duan Jin. Molecular & Cellular Biomechanics. 2024; 21(3): 541. doi: 10.62617/mcb541
25. Zhou HW, Xie Q, Liu BY, et al. Conducted a thorough review of the research regarding the effects of Baduanjin on the physical and mental health of the elderly. Journal World Science and Technology—Modernization of Traditional Chinese Medicine; 2006.
26. Mishra SI, Scherer RW, Snyder C, et al. Exercise interventions on health-related quality of life for people with cancer during active treatment. Cochrane Database of Systematic Reviews; 2012. doi: 10.1002/14651858.cd008465.pub2
27. Spitzer RL, Kroenke K, Williams JBW, et al. A Brief Measure for Assessing Generalized Anxiety Disorder. Archives of Internal Medicine. 2006; 166(10): 1092. doi: 10.1001/archinte.166.10.1092
28. Chau YF, Zhou H, Chen B, et al. Screening for depression and anxiety in lung cancer patients: A real-world study using GAD-7 and HADS. Thoracic Cancer. 2024; 15(13): 1041-1049. doi: 10.1111/1759-7714.15287
29. The WHOQOL Group. Development of the World Health Organization WHOQOL-BREF Quality of Life Assessment. Psychological Medicine. 1998; 28(3): 551-558. doi: 10.1017/s0033291798006667
30. Lin CY, Hwang JS, Wang WC, et al. Psychometric evaluation of the WHOQOL-BREF, Taiwan version, across five kinds of Taiwanese cancer survivors: Rasch analysis and confirmatory factor analysis. Journal of the Formosan Medical Association. 2019; 118(1): 215-222. doi: 10.1016/j.jfma.2018.03.018
31. Buysse DJ, Reynolds CF, Monk TH, et al. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry research. 1989; 28(2): 193-213. doi: 10.1016/0165-1781(89)90047-4
32. Liu H, Liu S, Xiong L, et al. Effects of traditional Chinese exercise on sleep quality: A systematic review and meta-analysis of randomized controlled trials. Medicine. 2023; 102(44): e35767. doi: 10.1097/md.0000000000035767
33. Friðriksdóttir N, Sævarsdóttir Þ, Halfdánardóttir SÍ, et al. Family members of cancer patients: Needs, quality of life and symptoms of anxiety and depression. Acta Oncologica. 2011; 50(2): 252-258. doi: 10.3109/0284186x.2010.529821
34. Pitman A, Suleman S, Hyde N, et al. Depression and anxiety in patients with cancer. BMJ; 2018. doi: 10.1136/bmj.k1415
35. Shylasree TS, Kattepur AK, Gupta M, et al. Compliance to treatment guidelines and survival in women undergoing interval debulking surgery for advanced epithelial ovarian cancer. Cancer Reports. 2019; 3(2). doi: 10.1002/cnr2.1217
36. Reiche EMV, Morimoto HK, Nunes SMV. Stress and depression-induced immune dysfunction: Implications for the development and progression of cancer. International Review of Psychiatry. 2005; 17(6): 515-527. doi: 10.1080/02646830500382102
37. Sirithanaphol W, Sookprasert A, Rompsaithong U, et al. Prognostic Factors for Penile Cancer and Survival in Response to Multimodality Therapy. Research and Reports in Urology. 2020; 12: 29-34. doi: 10.2147/rru.s238147
38. Wu F, Zhang J, Yang H, et al. The Effect of Physical Exercise on the Elderly's Anxiety: Based on Systematic Reviews and Meta-Analysis. Computational and Mathematical Methods in Medicine. 2022; 2022: 1-8. doi: 10.1155/2022/4848290
39. Li X, Leng Y, Xiong Z, et al. The Effect of Long-Term Learning of BaduanJin on Emotion Regulation: Evidence from Resting-State Frontal EEG Asymmetry. Psychology Research and Behavior Management. 2024; 17: 2391-2401. doi: 10.2147/prbm.s436506
40. Zhao L, Shi P, Xiong X, Zeng J. Nonpharmacological interventions for cancer-related fatigue in lung cancer patients: A protocol for an evidence map of overview of a network meta-analysis of existing trials. Medicine, 2021;100(32): e26864. doi.org/10.1097/MD.0000000000026864
41. Chen Y, Zuo X, Tang Y, et al. The effects of Tai Chi and Baduanjin on breast cancer patients: systematic review and meta-analysis of randomized controlled trials. Frontiers in Oncology. 2024; 14. doi: 10.3389/fonc.2024.1434087
42. Gong X, Rong G, Wang Z, et al. Baduanjin exercise for patients with breast cancer: A systematic review and meta-analysis. Complementary Therapies in Medicine. 2022; 71: 102886. doi: 10.1016/j.ctim.2022.102886
43. Zou L, Sasaki JE, Wang H, et al. A Systematic Review and Meta-Analysis of Baduanjin Qigong for Health Benefits: Randomized Controlled Trials. Evidence-Based Complementary and Alternative Medicine. 2017; 2017(1). doi: 10.1155/2017/4548706
44. Wei L, Liu Y, Wang Y, et al. The effects of Baduanjin on physical function, daily living activities and quality of life in patients with stroke: a systematic review and meta-analysis. Topics in Stroke Rehabilitation. 2023; 31(2): 178-198. doi: 10.1080/10749357.2023.2238433
45. Xia R, Wan M, Lin H, et al. Effects of mind–body exercise Baduanjin on cognition in community-dwelling older people with mild cognitive impairment: A randomized controlled trial. Neuropsychological Rehabilitation. 2022; 33(8): 1368-1383.

doi: 10.1080/09602011.2022.2099909

46. Ho RTH, Wan AHY, Chan JSM, et al. Study protocol on comparative effectiveness of mindfulness meditation and qigong on psychophysiological outcomes for patients with colorectal cancer: a randomized controlled trial. BMC Complementary and Alternative Medicine. 2017; 17(1). doi: 10.1186/s12906-017-1898-6
47. Cheung DST, Deng W, Tsao SW, et al. Effect of a Qigong Intervention on Telomerase Activity and Mental Health in Chinese Women Survivors of Intimate Partner Violence. JAMA Network Open. 2019; 2(1): e186967. doi: 10.1001/jamanetworkopen.2018.6967
48. Leung KCW, Yang YJ, Hui SSC, et al. Mind-Body Health Benefits of Traditional Chinese Qigong on Women: A Systematic Review of Randomized Controlled Trials. Evidence-Based Complementary and Alternative Medicine. 2021; 2021: 1-16. doi: 10.1155/2021/7443498
49. Van Vu D, Molassiotis A, Ching SSY, et al. Effects of Qigong on symptom management in cancer patients: A systematic review. Complementary Therapies in Clinical Practice. 2017; 29: 111-121. doi: 10.1016/j.ctcp.2017.09.005
50. Chan CLW, Wang CW, Ho RTH, et al. A systematic review of the effectiveness of qigong exercise in supportive cancer care. Supportive Care in Cancer. 2012; 20(6): 1121-1133. doi: 10.1007/s00520-011-1378-3
51. Kuo CC, Wang CC, Chang W L, et al. Clinical Effects of Baduanjin Qigong Exercise on Cancer Patients: A Systematic Review and Meta-Analysis on Randomized Controlled Trials. Evidence-based complementary and alternative medicine. eCAM, 2021; 6651238 .doi.org/10.1155/2021/6651238

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Article

The impact of mindfulness therapy and group nursing interventions on the mental health and social functioning of patients after cervical cancer surgery: A study focused on enhancing psychological resilience

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Abstract: Objective: This study aims to evaluate the effects of mindfulness-based therapy and group care intervention on the mental health and social functioning of postoperative cervical cancer patients and to explore the mediating role of psychological resilience in the intervention outcomes. **Methods:** A prospective randomized controlled design was adopted. A total of 221 postoperative cervical cancer patients were randomly assigned to the mindfulness-based therapy group, the group care intervention group, and the combined intervention group. The intervention lasted for 8 weeks, with a follow-up period of 3 months. Mental health and social functioning were assessed using the Hospital Anxiety and Depression Scale (HADS), the Perceived Stress Scale (PSS), the Social Functioning Scale (SDS), and the Connor-Davidson Resilience Scale (CD-RISC). Synergistic effects of the combined intervention and the mediating role of psychological resilience were analyzed using multiple linear regression and structural equation modeling (SEM). **Results:** The combined intervention group showed significantly greater improvements in anxiety, depression, psychological stress, social functioning, and psychological resilience compared to the single-intervention groups. Significant differences were observed between groups both at the end of the intervention and at the conclusion of the follow-up period ($P < 0.05$). Psychological resilience demonstrated a significant mediating effect in the improvements of anxiety and depression achieved through mindfulness and group care interventions ($P < 0.05$). Model fit indices indicated good model performance (CFI = 0.910, RMSEA = 0.058). Multiple linear regression analysis revealed a notable synergistic effect in the combined intervention group, with *R*-squared values indicating good model fit. **Conclusion:** The combined intervention of mindfulness-based therapy and group care significantly improves the mental health and social functioning of postoperative cervical cancer patients. Psychological resilience plays a key mediating role in this process, providing an effective intervention reference for future clinical practice.

Keywords: postoperative cervical cancer; mindfulness-based therapy; group care; psychological resilience

1. Introduction

Cervical cancer is one of the most common malignant tumors among women worldwide. Despite significant advancements in modern medicine, particularly in surgical techniques and radiotherapy/chemotherapy, postoperative patients often face severe psychological health issues, such as anxiety, depression, and social dysfunction [1,2]. These psychological problems significantly affect the patient's

quality of life and postoperative recovery [3]. Currently, psychological interventions in postoperative cervical cancer patients have garnered considerable attention. Mindfulness therapy and group nursing interventions have gradually become important approaches for improving patients' psychological states. However, there is a lack of systematic evaluation regarding the combined effects of these interventions and their impact on psychological resilience.

At present, although single psychological intervention methods are effective in the short term, they still have limitations in addressing complex postoperative psychological distress. In particular, there is a lack of systematic enhancement of psychological resilience, which makes it difficult for many patients to achieve long-term psychological recovery and the reconstruction of social functions [3,4]. Therefore, it is necessary to explore a more comprehensive intervention strategy that not only focuses on short-term emotional improvement but also emphasizes promoting long-term recovery through enhancing psychological resilience [5]. Moreover, the potential mediating role of psychological resilience in the recovery of mental health has not been thoroughly verified, which is the key focus of this study.

However, at present, there is still a lack of systematic research to clarify the comprehensive effect and mechanism of action of the integrated intervention of "mindfulness and group nursing" in populations after cervical cancer surgery. Some of the latest systematic reviews and practice guidelines (such as the "Chinese Guidelines for Oncology Psychotherapy" and relevant clinical expert consensus) [6] all emphasize that psychological intervention for cancer patients needs not only to alleviate acute emotional problems such as anxiety and depression but also to focus on the long-term reconstruction of social function and the enhancement of internal psychological resilience. However, these guidelines also point out that there is currently a lack of high-quality randomized controlled trials to verify the synergistic enhancement effect of multiple psychological interventions "in combination" on patients' psychological and social functions, as well as the key role mechanism of psychological resilience in this process. Although recent literature has discussed the positive impact of mindfulness or group intervention on anxiety and depression in postoperative patients, there is still insufficient evidence regarding the integration of the two interventions and their effect on psychological resilience. In view of this, the present study aims to respond to the evidence gap of "integrated, multidimensional psychological intervention" proposed by the guidelines and focuses on psychological resilience as a potential mediating variable, striving to achieve a breakthrough based on previous work. Unlike previous studies that only focused on a single intervention or short-term effects, this study combines mindfulness therapy with group nursing intervention and uses multiple linear regression and structural equation modeling (SEM) to deeply explore the interconnections among the intervention, psychological resilience, mental health, and social functioning in order to provide more systematic and long-lasting intervention strategies for clinical practice.

This study aims to evaluate the effects of combining mindfulness therapy and group nursing interventions on the psychological health and social functioning of postoperative cervical cancer patients. By using multiple linear regression and structural equation modeling, the study explores the mediating role of psychological resilience in the intervention outcomes. The results indicate that the combined

intervention significantly improved the patients' psychological health, enhanced social functioning, and played an important synergistic role through boosting psychological resilience. This provides a new perspective and clinical basis for the development of more effective psychological intervention strategies in the future.

2. Materials and methods

2.1. Study design

This study is a prospective randomized controlled trial conducted from July 2022 to July 2023, aiming to evaluate the effects of mindfulness therapy and group nursing interventions on the psychological health and social functioning of postoperative cervical cancer patients. The sample size was 221 participants, who were randomly assigned to the mindfulness therapy group (N = 73), the group nursing intervention group (N = 74), and the combined intervention group (N = 74). The sample size determination was based on the effect size found in similar previous studies and was calculated using G*Power software to ensure 80% statistical power (power = 0.80), while also accounting for a 10% potential dropout rate. Group allocation was performed using a computer-generated random number table, and the allocation process was managed by a research assistant, maintaining blinding for both the researchers and participants. The randomization results were recorded in an encrypted electronic data capture (EDC) system for verification, thus reducing study bias.

2.2. Study participants

Inclusion criteria: 1) postoperative cervical cancer patients aged between 18 and 65 years; 2) 3 to 12 months after undergoing radical hysterectomy; 3) Karnofsky Performance Status (KPS) score ≥ 70, capable of engaging in daily living activities; 4) voluntary participation in the study and signing of informed consent.

Exclusion criteria: 1) Patients with other malignant tumors or severe psychiatric disorders (e.g., schizophrenia, bipolar disorder); 2) patients with uncooperative language barriers or cognitive impairments; 3) patients currently undergoing other psychological interventions, or those who were unable to complete the required interventions for personal reasons.

2.3. Intervention measures

In recent years, Huai'an City has gradually introduced diversified psychological intervention models into the postoperative management of cervical cancer, with mindfulness therapy and group care having been preliminarily applied and confirmed feasible in local pilot programs. Our hospital has a dedicated psychological health management department that collaborates with clinical nursing teams to provide routine follow-up and psychological support; at the socio-cultural level, patients are also relatively accepting of the group mutual assistance format, thus laying a solid foundation for implementing the interventions. Meanwhile, our hospital has established platforms such as the "Oncology Rehabilitation Club", and prior pilot research has accumulated a certain amount of training and implementation

experience in mindfulness techniques, along with a mature group care process. Based on the relevant guidelines issued in recent years by domestic psychology and nursing societies, this study makes comprehensive use of mindfulness therapy and group care, aiming to further optimize the intervention procedures and evaluate their effects on postoperative cervical cancer patients.

2.3.1. Mindfulness therapy intervention

In this study, a standardized Mindfulness-Based Stress Reduction (MBSR) intervention manual [7], which has been translated and culturally adapted, was used to suit the understanding abilities of local patients. The intervention process involved weekly 90-minute mindfulness sessions for 8 weeks, including mindfulness meditation, body scanning, mindful breathing, and mindful walking. Each session was conducted by a professional with a master's degree in psychology and certification in mindfulness therapy. At the beginning of each session, a 10-minute guided discussion was provided to clarify the goals and significance of the exercises. Additionally, patients were required to practice mindfulness techniques learned during the intervention daily for 20 min. They used a provided diary to record their practice time and experiences. Research assistants reviewed the patients' practice logs weekly to ensure adherence to the intervention and maintain standardization.

2.3.2. Group nursing intervention

This study adopted a standardized group nursing intervention manual based on group dynamics theory. The intervention covered modules such as psychological education, social support, and coping skills training. The intervention process involved weekly 120-minute group nursing sessions for 8 weeks. The specific content included informational support (providing information on the disease, treatment, and rehabilitation), experience sharing (patients exchanging postoperative recovery experiences), psychological education (teaching methods to cope with anxiety and depression), and interpersonal skills practice (improving communication and social skills). The intervention was conducted by nursing staff and psychological experts who had received relevant training in nursing and psychology, ensuring that patients received emotional support and practical coping strategies. Each group consisted of 8–10 patients to ensure that each participant had sufficient opportunities to share and provide feedback. After each session, the facilitators recorded group dynamics, addressed individual issues and negative emotions in a timely manner, and ensured the effectiveness and safety of the intervention.

2.3.3. Combined intervention group

Intervention content: The combined mindfulness therapy and group nursing intervention involved patients participating in 1 session of mindfulness therapy (90 min) and 1 session of group nursing intervention (120 min) per week for 8 weeks. The intervention content and process strictly followed the specific procedures outlined for mindfulness therapy and group nursing intervention, ensuring standardization and comparability of the interventions.

2.4. Study indicators and assessment tools

2.4.1. Psychological health assessment

1) Anxiety and depression levels: The Hospital Anxiety and Depression Scale (HADS) [8] was used. Each assessment was conducted face-to-face by trained research assistants. The scale includes two dimensions: Anxiety (HADS-A) and depression (HADS-D), with 7 items in each dimension. The score range is 0–21, with higher scores indicating more severe symptoms.
2) Psychological stress level: The Perceived Stress Scale (PSS) [9] was used, consisting of 10 items. The score range is 0–40, with higher scores indicating greater perceived stress. Each patient received standardized training on filling out the scale prior to assessment to ensure the accuracy of the results.

2.4.2. Social functioning assessment

1) Social functioning level: The Social Dysfunction Scale (SDS) [10] was used, which includes three dimensions: family, social, and occupational functioning, with a total of 20 items. The score range is 0–60, with higher scores indicating more severe social dysfunction.
2) Self-efficacy: The General Self-Efficacy Scale (GSES) [11] was used, consisting of 10 items. The score range is 10–40, with higher scores indicating stronger self-efficacy.

2.4.3. Psychological resilience assessment

The Connor-Davidson Resilience Scale (CD-RISC) [12] was used, consisting of 25 items. The score range is 0–100, with higher scores indicating greater psychological resilience. Research assistants were responsible for conducting face-to-face assessments at baseline, at the end of the intervention, and during follow-up to ensure that patients understood each question and could answer accurately.

2.5. Data collection

Data collection was conducted at three time points: baseline (before intervention), at the end of the intervention (8 weeks later), and at the end of follow-up (3 months later). Each assessment was conducted face-to-face by research assistants who had received standardized training to ensure consistency in data collection. All scales were completed independently by the patients under the guidance of the research assistants to ensure the validity and reliability of the data. Data recording and management were carried out using an encrypted electronic data capture (EDC) system, with regular backups to ensure the security and accuracy of the data.

2.6. Statistical analysis

All data were analyzed using SPSS 25.0. Continuous variables were described as mean ± standard deviation (mean ± SD), and categorical variables were described using frequency and percentage. One-way analysis of variance (ANOVA) was used to compare the changes in psychological health, social functioning, and psychological resilience scores between different groups before and after the intervention. The significance level was set at $\alpha = 0.05$. For results with significant

differences, post hoc pairwise comparisons were conducted using the Bonferroni correction to ensure the validity of the results from multiple comparisons. Multiple linear regression analysis was used to evaluate the combined effects of mindfulness therapy and group nursing interventions on psychological health and social functioning, adjusting for potential confounding variables such as age, disease duration, and KPS score. Structural equation modeling (SEM) was used to analyze the mediating role of psychological resilience in the relationship between the interventions and improvements in psychological health and social functioning. Parameters were estimated using partial least squares (PLS), and the mediating effect of psychological resilience was tested.

2.7. Ethical considerations

This study was approved by the Ethics Committee of The Affiliated Huai'an Hospital of Xuzhou Medical University and The Second People's Hospital of Huai'an (Ethical approval number: CZ-20220108). All participants signed informed consent forms before the study began.

2.8. Quality control

To ensure the standardization and consistency of the interventions, all mindfulness therapy and group nursing interventions were conducted by psychologists or nursing staff with at least five years of experience and specialized training. During the intervention process, the research team held weekly meetings to review the intervention logs, discuss challenges, and develop solutions. For data quality control, data entry was double-checked by two independent research assistants to ensure accuracy. The collection and management of research data were regularly reviewed by the project leader, and monthly assessments of data consistency were conducted. Additionally, operational issues in the study were addressed through regular quality control meetings to ensure the reproducibility of the experimental design and the scientific integrity of the data.

3. Results

3.1. Baseline characteristics

A total of 12 patients withdrew from the study during the intervention or follow-up phases (dropout rate of approximately 5.4%), including 4 from the mindfulness therapy group, 6 from the group care intervention group, and 2 from the combined intervention group. The specific reasons were: Personal reasons (n = 5), physical condition not permitting (n = 4), and others (n = 3). Since the actual dropout rate was lower than the estimated 10%, its impact on the study's statistical power was limited. Finally, the sample size included in the analysis was 209 cases (69 in the mindfulness therapy group, 68 in the group care intervention group, and 72 in the combined intervention group).

Baseline demographic and clinical characteristics, as well as psychological health, social functioning, and psychological resilience scores, were compared across the three groups to ensure balance between groups. Marital status and education

level were analyzed using the Chi-square test, with no significant differences found ($P > 0.05$). Age, KPS score, and postoperative duration were analyzed using one-way ANOVA, and the results indicated no statistically significant differences among the groups ($P > 0.05$). Additionally, baseline scores for anxiety, depression, psychological stress, self-efficacy, and psychological resilience did not show significant differences across the three groups ($P > 0.05$). These results suggest that the baseline characteristics of the three groups were well balanced, ensuring the comparability of the subsequent intervention effects. (**Tables 1** and **2**).

Table 1. Comparison of baseline demographic and clinical characteristics.

Characteristic	Mindfulness Therapy Group	Group Nursing Intervention Group	Combined Intervention Group	Statistical Value	*P* Value
Age (years)	52.67 ± 7.48	53.21 ± 6.95	51.84 ± 8.03	$F = 0.567$	0.568
KPS Score	82.34 ± 4.95	81.75 ± 5.12	83.12 ± 4.80	$F = 1.239$	0.293
Postoperative Duration (Months)	6.45 ± 1.02	6.68 ± 0.95	6.53 ± 1.11	$F = 0.731$	0.484
Marital Status (Married/Single/Divorced)	52/10/11 (71.2%/13.7%/15.1%)	53/13/8 (71.6%/17.6%/10.8%)	51/12/11 (68.9%/16.2%/14.9%)	$\chi^2 = 1.249$	0.871
Education Level (Elementary/Junior High/High School and Above)	15/35/23 (20.5%/47.9%/31.6%)	17/30/27 (23.0%/40.5%/36.5%)	14/33/27 (18.9%/44.6%/36.5%)	$\chi^2 = 0.875$	0.928

Table 2. Comparison of baseline psychological health, social functioning, and psychological resilience scores across groups.

Indicator	Mindfulness Therapy Group	Group Nursing Intervention Group	Combined Intervention Group	*F* Value	*P* Value
Anxiety Level (HADS-A)	9.75 ± 1.43	9.62 ± 1.51	9.91 ± 1.48	0.425	0.655
Depression Level (HADS-D)	8.34 ± 1.25	8.21 ± 1.38	8.45 ± 1.32	0.319	0.728
Psychological Stress (PSS)	22.14 ± 3.05	21.87 ± 3.08	22.31 ± 3.11	0.345	0.709
Social Functioning (SDS)	38.92 ± 4.73	39.11 ± 4.69	39.05 ± 4.65	0.111	0.895
Self-Efficacy (GSES)	26.55 ± 3.42	26.71 ± 3.50	26.63 ± 3.48	0.081	0.922
Psychological Resilience (CD-RISC)	65.12 ± 6.91	65.87 ± 6.75	65.64 ± 6.84	0.267	0.766

3.2. Intervention effect analysis

All three groups showed improvement in anxiety, depression, psychological stress, social functioning, self-efficacy, and psychological resilience scores at both the end of the intervention and at follow-up. The differences in anxiety and depression levels approached significance at the end of the intervention ($P = 0.065$) and showed significant differences at the follow-up ($P < 0.05$), with the combined intervention group showing the most significant improvement (**Table 3**). Psychological stress levels significantly decreased at both the end of the intervention and the follow-up, with significant differences between the groups ($P < 0.05$), and the combined intervention group performing the best (**Table 4**). Social functioning significantly improved after the intervention, with significant differences between the groups at both the end of the intervention and at the follow-up ($P < 0.05$), with the combined intervention group showing the most noticeable improvement (**Table 5**). Self-efficacy and psychological resilience showed significant improvement after

the intervention, with the combined intervention group showing the most significant effect during the follow-up (**Tables 6** and **7**). Psychological resilience played a significant mediating role in the improvement of psychological health. Both mindfulness therapy and group nursing interventions significantly improved psychological resilience, thereby further reducing anxiety and depression levels. The path coefficient was significant ($P < 0.05$), and the model fit indices (CFI = 0.910, RMSEA = 0.058) indicated a good fit (**Figure 1**).

Table 3. Group comparisons of HADS scores after intervention.

Time Point	Indicator	Mindfulness Therapy Group	Group Nursing Intervention Group	Combined Intervention Group	*F* Value	*P* Value
End of Intervention (8 Weeks)	Anxiety Level (HADS-A)	7.89 ± 1.25	8.05 ± 1.38	7.55 ± 1.22	2.785	0.065
	Depression Level (HADS-D)	6.91 ± 1.18	7.08 ± 1.27	6.65 ± 1.15	2.113	0.124
End of Follow-up (3 Months)	Anxiety Level (HADS-A)	6.42 ± 1.03	7.05 ± 1.12	6.18 ± 1.05	4.125	0.018
	Depression Level (HADS-D)	5.92 ± 1.08	6.35 ± 1.10	5.72 ± 1.06	3.067	0.049

Table 4. Changes in PSS scores before and after intervention across groups.

Time Point	Mindfulness Therapy Group	Group Nursing Intervention Group	Combined Intervention Group	*F* Value	*P* Value	Effect Size (η^2)
End of Intervention (8 Weeks)	18.50 ± 2.50	18.75 ± 2.65	17.80 ± 2.58	$F = 4.233$	0.015	0.065
End of Follow-up (3 Months)	16.80 ± 2.38	17.25 ± 2.45	15.95 ± 2.40	$F = 5.487$	0.006	0.08

Table 5. Group comparisons of social functioning (SDS) scores before and after intervention.

Time Point	Indicator	Mindfulness Therapy Group	Group Nursing Intervention Group	Combined Intervention Group	*F* Value	*P* Value	Effect Size (η^2)
End of Intervention (8 Weeks)	Social Functioning (SDS)	33.78 ± 3.45	34.12 ± 3.55	32.85 ± 3.25	3.987	0.021	0.058
End of Follow-up (3 Months)	Social Functioning (SDS)	29.75 ± 3.20	30.10 ± 3.35	28.95 ± 3.05	4.654	0.012	0.072

Table 6. Changes in self-efficacy (GSES) scores before and after intervention.

Time Point	Indicator	Mindfulness Therapy Group	Group Nursing Intervention Group	Combined Intervention Group	*F* Value	*P* Value	Effect Size (η^2)
End of Intervention (8 Weeks)	Self-Efficacy (GSES)	28.87 ± 2.97	29.13 ± 3.11	30.28 ± 3.04	3.873	0.024	0.059
End of Follow-up (3 Months)	Self-Efficacy (GSES)	30.46 ± 2.88	31.07 ± 2.93	32.03 ± 2.78	4.759	0.011	0.071

Table 7. Group comparisons of psychological resilience (CD-RISC) score changes before and after intervention.

Time Point	Indicator	Mindfulness Therapy Group	Group Nursing Intervention Group	Combined Intervention Group	*F* Value	*P* Value	Effect Size (η^2)
End of Intervention (8 Weeks)	Psychological Resilience (CD-RISC)	71.15 ± 5.81	72.34 ± 5.90	74.45 ± 5.76	4.215	0.018	0.063
End of Follow-up (3 Months)	Psychological Resilience (CD-RISC)	73.78 ± 5.32	74.61 ± 5.45	77.02 ± 5.23	5.434	0.007	0.076

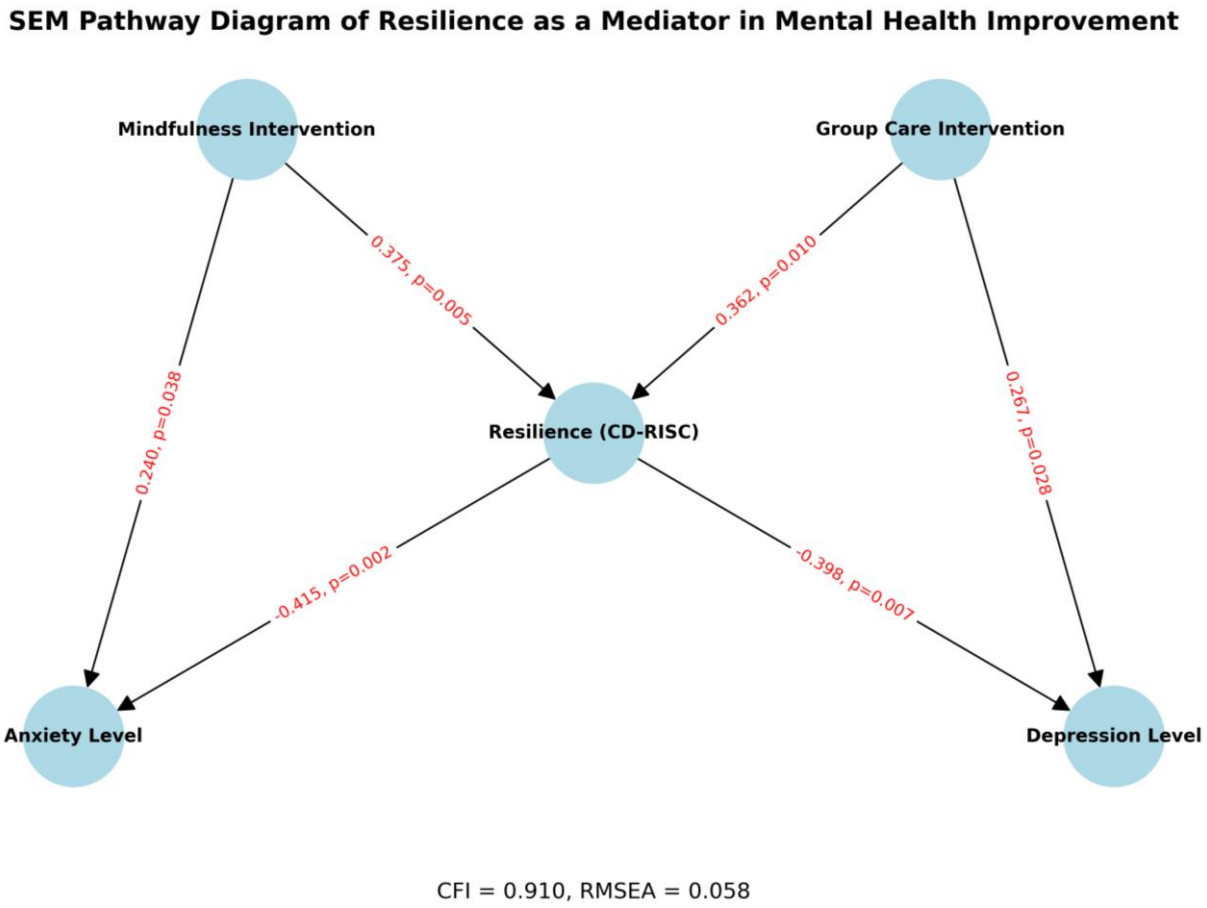


Figure 1. Mediating effect path diagram of psychological resilience in the improvement of psychological health.

3.3. Synergistic effect of combined intervention

The combined intervention group showed significant advantages in the improvement of anxiety, depression, psychological stress, and social functioning. Compared to the single intervention groups, the synergy coefficients were larger and statistically significant ($P < 0.05$). The R-squared values of the multiple linear regression were also higher, indicating better model fit (**Table 8**). These results suggest that the synergistic effect of the combined intervention in psychological health recovery is significant.

Table 8. Synergistic effect of mindfulness therapy and group nursing intervention on psychological health and social functioning.

Dimension	Intervention Group	β Value	Standard Error (SE)	95% Confidence Interval	P Value	R^2 Value
Improvement in Anxiety (HADS-A)	Mindfulness Therapy Group	−0.40	0.09	(−0.58, −0.22)	0.003	0.42
	Group Nursing Intervention Group	−0.35	0.08	(−0.52, −0.18)	0.007	0.39
	Combined Intervention Group	−0.55	0.10	(−0.75, −0.35)	0.001	0.50
Improvement in Depression (HADS-D)	Mindfulness Therapy Group	−0.39	0.10	(−0.57, −0.21)	0.005	0.40
	Group Nursing Intervention Group	−0.33	0.09	(−0.51, −0.15)	0.01	0.37
	Combined Intervention Group	−0.52	0.11	(−0.72, −0.32)	0.002	0.48

Table 8. (*Continued*).

Dimension	Intervention Group	β Value	Standard Error (SE)	95% Confidence Interval	P Value	R^2 Value
Improvement in Psychological Stress (PSS)	Mindfulness Therapy Group	−0.36	0.08	(−0.52, −0.20)	0.006	0.38
	Group Nursing Intervention Group	−0.31	0.07	(−0.46, −0.16)	0.012	0.36
	Combined Intervention Group	−0.47	0.09	(−0.64, −0.30)	0.001	0.44
Improvement in Social Functioning (SDS)	Mindfulness Therapy Group	−0.27	0.07	(−0.41, −0.13)	0.014	0.35
	Group Nursing Intervention Group	−0.24	0.06	(−0.36, −0.12)	0.018	0.33
	Combined Intervention Group	−0.42	0.08	(−0.58, −0.26)	0.004	0.43

4. Discussion

Both mindfulness therapy and group nursing intervention showed certain unique effects in alleviating anxiety and depression in post-operative cervical cancer patients. However, the results partly indicated that the improvement in the combined intervention group was significantly better than in the single intervention groups, particularly at the end of the follow-up period, where the combined intervention showed the most pronounced effect. This result emphasizes the importance of the synergistic effect of combining different psychological intervention methods in the psychological recovery of cancer patients [13]. The core mechanism of mindfulness therapy is to reduce catastrophic thinking, allowing patients to focus on the present and reduce reactions to uncertainty and negative emotions about the future [14]. On the other hand, group nursing builds a supportive network, enabling patients to gain understanding and resonance from peer support, reducing feelings of isolation, thereby alleviating anxiety and depression [15]. The combined application of these two interventions activates a comprehensive multi-dimensional mechanism for alleviating psychological burden. After the intervention, the significant improvements in anxiety and depression levels in the combined intervention group persisted, indicating that the combination of mindfulness and group nursing is effective not only in the short term but also maintains its therapeutic effect in the long term. This phenomenon highlights the importance of the long-term stability of psychological interventions for patient recovery. Chronic anxiety and depression can severely affect patients' quality of life and willingness to recover, while effective long-term interventions can enhance patients' coping abilities with life challenges [16]. The continued advantage of the combined intervention group during the follow-up phase suggests that this integrated intervention approach has the potential to become a standardized rehabilitation support tool, better addressing the psychological rehabilitation needs of post-operative cervical cancer patients.

Psychological resilience played a crucial mediating role in this study, linking the interventions with improvements in mental health. The results showed that through mindfulness therapy and group nursing intervention, patients' psychological resilience was significantly enhanced, and this enhancement became a key bridge for the improvement of anxiety and depression levels. Psychological resilience is essentially an adaptive resource that enables patients to mobilize their internal coping abilities when facing uncertainty and post-operative life challenges, thereby reducing excessive reactions to negative events [17]. Mindfulness therapy helps

patients increase awareness and reduce sustained attention to painful emotions; group nursing, on the other hand, provides interpersonal support, allowing patients to gain more emotional resources. It is this dual intervention mechanism that jointly promoted the improvement in psychological resilience. The significant coefficients and good model fit indicators in the path analysis further support the mediating role of psychological resilience in the intervention effects. This finding suggests that by enhancing psychological resilience, the impact of the intervention on patients is not a direct one-dimensional effect but rather an indirect effect through the enhancement of psychological flexibility, thereby amplifying the overall influence of the intervention [18]. In clinical intervention practice, improving psychological resilience is not only one of the intervention goals but also a core mechanism that ensures the maintenance and amplification of intervention effects. The significance of this mediating effect indicates that, for future psychological interventions in post-operative cervical cancer patients, emphasis should be placed on adopting methods that enhance resilience to help patients better adapt to the psychological pressures and challenges in treatment and recovery.

The significant advantages of combined interventions in improving social function and self-efficacy in postoperative cervical cancer patients show the unique value of such integrated interventions. The improvement in social function is reflected in the patients' ability to better assume family, social, and professional roles, which is not only an important part of recovery but also the foundation for patients' re-entry into society and the restoration of normal life [19]. Mindfulness therapy plays an important role in enhancing patients' self-awareness and psychological resilience, helping them to more rationally face the challenges of recovery, while group nursing helps patients gain emotional resources through the establishment of a social support network, reducing psychological burdens caused by isolation [20]. Through the combination of both, patients are able to effectively improve their social function and also become more confident and stable in meeting the demands of their social roles. The enhancement of self-efficacy is another significant result of the combined intervention model. Self-efficacy directly influences how patients cope with life challenges and their confidence in doing so. Mindfulness therapy helps patients develop acceptance of their emotions and coping skills, making them more proactive in the psychological and physical recovery process [21]. Group nursing, through feedback from others and emotional exchanges, helps patients strengthen their belief in their ability to cope with difficulties. The combined intervention group in this study showed the best results in enhancing self-efficacy, which indicates that combined interventions can effectively enhance patients' intrinsic motivation and confidence for recovery, laying a solid foundation for long-term rehabilitation. The advantage of the combined intervention model lies not only in its short-term psychological support but also in its ability to stimulate the patients' long-term recovery potential [22]. By significantly improving social function and self-efficacy, the combined intervention group patients are more likely to maintain a positive and proactive attitude during the recovery phase, which not only helps alleviate symptoms but also contributes to improving overall quality of life, facilitating a smoother return to normal life.

The results of the multiple linear regression analysis clearly reveal the significant synergistic effect of the combined mindfulness therapy and group nursing intervention in improving patients' psychological health and social function. The combined intervention not only effectively improves psychological issues such as anxiety and depression in the short term but also demonstrates lasting advantages in long-term follow-up. The relatively high *R*-squared value further indicates a good model fit, which means that the benefits brought by the intervention have strong explanatory power and reliability. The effectiveness of the combined intervention lies not only in the individual advantages of each intervention strategy but also in their complementarity and reinforcement. Mindfulness therapy provides patients with effective emotional regulation strategies, helping them focus on the present moment, while group nursing offers more psychological resources through group support and shared experiences [23]. The clinical significance of this integrated intervention model is that it provides psychological support strategies for postoperative cervical cancer patients that go beyond traditional treatment options. The combined intervention helps patients more proactively and positively cope with various challenges after surgery, thereby improving overall quality of life while enhancing psychological health and social function. The combined intervention model can serve as a beneficial complement to standardized clinical rehabilitation treatments, particularly in providing additional emotional support and coping strategies during the postoperative rehabilitation phase, helping patients better adapt to life changes and the recovery process.

This study primarily compares the effects of mindfulness therapy, group care intervention, and their combined approach on the psychological health and social functioning of postoperative cervical cancer patients. Due to constraints imposed by our hospital's routine follow-up and care model as well as ethics review requirements, no "pure control group" was established. In our clinical practice, postoperative cervical cancer patients generally receive basic psychological and social support, making it difficult and inappropriate to place patients in a state of "completely non-intervention". Furthermore, previous literature has confirmed that similar interventions (mindfulness or group support) yield significant benefits compared to "no intervention", so this study focuses more on comparing the relative effects of different interventions rather than verifying "whether to intervene". This design may limit our ability to evaluate the absolute efficacy of the intervention, but it is more feasible under current ethical and practical conditions. Meanwhile, the actual dropout rate in this study was only 5.4%, which is lower than our previously estimated 10%, thus exerting a limited impact on overall statistical power; therefore, the study findings maintain relatively robust validity. In the future, if multicenter or larger-scale studies can incorporate standardized "routine care" or other suitable control methods and further consider the specific needs of different age groups as well as applicability in various cultural and medical settings, it may further enhance the generalizability of the research results and strengthen causal inference.

5. Conclusion

This study, by integrating mindfulness therapy and group nursing interventions, has validated the significant role of combined interventions in improving psychological health and social function in postoperative cervical cancer patients. The results emphasize the key role of psychological resilience as a mediator and demonstrate the positive effects of combined interventions on self-efficacy and social function. These findings suggest that combining mindfulness therapy with group nursing can maximize the effects of psychological interventions, providing a more systematic model of psychological support during the cancer recovery phase, with clear potential for clinical application, especially in enhancing patients' quality of life and long-term psychological recovery.

Author contributions: Conducted and designed the research, XZ and ML; carried out experiments, XZ and ML; analyzed findings, XZ and ML; edited and refined the manuscript with a focus on critical intellectual contributions, XZ and ML; participated in collecting, XW; assessing, XW; interpreting the data; XW; made significant contributions to data interpretation and manuscript preparation, XW; provided substantial intellectual input during the drafting and revision of the manuscript, RMX and YX. All authors have read and agreed to the published version of the manuscript.

Consent to publish: The manuscript has not been published before, and it is not being reviewed by any other journal. The authors have all approved the content of the paper.

Data availability statement: To acquire the data that underpins the results of this study, please contact the corresponding author, [YX].

Ethical approval: The study was conducted in accordance with the Declaration of Helsinki. The study received approval from the Ethics Committee of The Affiliated Huai'an Hospital of Xuzhou Medical University (protocol code No. CZ--2022010 and date of approval 8 January 2022) and The Second People's Hospital of Huai'an (protocol code No. CZ--2022010 and date of approval 8 January 2022).

Informed consent statement: Informed consent was obtained from all subjects involved in the study.

Conflict of interest: The authors declare no conflict of interest.

References

1. Cillessen L, Johannsen M, Speckens A, Zachariae R. Mindfulness-based interventions for psychological and physical health outcomes in cancer patients and survivors: A systematic review and meta-analysis of randomized controlled trials. Psycho-Oncology. 2019; 28: 2257–2269.
2. Zhang Z, Abdullah M, Shari N, Lu P. Acceptance and commitment therapy versus mindfulness-based stress reduction for newly diagnosed head and neck cancer patients: A randomized controlled trial assessing efficacy for positive psychology, depression, anxiety, and quality of life. PLoS One. 2022; 17.
3. Xunlin NG, Lau Y, Klainin-Yobas P. The effectiveness of mindfulness-based interventions among cancer patients and survivors: A systematic review and meta-analysis. Supportive Care in Cancer. 2019; 28: 1563–1578.

4. Chayadi E, Baes N, Kiropoulos L. The effects of mindfulness-based interventions on symptoms of depression, anxiety, and cancer-related fatigue in oncology patients: A systematic review and meta-analysis. PLoS One. 2022; 17.
5. Pedro J, Monteiro-Reis S, Carvalho-Maia C, et al. Evidence of psychological and biological effects of structured Mindfulness-Based Interventions for cancer patients and survivors: A meta-review. Psycho-Oncology. 2021; 30: 1836–1848.
6. Tang L. Interpretation of the "Chinese Guidelines for Oncology Psychotherapy" (Chinese). Medicine and Philosophy (B). 2016; 11: 21–23.
7. Kabat-Zinn J. Mindfulness-based interventions in context: Past, present, and future. Clinical Psychology: Science and Practice. 2003; 10(2): 144–156.
8. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiatrica Scandinavica. 1983; 67(6): 361–370.
9. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. Journal of Health and Social Behavior. 1983; 24(4): 385–396.
10. Wing JK, Leff JP. The social functioning scale. International Journal of Social Psychiatry. 1978; 24(1): 11–22.
11. Schwarzer R, Jerusalem M. Generalized self-efficacy scale. NFER-Nelson; 1995. pp. 35–37
12. Connor KM, Davidson JRT. Development of a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC). Depression and Anxiety. 2003; 18(2): 76–82.
13. Yang X, Huang L, Li C, et al. The effectiveness of mindfulness-based stress reduction intervention on alleviating anxiety and depression in postoperative patients with cervical cancer. Medicine. 2022; 101.
14. Park S, Sato Y, Takita Y, et al. Mindfulness-based Cognitive Therapy for Psychological Distress, Fear of Cancer Recurrence, Fatigue, Spiritual Wellbeing and Quality of Life in Patients with Breast Cancer—a Randomized Control Trial. Journal of pain and symptom management. 2020.
15. Van Der Gucht K, Ahmadoun S, Melis M, et al. Effects of a mindfulness-based intervention on cancer-related cognitive impairment: Results of a randomized controlled functional magnetic resonance imaging pilot study. Cancer. 2020.
16. Liu M, Guo J, Sun H, Liu G. The effect of psychological nursing on the short- and long-term negative emotions and quality of life of cervical cancer patients undergoing postoperative chemotherapy. American Journal of Translational Research. 2021; 13(7): 7952–7959.
17. Zang J, Li T, Zhang M, et al. Effect of mindfulness-based stress reduction on anxiety and depression in postoperative cervical cancer patients. Psychologies. 2021; (6): 68. doi: 10.19738/j.cnki.psy.2021.06.032
18. Gu Z, Yang C, Zhang K, Wu H. Clinical Prediction Models of Severe Cancer-Related Fatigue in Cervical Cancer Patients and Effectiveness of Mindfulness-Based Stress Reduction: A Randomized Controlled Trial. Authorea; 2022.
19. Wang X, Wang S, Yang D, et al. Associations among resilience, hope, social support, stress, and anxiety severity in Chinese women with abnormal cervical cancer screening results. Heliyon. 2022; 8(12): e12539–e12539.
20. Wang C, Wang Y, Wu F, et al. Fear of Progression and Resilience as Mediators of the Association between Family Function and Quality of Life among Patients with Cervical Cancer. European Journal of Cancer Care. 2024; 1–12.
21. Carney L, Park C, Hingorany P. The mechanisms of mindfulness-based stress reduction and mindfulness-based cognitive therapy for cancer patients and survivors: A systematic review. Psychology of Consciousness: Theory, Research, and Practice. 2023.
22. Tan S, Chee C, Ngai C, et al. Mindfulness-based supportive therapy on reducing suffering in patients with advanced cancer: Randomised controlled trial. BMJ Supportive & Palliative Care. 2022.
23. Rieger K, Lobchuk M, Duff M, et al. Mindfulness-based arts interventions for cancer care: A systematic review of the effects on wellbeing and fatigue. Psycho-Oncology. 2020; 30.

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Article

Exploring the bidirectional relationships and mediating pathways between burnout and depression, anxiety, and sleep among cancer nursing staff: A multicenter study in China

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Abstract: Backgrounds: Burnout is related to nursing turnover, especially among cancer nursing staff. Evidence shows that depression, anxiety, and sleep are all associated with burnout. However, no studies have explored the potential bidirectional and mediating effects among them. **Methods:** A total of 1023 cancer nursing staff from 20 hospitals from January 2021 to January 2023 in the economically developed, central, and western regions of China were selected for this study. The Self-Rating Depression Scale, Self-Rating Anxiety Scale, Pittsburgh Sleep Quality Index, and Maslach Burnout Inventory General Survey were used to assess their depression, anxiety, sleep, and burnout. An online questionnaire was used for the assessment. Cross-lagged panel modeling (CLPM) was applied to reveal the associations between depression, anxiety, sleep, and burnout after adjusting for demographic variables. **Results:** Age group differences in PSQI, SDS, SAS, and burnout at baseline were statistically significant, and the older the age, the higher the score ($p < 0.001$). The difference in SDS between gender groups was statistically significant (54.969.65 vs. 53.629.14, $p = 0.030$). The difference in PSQI between marital status groups was statistically significant, with the divorce group scoring the highest ($P = 0.049$). Models for this analysis showed significant net predictive effects of baseline depression, anxiety, and sleep on follow-up burnout, and a significant net predictive effect of baseline burnout on follow-up sleep. The mediating effects of depression (indirect effect: 0.011, 95% CI: 0.007, 0.016) and anxiety (indirect effect: 0.012, 95% CI: 0.007, 0.017) held true when sleep was the independent variable and burnout was the dependent variable. **Conclusions:** Both the bidirectional cross-causal effects and potential mediating effects can contribute to the understanding of the factors influencing burnout among cancer nursing staff. Early intervention targeting relevant factors may be beneficial in alleviating burnout among cancer nursing staff.

Keywords: burnout; depression; anxiety; sleep; cross-lagged panel modeling

1. Introduction

Cancer, as a disease that seriously threatens human health, has a complex and lengthy treatment and nursing process. Presently, the global incidence of cancer is surging, attributable to a confluence of factors including population aging, the proliferation of unhealthy lifestyles, and environmental determinants. Compelling statistics indicate that, on average, over 10,000 individuals are diagnosed with cancer daily, translating to 7.5 diagnoses per minute [1]. Amidst this scenario, nursing staff assume a pivotal role in the care continuum of cancer patients. Dowling et al. revealed that due to the intricate nature of cancer symptoms and the heightened work pressure, cancer nursing staff are more predisposed to burnout compared to their counterparts in other departments [2]. This is where the concept of “burnout”

becomes relevant. The term “burnout” was first coined by Freudenberger [3]. Subsequently, Maslach and Jackson [4] introduced it into the occupational context, coining the term more formally in this sphere and categorizing it into three dimensions: Emotional exhaustion (EE), depersonalization (DP), and reduced personal accomplishment (PA). This categorization helps in understanding the multifaceted nature of the stress that cancer nursing staff, among others, may experience due to the nature of their work dealing with a large number of cancer patients. Burnout has long been a nagging concern within the cancer nursing profession. Multiple studies have unearthed a significant correlation between nursing burnout and nurse turnover among cancer care providers [2,5]. In fact, the perennial issue of nurse shortages, often intertwined with exorbitant turnover costs, persists. Moreover, burnout has cast a shadow over the turnover rate and the implementation of certain nursing models, thereby impeding patients’ rehabilitation progress.

Adding to the complexity, cancer nursing staff often grapple with a host of contemporary issues. For instance, the increasing demand for specialized cancer care, driven by the growing cancer patient population, has led to heavier workloads. Additionally, the rapid evolution of cancer treatment modalities requires nurses to constantly update their knowledge and skills, adding to their professional stress. There is also the challenge of coordinating care across multiple healthcare providers and settings, which can be both time-consuming and mentally taxing. These ongoing issues not only exacerbate the existing problem of burnout but also underscore the urgent need for effective interventions. Cancer nursing staff typically operate in a high-pressure environment, rendering depression and anxiety common psychological afflictions among them [6]. A series of studies have corroborated that these mental health issues not only reverberate within their personal and professional relationships but also undermine the quality of care delivery, clinical performance, and patient safety [7,8]. Coupled with this, sleep disturbances are alarmingly prevalent among cancer nurses. Frequent night shifts and elevated work pressure frequently culminate in insufficient sleep duration, compromised sleep quality, and difficulties in falling asleep, particularly among those in the operating room [9]. Lin et al. discovered that over 70% of Chinese nurses, with 82% in Shanghai specifically, suffer from short sleep duration and poor sleep quality [10]. These sleep problems not only imperil the physical well-being of cancer nurses but also exact a toll on their mental health. Previous research has established connections between burnout and depression [11], anxiety [12], and sleep quality [13,14]. Nevertheless, the majority of these studies are cross-sectional, failing to account for the temporal dynamics that could influence the relationships between variables. This methodological limitation hampers the ability to discern causal relationships. Although some studies have affirmed the associations between sleep and depression [15] and anxiety [16], the potential mediating role of psychological states in the relationship between sleep and burnout remains shrouded in uncertainty.

The cross-lagged panel model (CLPM), a longitudinal data analysis approach, is designed to untangle the intricate web of relationships between variables [17]. It can estimate contemporaneous associations between variables as well as the associations between the same variables at different time points, offering a cross-lagged coefficient

β. This coefficient represents the influence of one variable on another after controlling for its own predictive power, hence the term "lagged effect". Compared to traditional regression, CLPM has the advantage of controlling for autoregressive effects. Despite its widespread application in exploring variable relationships, especially potential mediating effects, its use in nursing research is not without limitations.

In light of the above, this study, leveraging the CLPM model, posits the following objectives: 1) To unearth the relationships between sleep, depression, anxiety, and burnout among cancer nursing staff; 2) to determine whether depression mediates the relationship between sleep quality and burnout among cancer nursing staff; and 3) to ascertain whether anxiety mediates the relationship between sleep quality and burnout among cancer nursing staff. By doing so, this research endeavors to fill the lacunae in the existing literature, offering a more nuanced understanding of the complex interplay between these factors. This, in turn, can inform the development of more targeted and effective interventions to mitigate burnout among cancer nursing staff.

2. Methods

2.1. Research design

This study adopted a longitudinal research design. By collecting data at two different time points, this approach can better capture the dynamic relationships among depression, anxiety, sleep, and job burnout as they change over time. It effectively controls the influence of time factors on the relationships between variables. Compared with cross-sectional studies, it is more conducive to determining the causal directions between variables, which is crucial for a deep understanding of the interaction mechanisms among these factors.

2.2. Sample calculate

According to the Kendall sample size calculation, this study consists of 56 items. Generally, the sample size is 5–10 times the number of items [18]. Therefore, the sample size of this study should be at least 560 cases. A total of 1023 cases participated in this study, meeting this requirement.

2.3. Subjects

To achieve a macroscopic description of the population, referring to the three-economic-belt approach adopted by China in the 1980s, we utilized convenience sampling to select 1023 cancer nursing staff from a total of 20 hospitals in economically developed areas such as Beijing and Shanghai, the mid-developed regions of Shanxi and Hebei, and the western region of Gansu, and conducted follow-up observations. The baseline was set in January 2021 (N = 1850), and follow-up was carried out every eight months. Thus, the second follow-up was from September 2021 to April 2022 (N = 1410), and the third was from May 2022 to January 2023 (N = 1023) (**Figure 1**). The inclusion criteria were as follows: 1) Holding a Chinese nursing practice license; 2) working full-time with more than 3 years of working experience; 3) being front-line staff, including nursing assistants, licensed practical nurses, and registered nurses, who expressed interest in the training and intervention were invited

to participate; 4) the time taken to fill out the questionnaire is more than 1 min, and the true information of the respondent can be traced. The exclusion criteria were: 1) Withdrawing from the study midway; 2) being pregnant; 3) refusing to sign the informed consent form.

The paper-based questionnaires were converted into an online format using the networking questionnaire tool, Questionnaire Star Software. This digital transformation allowed researchers to access Questionnaire Star at any time to monitor questionnaire responses, ensuring efficient data collection and management. Rationale for Participant Selection. The ethical approval number of this research:

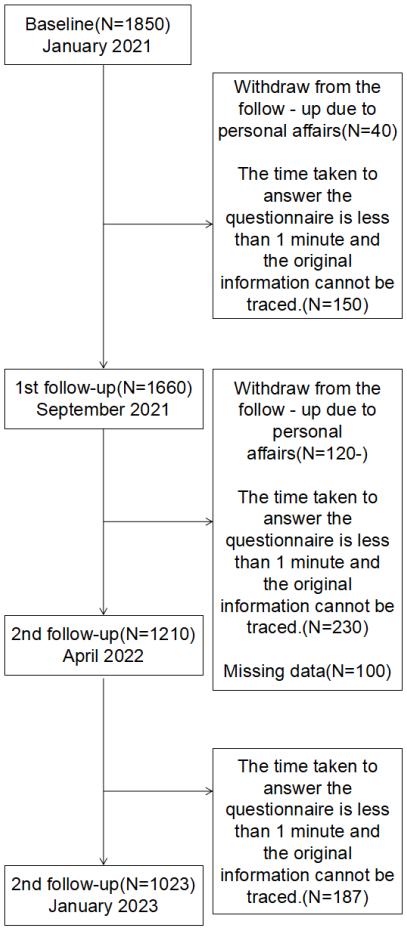


Figure 1. The detailed information of follow-up.

2.4. Measurement

Data collected for this study included demographics (e.g., gender, age, marriage, and length of service), depressive symptoms, sleep, and burnout. Depression, sleep, and burnout were evaluated by the Self-Rating Depression Scale, the 22-item Maslach Burnout Inventory, and the Pittsburgh Sleep Quality Index, respectively.

2.4.1. Self-Rating Depression Scale

We used the Self-Rating Depression Scale (SDS) to evaluate depression symptoms in subjects. This short-term self-rating scale was compiled by Zung in 1965 [19]. It has been widely used for screening and depression measurement across different age groups and demonstrates good reliability and validity even among

normal subjects [20]. The scale consists of 20 items that reflect the subjective feelings of depression. Each item is rated on a four-point scale based on the frequency of symptoms. Some items are scored in a positive direction (higher scores indicate more severe symptoms), while others are reverse-scored. After calculating the raw score, it is converted into a standard score. Generally, the higher the standard score on this scale, the more severe the depression symptoms. According to the literature, there are different thresholds for SDS scores to categorize the severity of depression [21]. In this study, the Cronbach's α for SDS at the baseline survey and at the follow-up survey was 0.85.

2.4.2. Self-Rating Anxiety Scale

The Self-Rating Anxiety Scale (SAS) was used to evaluate anxiety symptoms in subjects, which is a short-term self-rating scale compiled by Zung in 1971 [21]. The scale consists of 20 items, and the range of scores was shifted from 20 to 80 to 25 to 100 through certain conversion principles. Higher scores indicate greater anxiety [22]. Cronbach's α for SAS at the baseline survey and at the follow-up survey in this study was 0.83.

2.4.3. Maslach Burnout Inventory General Survey

We used the Maslach Burnout Inventory General Survey (MBI-GS) to assess job burnout in subjects. This scale was developed by Michael Leiter and others in 1996 [23]. The scale consists of a total of 3 dimensions (personal accomplishment, de-personalization, and emotional exhaustion). Higher scores indicate higher levels of burnout. Cronbach's α for this scale at the baseline survey and at the follow-up survey in this study was 0.87.

2.4.4. Pittsburgh Sleep Quality Index

We used the Pittsburgh Sleep Quality Index (PSQI) to assess the quality of sleep in this study. The scale was developed in 1989 by Dr. Daniel Buysse of the University of Pittsburgh and others [24]. Each component of the PSQI is scored on a scale of 0 to 3, and the seven component scores are then added together to obtain a global PSQI score ranging from 0 to 21, with higher scores indicating poorer sleep quality and scores greater than 5 indicating severe sleep quality [25]. The scale has been widely proven to have good reliability and validity [26]. Cronbach's α for this scale at the baseline survey and at the follow-up survey in this study was 0.83.

2.5. Statistical analysis

As a model for studying dynamic causal relationships, in this research, the cross-lagged panel model (CLPM) was selected to investigate the mutual dynamic relationships among depression, anxiety, and job burnout. First, CLPM is suitable for analyzing the interrelationships among multiple variables at different time points, which highly coincides with the aim of this study to explore the dynamic relationships among variables such as depression, anxiety, sleep, and job burnout as they change over time. Through the CLPM, we can estimate the contemporaneous associations between variables, that is, the mutual influence between variables at the same time point [27]. In other words, it refers to the influence of one variable at a certain time point on another variable at a subsequent time point, controlling for the influence of

the variable's own previous state. This is crucial for determining the causal directions between variables and helps us deeply understand the interaction mechanisms among these factors. Secondly, the CLPM can control the autoregressive effect [28]. In longitudinal studies, variables themselves often exhibit continuity over time, meaning that the previous state will affect the subsequent state. By incorporating autoregressive paths, the CLPM can effectively isolate the true mutual influence between variables and avoid misestimating the relationships between variables due to ignoring the autoregressive effect [29]. In this study, states such as depression, anxiety, sleep, and job burnout of cancer nursing staff may have a certain degree of stability at different time points. The CLPM can take this stability into account in the analysis, thus revealing the relationships between variables more accurately. Furthermore, compared with other models, the CLPM has better flexibility and interpretability when dealing with such complex longitudinal data relationships. It can be appropriately adjusted according to the specific research questions and data characteristics.

We used SPSS 26.0 and Mplus 7.4 to analyze the data. Continuous quantitative information was first tested for normality, and those that satisfy a normal distribution were indicated by $\overline{x} \pm S$. Differences between groups were tested using a group *t*-test and analysis of variance (AVONA). We used Pearson's correlation analysis for variable correlation exploration at different time points. And CLPM was constructed to explore the cross-lags and mediating effects between variables. We used linear regression to adjust confounding effects. In addition, structural equation modeling (SEM) in a cross-lagged panel model (CLPM) design was constructed using Mplus 7.4, including a follow-up sample (n = 1023), to examine the bidirectional effects between sleep quality and burnout and to explore the mediating roles played by depression and anxiety, respectively. Age, gender, marital status, income, insurance status, and years of employment were adjusted as covariates in the model. In the present study, we explored this association using summary scores from the original scale. Based on the past studies, we utilized a Normed x^2 index < 2, Root Mean Square Error of Approximation (RMSEA) ≥ 0.05, Comparative Fit Index (CFI) ≥ 0.90, and Tacker-Lewis Index (TLI) ≥ 0.90 as the thresholds for a good SEM model fit [30]. Differences were considered statistically significant at $P < 0.05$.

3. Results

Table 1 presented the results of differences in scale scores among groups defined by various demographic variables, namely age, gender, marital status, number of insurances, and income. The scales involved are the Pittsburgh Sleep Quality Index (PSQI), Self-Rating Depression Scale (SDS), Self-Rating Anxiety Scale (SAS), and Maslach Burnout Inventory General Survey (MBI-GS). For age group differences, PSQI, SDS, SAS, and MBI-GS all showed statistically significant variations (P < 0.001). As age increased, the scores on these scales generally rose, indicating that older individuals might experience poorer sleep quality (higher PSQI scores), more depressive symptoms (higher SDS scores), greater anxiety (higher SAS scores), and more burnout (higher MBI-GS scores). In terms of gender, the SDS scores differed significantly between females and males. Females had an average SDS score of 54.96 ± 9.65, while males had an average score of 53.62 ± 9.14 (P = 0.030), suggesting that

females may have a slightly higher level of self-rated depression compared to males in this study. Regarding marital status, the PSQI scores varied significantly among different groups. The divorced group had the highest average PSQI score, with a statistically significant result ($P = 0.049$), which might imply that divorced individuals in the sample have more problems with sleep quality compared to married and other marital status groups. For the remaining demographic variables, namely the number of insurances and income levels, the differences in scale scores among the corresponding groups were not statistically significant. This indicates that, within the context of this study, these variables did not have a significant impact on the scores of PSQI, SDS, SAS, and MBI-GS.

Table 1. Results of differences in scale scores between groups of demographic variables.

Variable	**PSQI**	**SDS**	**SAS**	**MBI-GS**
Age				
≤ 37	8.26 ± 3.53	47.63 ± 8.87	47.45 ± 7.45	50.79 ± 6.61
38~41	12.36 ± 1.79	52.87 ± 7.61	50.85 ± 5.57	55.85 ± 6.81
42~47	15.41 ± 2.97	57.26 ± 7.79	54.97 ± 6.23	58.29 ± 9.76
≥ 48	16.56 ± 20.69	62.44 ± 10.47	62.60 ± 8.18	68.78 ± 12.98
F	477.819	146.414	240.626	165.345
P	< 0.001	< 0.001	< 0.001	< 0.001
Gender				
Female	13.02 ± 4.47	56.34 ± 11.27	54.96 ± 9.65	57.53 ± 13.09
Male	12.86 ± 4.52	54.44 ± 10.44	53.62 ± 9.14	58.10 ± 11.15
t	0.434	2.173	1.755	−0.594
P	0.664	0.030	0.079	0.552
Marital status				
Married	12.66 ± 4.48	54.84 ± 10.40	53.62 ± 9.32	57.82 ± 11.21
divorced	13.42 ± 4.67	54.60 ± 11.10	53.90 ± 9.26	58.25 ± 12.29
Other*	12.68 ± 4.28	54.86 ± 10.47	54.51 ± 8.96	58.16 ± 11.12
F	3.017	0.056	0.616	0.153
P	0.049	0.945	0.540	0.858
Number of Insurance				
1	12.93 ± 4.57	54.71 ± 11.08	53.74 ± 9.38	58.41 ± 12.12
≥ 2	12.75 ± 4.33	54.95 ± 9.06	54.19 ± 8.82	57.77 ± 11.64
t	0.531	−0.306	−0.664	0.736
P	0.595	0.759	0.507	0.462
Income				
High	12.73 ± 4.48	54.36 ± 11.06	53.61 ± 9.26	57.72 ± 12.47
Mid	12.71 ± 4.56	54.29 ± 10.69	53.14 ± 9.20	57.71 ± 11.36
Low	13.12 ± 4.51	55.39 ± 10.17	54.48 ± 9.23	59.00 ± 11.96
F	0.979	1.244	1.847	1.435
P	0.376	0.289	0.158	0.239

Notes: PSQI: Pittsburgh Sleep Quality Index; SDS: Self-Rating Depression Scale; SAS: Self-Rating Anxiety Scale; MBI-GS: Maslach Burnout Inventory General Survey; Other: Cohabit illegally and widowed.

3.1. Correlation between scale scores

Figure 2 was a heat map presenting the results of Pearson correlation analysis among different variables. The variables involved include the Pittsburgh Sleep Quality Index (PSQI), the Self-Rating Depression Scale (SDS), the Self-Rating Anxiety Scale (SAS), and the Maslach Burnout Inventory General Survey (MBI-GS), with multiple measurements at different time points [denoted as 1 (January 2021–August 2021), 2 (September 2021–April 2022), and 3 (May 2022–January 2023)]. Based on the Pearson correlation results shown in **Figure 1**, it is evident that there are statistically significant correlations. Specifically, the correlations between depression scores (SDS) and burnout scores (MBI-GS), anxiety scores (SAS) and burnout scores (MBI-GS), as well as sleep quality scores (PSQI) and burnout scores (MBI-GS) at each time point were positive and significant.

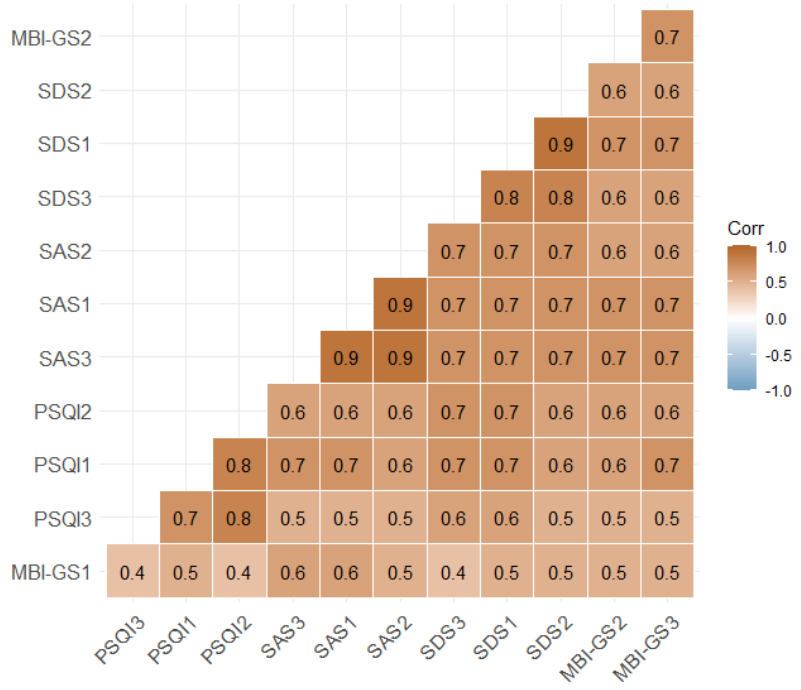


Figure 2. Bivariate correlations among depression, anxiety, sleep disorders, and burnout across the three follow-up stages.

Notes: SDS, Self-Rating Depression Scale; SAS, Self-Rating Anxiety Scale; MBI-GS, Maslach Burnout Inventory General Survey; PSQI, Pittsburgh Sleep Quality Index. 1 means January 2021–August 2021; 2 means September 2021–April 2022; 3 means May 2022–January 2023.

3.2. Fitting of the CLPM models

A CLPM was constructed with sleep quality as the independent variable and burnout as the dependent variable. **Figure 3a** shows that sleep quality at baseline positively affects burnout in the second year of follow-up, burnout at baseline significantly affects sleep quality in the second year of follow-up, and burnout in the second year of follow-up positively affects sleep quality in the second year of follow-up. The normal χ^2 index (χ^2/df) was 7.664 (χ^2 = 68.973, df = 9, p < 0.001), RMSEA = 0.115 (95% CI: 0.081, 0.126), TLI = 0.844, CFI = 0.956 and SRMR = 0.033 (**Table 2**).

The results show that anxiety at baseline positively influenced burnout in the first year of follow-up, anxiety in the first year of follow-up positively influenced burnout in the second year of follow-up, and burnout in the first year of follow-up positively influenced anxiety in the second year of follow-up (**Figure 3b**). The normal χ^2 index (χ^2/df) was 7.429(χ^2 = 66.864, df = 9, p < 0.001), RMSEA = 0.124 (95% CI: 0.099, 0.151), TLI = 0.858, CFI = 0.960 and SRMR = 0.027 (**Table 2**).

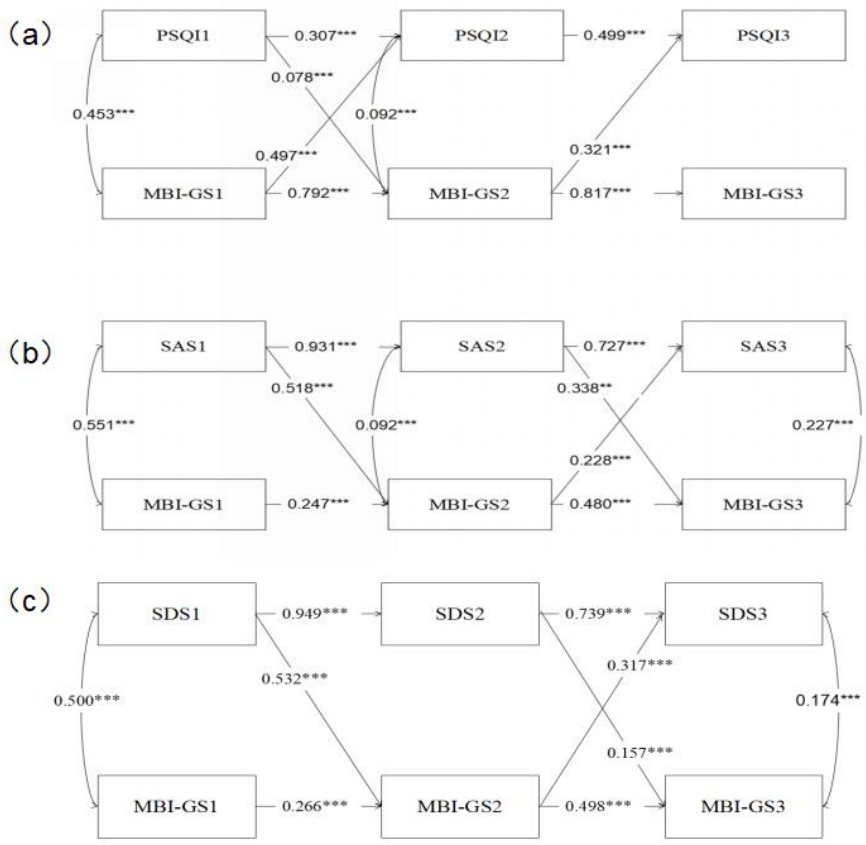


Figure 3. CLPM path map among depression, anxiety, sleep disorders and burnout, **(a)** sleep-burnout; **(b)** anxiety-burnout; **(c)** depression-burnout.

Notes: SDS, Self-Rating Depression Scale; SAS, Self-Rating Anxiety Scale; MBI-GS, Maslach Burnout Inventory General Survey; PSQI, Pittsburgh Sleep Quality Index. 1 means January 2021–August 2021; 2 means September 2021–April 2022; 3 means May 2022–January 2023; *** P < 0.001.

Table 2. Results of the model fit indicators.

	CFI	TLI	x^2	SRMR	RMSEA (95% CI)
PSQI-MBI-GS	0.956	0.844	68.973	0.033	0.115 (0.081, 0.126)
SAS-MBI-GS	0.960	0.858	66.864	0.027	0.124 (0.099, 0.151)
SDS-MBI-GS	0.981	0.933	31.602	0.025	0.082 (0.057, 0.110)
PSQI-SDS-MBI-GS	0.989	0.961	111.402	0.011	0.105 (0.088, 0.123)
PSQI-SAS-MBI-GS	0.989	0.959	111.206	0.012	0.105 (0.088, 0.124)

Notes: PSQI: Pittsburgh Sleep Quality Index; SDS: Self-Rating Depression Scale; SAS: Self-Rating Anxiety Scale; MBI-GS: Maslach Burnout Inventory General Survey.

Finally, the results showed that depression at baseline had a positive correlation with burnout at the first year of follow-up, depression at the second year of follow-up had a positive effect on burnout at the third year of follow-up, and burnout at the

second year of follow-up positively affected depression at third year of follow-up (**Figure 3c**). The normal χ^2 index (χ^2/df) was 3.451 (χ^2 = 31.062, df = 9, p < 0.001), RMSEA = 0.082 (95% CI: 0.057, 0.110), TLI = 0.933, CFI = 0.981 and SRMR = 0.025 (**Table 2**).

3.3. Mediating analysis

A CLPM mediation model was constructed with depression as the mediator, sleep quality as the independent variable and burnout as the dependent variable. After adjusting age (years), gender, and marital status. **Figure 4a** showed that in the pathway from PSQI at baseline to MBI-GS at the third follow-up, the mediating effect of SDS at the second follow-up was 0.011 (p < 0.001). The normal χ^2 index (χ^2/df) was 9.267 (χ^2 = 111.206, df = 12, p < 0.001), RMSEA = 0.105 (95% CI: 0.088, 0.123), TLI = 0.961, CFI = 0.989 and SRMR = 0.011 (**Table 2**).

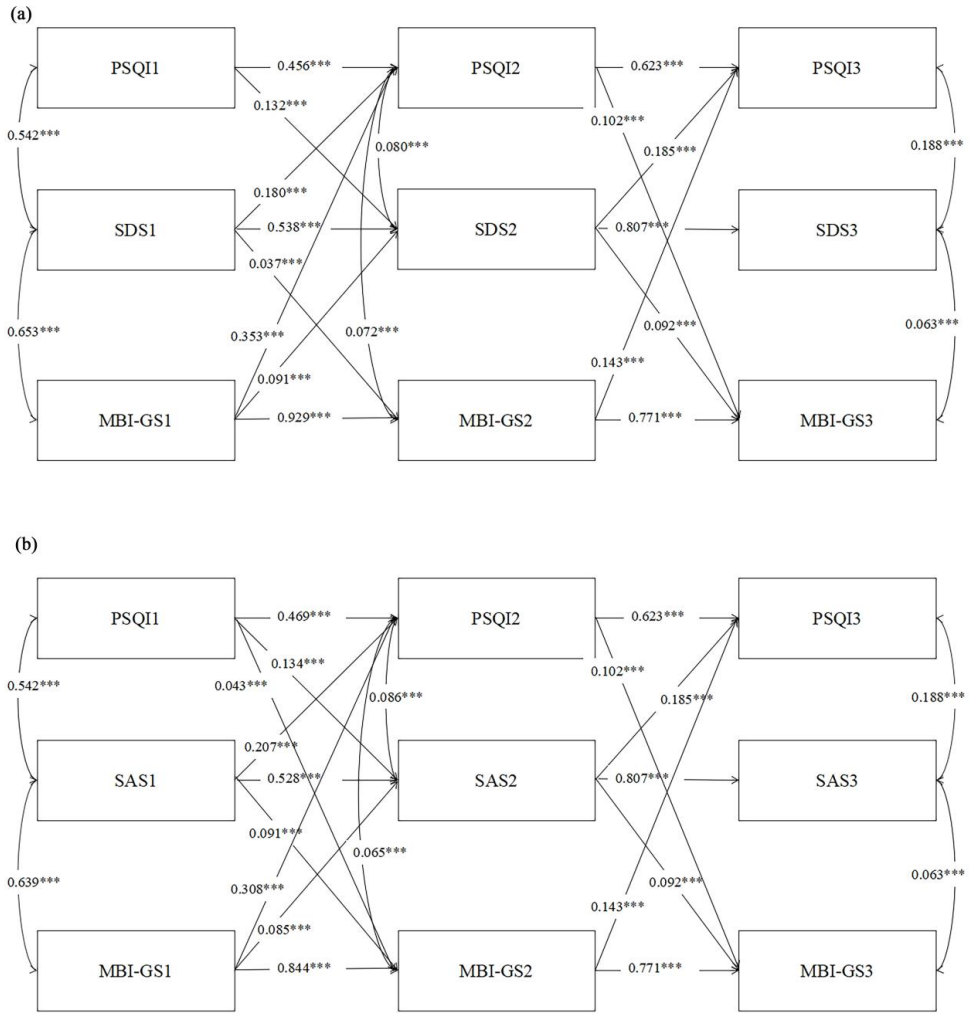


Figure 4. Standardized path coefficients in CLPM-mediating path from baseline to 3rd follow-up, **(a)** sleep-depression-burnout; **(b)** sleep-depression-burnout.

Notes: SDS, Self-Rating Depression Scale; SAS, Self-Rating Anxiety Scale; MBI-GS, Maslach Burnout Inventory General Survey; PSQI: Pittsburgh Sleep Quality Index; 1 means January 2021–August 2021; 2 means September 2021–April 2022; 3 means May 2022–January 2023; *** P < 0.001.

The CLPM mediation model was constructed with anxiety as the mediator, sleep quality as the independent variable and burnout as the dependent variable. **Figure 3** showed that in the pathway from PSQI at baseline to MBI-GS at the third follow-up, the mediating effect of SDS at the second follow-up was 0.012 ($p < 0.001$). The normal χ^2 index (χ^2/df) was 9.267 ($\chi^2 = 111.206$, df = 12, $p < 0.001$), RMSEA = 0.105 (95% CI: 0.088, 0.124), TLI = 0.959, CFI = 0.989 and SRMR = 0.011 (**Table 2**).

4. Discussion

To the best of our knowledge, this study is currently the first in the field to explore the longitudinal associations and potential mediating relationships among depression, anxiety, sleep, and burnout among cancer nursing staff using the cross-lagged panel model (CLPM). This study has revealed some interesting results: 1) We found significant cross-lags between sleep, depression, and anxiety and burnout; 2) the cross-lagged mediating effect of depression held when depression was the mediator, sleep was the independent variable, and burnout was the dependent variable; 3) the mediating effect of anxiety held when anxiety was the mediator, sleep was the independent variable, and burnout was the dependent variable. In this way, this study enabled us to document the factors influencing burnout and the potential mediating pathways of influence, providing new evidence for reducing burnout among cancer nursing staff.

We discovered distinct variations in the scores of depression, anxiety, sleep quality, and burnout across different age groups. Notably, as participants advanced in age, these conditions showed a tendency to worsen. This finding aligns with the conclusions drawn by Mehran and his colleagues [31]. Their research results suggest that the elderly population experiences more profound depressive symptoms, potentially attributable to the effects of aging and the challenges they face within their family environments. In the gender groups, women were more depressed than men. Divorced participants had significantly lower sleep quality than the other groups. Lu et al. showed that in terms of age distribution, the prevalence of depression and dysphoria was more common in the older age group (18–34 years) compared to the youngest age group (18–34 years) [32]. Whereas, in the gender distribution of depressive disorders in our country, the lifetime prevalence and 12-month prevalence of any of the subtypes of depressive disorders were higher in females than in males. This is consistent with our findings. Compared with younger people, participants in their 40s are often facing multiple stressors (work stress, children's education stress, parents' retirement stress), and women in particular are also affected by menopause and thus tend to be more prone to depression and anxiety. The traditional Chinese concept of marriage is "one life, one death", and divorced participants experience more stress in their lives, which affects the quality of their sleep. Therefore, daily work should focus on providing daily emotional counseling to this group of caregivers to help them improve their daily life stress.

Baseline depression (or depression severity) was a significant net predictor of follow-up burnout (or severity of burnout). The throughput coefficients for these net cross-predictive effects were significantly smaller than the baseline and follow-up

cross-sectional associations between them. And there were significant bidirectional effects between depression and burnout as follow-up time increased, which is supported by the study by Crudden et al. [33]. These bidirectional effects mean that, on the one hand, a high level of depression may gradually lead to an increase in the degree of burnout. Depressive emotions reduce an individual's enthusiasm and motivation for work, making them more prone to feeling tired and helpless when facing work pressure. Over time, the symptoms of burnout become more pronounced. On the other hand, burnout may, in turn, exacerbate depressive emotions. Persistent burnout makes it difficult for individuals to gain a sense of achievement at work, causing them to doubt their own value, which can then trigger or worsen depressive feelings. Also, anxiety showed the same results as depression, and this finding was also validated by the study [1]. However, there was a difference in the relationship between sleep and burnout compared to anxiety and depression. The results of this study showed that baseline sleep (or sleep severity) was a significant net predictor of follow-up burnout (or severity of burnout). And baseline burnout (or burnout severity) was a significant net predictor of follow-up sleep (or sleep severity). However, the effect of burnout on sleep remained significant with follow-up. Opoku et al. found that sleep deprivation increased employee burnout [34], which further affected sleep. This is a very interesting finding. Much of the past research has focused on the singular effects of depression, anxiety, and sleep on burnout and not on the cross-lagged effects as time progresses. This study suggests the need to focus on the pre-existing psychological state and sleep quality of operating theater nursing staff with some follow-up communication. Timely intervention for nurses who have developed psychological problems or sleep problems can reduce their burnout.

Another significant finding of this study regarding depression and anxiety held true for both mediating effects in pathways with sleep as the independent variable and burnout as the dependent variable. Sleep disturbances are typical of most people with depression and are among the core symptoms of the disease. When intervening in sleep, it can be effective in relieving depressive symptoms, and some studies have confirmed that antidepressants also enhance the quality of sleep in patients [35–37]. It reminds us that for the special group of operating room nurses, due to the high-stress, high-risk, and high-intensity nature of their work, they are more likely to be troubled by these problems. Therefore, in daily management and care, a comprehensive intervention strategy should be formulated. A bidirectional relationship between depression and sleep was also found in the mediated path coefficient plot of this study. The mediating effect of depression accounted for 1.1% of the total effect when correcting for confounders. Although the indirect effect is low, it is noteworthy. Similarly, the mediating effect of anxiety accounted for 1.2% of the total effect when correcting for confounders. The reason for the similarity of the mediating effects of the two may be because depression and anxiety always occur together [38]. The present study also found the same bidirectional effects of anxiety and sleep. This close and mutually influential relationship among depression, anxiety, and sleep is of great significance for understanding the mental health status of cancer nurses. In actual clinical situations, this means that when formulating mental health intervention strategies for this special occupational group, the complex connections among these variables need to be fully considered. When cancer nurses have sleep problems, we

should not only focus on improving sleep itself but also conduct an in-depth assessment of whether they also have depressive or anxious emotions simultaneously. For those nurses who have already shown symptoms of depression, apart from routine antidepressant treatment, improving sleep quality should be an important supplementary intervention measure. Hospitals can provide them with specialized sleep management programs. Similarly, for nurses with anxiety, apart from psychological counseling and possible drug treatment, improving sleep can also help break the negative cycle between anxiety and sleep. This can be achieved by creating a quiet and comfortable resting environment for them and providing necessary psychological support and relaxation resources. By comprehensively understanding and intervening in the bidirectional relationship among depression, anxiety, and sleep, it is expected that we can more effectively improve the mental health level of cancer nurses, ensure their work quality and quality of life, and provide patients with better nursing services. Also, this study found that anxiety and sleep have the same bidirectional effect. This suggests that in the future we need to focus on the psychological status of nursing staff in the operating theater and assess it in real time. Psychological counseling should be provided to symptomatic nursing staff to reduce the incidence of sleep disorders such as insomnia and burnout.

There are some limitations to this study. Despite encompassing a certain number of hospitals across the Eastern, Central, and Western regions of China, the geographical scope remains relatively restricted. The research could have potentially benefited from a more extensive sampling, covering a wider array of hospitals from diverse regions, including remote and less-developed areas. This broader coverage might have provided a more comprehensive and representative view of the cancer nursing population. The COVID-19 pandemic imposed significant constraints on data collection. Specifically, it was unfeasible to gather additional crucial information, such as whether the participants suffered from chronic conditions like hypertension [35] or diabetes [1]. These comorbidities could potentially act as confounding factors, influencing the relationships between depression, anxiety, sleep, and burnout among cancer nurses. Incorporating such variables into the analysis could have offered a more nuanced understanding of the underlying mechanisms at play. Another aspect of concern is the reliance on an online self-reported questionnaire for data collection. While this method provided a convenient and efficient way to reach a relatively large number of participants, it is not without drawbacks. Self-reported questionnaires are subject to issues such as response bias [39], where participants may inadvertently or deliberately provide inaccurate information. Future research could address this limitation by validating the findings through offline clinical tool assessments. These clinical tools, such as standardized psychological tests administered by trained professionals, can offer more objective and reliable measures of depression, anxiety, sleep quality, and burnout. Finally, due to limited funding, we could only conduct convenience sampling, which was why only some regions were included in this study. Nevertheless, considering the drawbacks of convenience sampling [40], in the future, multi-center large-cohort studies are still needed to validate the conclusions of this research.

5. Conclusion

This study highlights the impact of baseline depression, anxiety, and sleep symptoms on burnout at follow-up, and burnout symptoms at follow-up may also influence depression, anxiety, and sleep at follow-up. Both depression and anxiety mediated the relationship between sleep and burnout. Therefore, we need to focus on the psychological problems of nursing staff in the operating theater and provide psychological counseling as early as possible to those who have already developed psychological problems to reduce their burnout. This will help to reduce nursing turnover and improve patient safety.

Author contributions: Conceptualization, QY and XNL; methodology, QY; software, QY; validation, QY and XNL; formal analysis, QY; investigation, QY; resources, QY; data curation, QY; writing—original draft preparation, QY; writing—review and editing, QY and XNL; visualization, QY; supervision, XNL; project administration, QY; funding acquisition, XNL. All authors have read and agreed to the published version of the manuscript.

Institutional review board statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board of the local institutional review boards at the participants' centers (the ethical approval number of this study is: KY2023-260-02; approved on 2023/12/10).

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References

1. Schwartz SM. Epidemiology of Cancer. Clin. Chem. 2024; 70(1): 140–149.
2. Dowling M, Efstathiou N, Drury A, et al. Cancer nursing research priorities: A rapid review. Eur. J. Oncol. Nurs. 2023; 63: 102272.
3. Freudenberger HJ. Staff Burn-Out. Journal of Social Issues. 1974; 30: 159–165.
4. Maslach C, Jackson SE, Leiter MP. Maslach Burnout Inventory: Third edition. In: Zalaquett CP, Wood RJ (editors). Evaluating stress: A book of resources. Scarecrow Education; 1997. pp. 191–218.
5. Jiang H, Ma L, Gao C, et al. Satisfaction, burnout and intention to stay of emergency nurses in Shanghai. Emerg. Med. J. 2017; 34(7): 448–453.
6. Moller JJK, Jespersen E, Lindahl-Jacobsen R, Ahrenfeldt LJ. Associations between perceived information needs and anxiety/depressive symptoms among cancer caregivers: A cross-sectional study. J. Psychosoc. Oncol. 2020; 38(2): 171–187.
7. Leow MQH, Chan SWC. The Challenges, Emotions, Coping, and Gains of Family Caregivers Caring for Patients with Advanced Cancer in Singapore: A Qualitative Study. Cancer Nurs. 2017; 40(1): 22–30.
8. Khater W, Masha'al D, Al-Sayaheen A. Sleep assessment and interventions for patients living with cancer from the patients' and nurses' perspective. Int. J. Palliat. Nurs. 2019. 25(7): 316–324.
9. Lin SH, Liao WC, Chen MY, Fan JY. The impact of shift work on nurses' job stress, sleep quality and self-perceived health status. J. Nurs. Manag. 2014; 22(5): 604–612.
10. Chen C, Meier ST. Burnout and depression in nurses: A systematic review and meta-analysis. Int. J. Nurs. Stud. 2021; 124: 104099.

11. Golonka K, Mojsa-Kaja J, Blukacz M, et al. Occupational burnout and its overlapping effect with depression and anxiety. Int. J. Occup. Med. Environ. Health. 2019; 32(2): 229–244.
12. Metlaine A, Sauvet F, Gomez-Merino D, et al. Sleep and biological parameters in professional burnout: A psychophysiological characterization. PLoS One. 2018; 13(1): e0190607.
13. Wolf MR, Rosenstock JB. Inadequate Sleep and Exercise Associated with Burnout and Depression Among Medical Students. Acad. Psychiatry. 2017; 41(2): 174–179.
14. Mirchandaney R, Asarnow LD, Kaplan KA. Recent advances in sleep and depression. Curr. Opin. Psychiatry. 2023; 36(1): 34–40.
15. Chellappa SL, Aeschbach D. Sleep and anxiety: From mechanisms to interventions. Sleep Med. Rev. 2022; 61: 101583.
16. Zhou F, Li S, Xu H. Insomnia, sleep duration, and risk of anxiety: A two-sample Mendelian randomization study. J. Psychiatr. Res. 2022; 155: 219–225.
17. Hamaker EL, Kuiper RM, Grasman RP. A critique of the cross-lagged panel model. Psychol. Methods. 2015; 20(1): 102–116.
18. Shi J. Methods for Estimating Sample Size in Clinical Research (Chinese). Chinese Journal of Rehabilitation Medicine. 2003; 7(10): 1569–1571.
19. Zung WW. A Self-Rating Depression Scale. Arch. Gen. Psychiatry. 1965; 12: 63–70.
20. Jokelainen J, Timonen M, Keinänen-Kiukaanniemi S, et al. Validation of the Zung self-rating depression scale (SDS) in older adults. Scand. J. Prim. Health Care. 2019; 37(3): 353–357.
21. Zung WW. A rating instrument for anxiety disorders. Psychosomatics. 1971; 12(6): 371–379.
22. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta. Psychiatr. Scand. 1983; 67(6): 361–370.
23. Bria M, Spânu F, Băban A, Dumitraşcu DL. Maslach Burnout Inventory—General Survey: Factorial validity and invariance among Romanian healthcare professionals. Burnout Research. 2014; 1(3): 103–111.
24. Buysse DJ, Reynolds 3rd CF, Monk TH, et al. The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. Psychiatry Res. 1989; 28(2): 193–213.
25. Zitser J, Allen IE, Falgàs N, et al. Pittsburgh Sleep Quality Index (PSQI) responses are modulated by total sleep time and wake after sleep onset in healthy older adults. PLoS One. 2022; 17(6): e0270095.
26. Cox SD, Benoit JS, Brohard CL, McIntyre TM. Evaluation of sleep quality among nursing faculty: Application of the Pittsburgh Sleep Quality Index-A descriptive correlational study. Nurs. Open. 2022; 9(1): 339–348.
27. Mund M, Nestler S. Beyond the Cross-Lagged Panel Model: Next-generation statistical tools for analyzing interdependencies across the life course. Adv. Life Course Res. 2019; 41: 100249.
28. Wu W, Carroll IA, Chen PY. A single-level random-effects cross-lagged panel model for longitudinal mediation analysis. Behav. Res. Methods. 2018; 50(5): 2111–2124.
29. Hamaker EL. The within-between dispute in cross-lagged panel research and how to move forward. Psychol. Methods. 2023.
30. Iacobucci D. Structural equations modeling: Fit Indices, sample size, and advanced topics. Journal of Consumer Psychology. 2010; 20(1): 90–98.
31. Mehran K, Shahbaz M, Waris T, et al. The Influence of Depression on Different Age and Gender Groups in Bahawalpur. Journal of Clinical and Nursing Research. 2024; 8(7): 196–207.
32. Lu J, Xu X, Huang Y, et al. Prevalence of depressive disorders and treatment in China: A cross-sectional epidemiological study. The Lancet. Psychiatry. 2021; 8(11): 981–990.
33. Crudden G, Margiotta F, Doherty AM. Physician burnout and symptom of anxiety and depression: Burnout in Consultant Doctors in Ireland Study (BICDIS). PLoS One. 2023; 18(3): e0276027.
34. Opoku MA, Kang SW, Choi SB. The influence of sleep on job satisfaction: Examining a serial mediation model of psychological capital and burnout. Front. Public Health. 2023; 11: 1149367.
35. de Moraes Costa G, Ziegelmann PK, Zanatta FB, et al. Efficacy, acceptability, and tolerability of antidepressants for sleep quality disturbances in post-traumatic stress disorder: A systematic review and network meta-analysis. Prog. Neuropsychopharmacol. Biol. Psychiatry. 2022; 117: 110557.
36. Sutanto CN, Loh WW, Kim JE. The impact of tryptophan supplementation on sleep quality: A systematic review, meta-analysis, and meta-regression. Nutr. Rev. 2022; 80(2): 306–316.
37. Birkinshaw H, Friedrich CM, Cole P, et al. Antidepressants for pain management in adults with chronic pain: A network meta-analysis. Cochrane Database Syst. Rev. 2023; 5(5): CD014682.

38. Tiller JWG. Depression and anxiety. Med. J. Aust. 2013; 199(S6): S28–31.
39. Hill NL, Mogle J, Whitaker EB, et al. Sources of Response Bias in Cognitive Self-Report Items: “Which Memory Are You Talking About?”. Gerontologist. 2019; 59(5): 912–924.
40. Andrade C. The Inconvenient Truth About Convenience and Purposive Samples. Indian J. Psychol. Med. 2021; 43(1): 86–88.

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Article

Fear of cancer recurrence, distress, and quality of life in adolescent and young adult cancer survivors

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Abstract: Adolescents and young adult cancer survivors often experience high levels of fear of cancer recurrence (FCR), which significantly impacts their emotional well-being and quality of life. The lack of studies on this target population in Portugal leads to a gap of knowledge that informs the development of interventions and solutions aimed at AYA cancer survivors. This study aimed to analyze the moderating effect of FCR on the relationship between emotional distress and quality of life in AYA surviving cancer. This is a cross-sectional study including 96 participants between the ages of 15 and 25 at the time of diagnosis. Sociodemographic, clinical, and psychosocial characteristics were collected through a sociodemographic and clinical questionnaire, the FCR7 scale, the Hospital Anxiety and Depression Scale (HADS), and the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core-30 (EORTC QLQ-C30). We analyzed correlations between FCR and clinical, sociodemographic factors and tested the direct and indirect relationships between FCR, distress, and quality of life. The results indicated that high levels of FCR were associated with lower emotional functioning, and gender was the only sociodemographic variable significantly associated with FCR. Although anxiety was found to influence emotional functioning in AYAs, FCR did not moderate the relationship between anxiety and emotional functioning. This study allows us to gain more knowledge about the psychological impact of the disease on this population.

Keywords: fear of cancer recurrence; adolescents and young adult; distress; anxiety; emotional functioning; quality of life

1. Introduction

Cancer is considered the second most common cause of death globally, responsible for the death of 9.6 million people in 2018 [1,2]. Research on Fear of Cancer Recurrence (FCR) has primarily focused on the adult population, consistently showing that FCR is associated with poorer psychological functioning and reduced quality of life, particularly among younger adults [3–5]. Studies indicate a strong association between high levels of FCR and symptoms of anxiety and depression in adult cancer survivors: 84% report elevated anxiety and stress, with younger survivors showing higher anxiety than older ones, and 66% reporting high levels of depression associated with FCR [3–10]. FCR in this group is defined as persistent and intrusive

worries about the possibility of the disease returning or progressing [1,11–15]. This fear can manifest across a continuum, from moderate levels of concern to severe, maladaptive distress that substantially disrupts daily life. FCR also significantly impacts quality of life. For example, Handschel et al. [16] and Chen et al. [17] found that 80% of participants experienced FCR and that greater levels of FCR were associated with lower self-reported quality of life and more negative expectations about the future. Furthermore, FCR tends to hinder psychosocial adjustment, particularly in younger individuals when compared to older adults, and is consistently associated with higher levels of anxiety and depression [18].

Among younger individuals, adolescents and young adults (AYAs)—those diagnosed with cancer between the ages of 15 and 39 [19,20]—represent a particularly vulnerable group. Cancer continues to be one of the leading causes of death in AYAs, and Portugal holds the position of the sixth European country with the highest incidence rates in those aged 15 to 29 and eighth in mortality rates [21]. Cancer has a significant impact on the mental health of AYA survivors, who are frequently affected by psychological difficulties. Approximately one in three AYAs experiences anxiety, and one in four deals with depressive symptoms, demonstrating the urgent need for customized psychological care interventions [22–24].

One of the main concerns among AYAs is FCR. The literature indicates that the majority of AYA cancer survivors report high levels of FCR. Luigjes-Huizer et al. [25] found that between 39% and 97% of survivors reported some degree of FCR, with 22% to 87% experiencing moderate levels and up to 15% reporting high levels of FCR. Similar findings have been reported in other studies, with high FCR impacting between 20% and 74% of cancer survivors [6,7,26,27]. FCR is a complex and multidimensional experience, influencing emotional states, cognitive processes, perceptions, and behaviors [11,12] levels of FCR.

Despite the limited number of studies focused exclusively on AYAs, existing evidence suggests that FCR has a substantial impact in this group. Higher levels of FCR among AYAs have been associated with greater psychological distress and anxiety, as well as a reduced quality of life [28]. FCR in AYAs has also been associated with a higher risk of psychological maladjustment and impaired well-being [28]. Moreover, Shay et al. [1] reinforce the association between elevated FCR and diminished quality of life. These findings reflect a consistent relationship between the fear and worry experienced by cancer survivors, without considering whether they are adults or AYAs [13,22]. Given the apparent increased vulnerability of younger individuals to the negative effects of FCR, it is important to further investigate its impact on AYA cancer patients. Even with the growing international research on this subject, in Portugal, there is a clear gap and possible absence of studies on symptoms of anxiety, depression, FCR, and quality of life in AYA. Considering this, it is pertinent to explore this association in terms of the national reality. The lack of studies on this target population in Portugal leads to a lack of knowledge on the part of society, hindering the development of interventions and solutions aimed at AYA cancer survivors. There is also a gap in the evidence on concerns related to the recurrence of the disease and the mechanisms leading to poor psychosocial adjustment. To fill these gaps, this study aims to: a) compare the psychosocial adjustment of AYAs with that of the validation sample of the measures used and b) analyze whether FCR moderates the relationship

between emotional distress and quality of life. This approach is intended to contribute to greater knowledge about the psychological impact of the disease on this population and potentially inform the development of more effective support strategies.

2. Materials and methods

2.1. Study design and participants

This cross-sectional study included a convenience sample of individuals aged between 15 and 54 years. The inclusion criteria for participation were: i) a previous diagnosis of cancer and ii) age between 15 and 25 years at the time of diagnosis. No time limits were imposed after diagnosis or stage of treatment, as the literature is inconsistent regarding the association between these variables and FCR [28].

2.2. Instruments

The sociodemographic questionnaire included questions regarding age, gender, nationality, marital status, education, and professional status, which made it possible to collect data about the sample. The clinical questionnaire made it possible to understand issues related to the diagnosis of cancer, namely age at diagnosis, time since diagnosis, type of cancer, stage and treatments, whether there had been a recurrence, as well as the perceived need for psychological support due to the diagnosis.

The FCR7 version [29] is a brief unidimensional scale that assesses levels of FCR. This instrument consists of 7 items, where the modality follows a Likert-type scale, with the first 6 items having a response from 1—never to 5—always, and item 7 with a response from 1—not at all to 10—very much, where higher scores represent a higher level of FCR. One example of an item is "I am afraid that my cancer may recur". As far as internal consistency is concerned, this scale showed a = 0.89 in the Portuguese validation [30], as was found in the present study.

The Hospital Anxiety and Depression Scale (HADS [31]; Portuguese version by Pais-Ribeiro et al. [32]) assesses emotional components in individuals with physical illnesses. This Portuguese version consists of 14 items, divided into two subscales, Anxiety and Depression, in which the modality follows a 4-point Likert scale (0–3). Individuals with scores above 11 have clinically significant symptoms [32]. These symptoms can be classified as normal (0–7), mild (8–10), moderate (11–14), and severe (15–21). One example of the anxiety subscale is "I get a sort of frightened feeling as if something awful is about to happen". At the same time, "I still enjoy the things I used to enjoy" exemplifies the type of items in the depression subscale. With regard to internal consistency, the anxiety and depression subscales had a value of α = 0.76 and α = 0.81, respectively [32]. In this sample, the anxiety and depression subscales showed good internal consistency (a = 0.88 and 0.78, respectively).

We also used the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core-30 (EORTC QLQ-C30 [33]; Portuguese version by Pais-Ribeiro et al. [34]), which assesses quality of life in cancer patients, consisting of 30 items distributed over 5 functional subscales, namely physical, role, cognitive, emotional, and social functioning [34]. An example of an item is "Do you have any

trouble doing strenuous activities, like carrying a heavy shopping bag or a suitcase?" A higher score implies better functioning, except for symptom subscales, where higher scores point to higher symptoms. As for the response mode, a 4-point Likert scale was used (1—not at all to 4—very much), where high scores indicate a better quality of life and a high score on the symptoms scale reveals high levels of symptomatology. As for internal consistency, it has good values, from 0.74 to 0.81 [34]. In this study, the instrument showed good internal consistency (a = 0.91).

2.3. Procedure

The study is part of the *Projeto Sem Medos*—What if cancer comes back?: "A family-centered adjustment to the fear of cancer recurrence in adolescents and young adults with cancer and their caregivers" (Ref. 2021.05418.BD), which aims to understand the adjustment processes of AYAs with cancer and caregivers to the FCR and is approved by the FPCEUP Ethics Committee (Ref. 2022/03-06c). Data was collected between November 2023 and February 2024 via an online questionnaire shared by national associations that support these patients, such as Acreditar, the Rui Osório de Castro Foundation, the Portuguese League Against Cancer, and on social networks such as Instagram, where influencers, groups, and forums were asked to help spread the word. Before taking part, all participants were given a detailed description of the study's objectives and procedures on the first page of the questionnaire and were guaranteed voluntary participation in the study, as well as the anonymity and confidentiality of the data collected. Informed consent was obtained for all participants.

2.4. Data analysis

The statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS), version 29 [35]. Descriptive statistics (i.e., means, standard deviations, and frequencies) were used to summarize the participants' sociodemographic and clinical characteristics. Difference tests (t-test) were also considered to compare the psychosocial adjustment of the present sample with the original validation samples of the measures used in this study. Pearson's correlations were employed to assess the bivariate relationships between the sociodemographic and clinical variables and the FCR7, as well as the associations between FCR, distress, and quality of life. Additionally, based on the correlation analysis, a moderation model was conducted using the PROCESS macro for SPSS to explore the role of FCR as a moderator in the relationship between anxiety and emotional functioning. All analyses considered a significance level of $p < 0.05$.

3. Results and discussion

3.1. Characteristics of AYA

This study included a sample of 96 individuals aged between 15 and 54 years (M = 26.04; SD = 6.7; see **Table 1**), 83.3% females and 79.2% single. In terms of education, 36.5% of the participants completed a degree, and 45.8% were employed full-time. The most common diagnoses among the participants included Hodgkin's lymphoma (24%) and leukemia (19.8%), and 47.9% of the sample had undergone

surgery, 45.8% radiotherapy, and 80.2% chemotherapy. In this sample, the majority were no longer undergoing treatment (69.8%), and the diagnosis had occurred, on average, approximately 6 years ago (range: one month to 39 years). Most of the participants had not had a relapse (83.3%), nor had they been followed up psychologically (53.1%). Among our participants, 68.8% of AYAs were found to have clinically significant levels of FCR. Compared to the sample used for the original validation of the FCR7 scale [29], the participants included in this study reported significantly higher levels of FCR (M = 24.02; $t = 17.82$; $p < 0.001$). Regarding levels of anxiety and depression, the results indicated that 40.6% of the participants showed significant levels of depressive symptoms. It was found that the levels of cognitive functioning (M = 68.58; $t = -3.24$; $p = 0.002$), social functioning (M = 63.02; $t = -4.38$; $p < 0.001$), and overall quality of life (M = 33.16; $t = -13.77$; $p < 0.001$) of the AYA were significantly lower compared to the sample of adult cancer patients used to validate the EORTC QLQ-C30 [34].

Table 1. Sociodemographic and clinical characteristics ($n = 96$).

Characteristics	***n***	**%**
Sociodemographic		
Age (M ± SD)	26.04 ± 6.7	
Diagnostic age (M ± SD)	19.52 ± 0.39	
Gender		
Female	80	83.3
Male	16	16.7
Marital Status		
Single	76	79.2
The fact union	9	9.4
Married	10	10.4
Other	1	1
Education		
2nd cycle	1	1
3nd cycle	6	6.3
Secondary education	32	33.3
Graduate	35	36.5
Master	21	21.9
Doctoral	1	1
Work situation		
Student	31	32.3
Full-time employee	44	45.8
Part-time employee	2	2.1
Unemployed	11	11.5
Other	8	8.3
Clinic		
Time since diagnosis (M ± SD)	5.93 ± 0.69	

Table 1. (*Continued*).

Characteristics	*n*	%
Type of cancer		
Leucemia	19	19.8
lymphoma of Hodgkin	23	24
lymphoma of non-Hodgkin	4	4.2
thyroid	6	6.3
brain cancer	8	8.3
testicular can	1	1
Skin cancer	2	2.1
Uterine	1	1
Other	32	33.3
Treatment status		
Active	25	26
It's no longer working	67	69.8
Other	4	4.2
Surgery		
Yes	46	47.9
No	50	52.1
Radiotherapy		
Yes	44	45.8
No	52	54.2
Chemotherapy		
Yes	77	80.2
No	19	19.8
Immunotherapy		
Yes	4	4.2
No	92	95.8
Hormonal therapy		
Yes	6	6.3
No	90	93.8
Recurrence		
Yes	16	16.7
No	80	83.3
Psychological support		
Yes	45	46.9
No	51	53.1

Note: N = frequencies; % = percentage of participants; M = mean; SD = standard deviation.

3.2. Correlations between FCR and clinical, sociodemographic factors

Bivariate correlations between clinical and sociodemographic variables revealed no significant relationships between fear of cancer recurrence (FCR) and factors such as age, treatment modalities (surgery, chemotherapy, radiotherapy, immunotherapy,

and hormone therapy), recurrence, disease status, and diagnostic timing ($p > 0.05$). However, a weak to moderate positive correlation was observed between FCR and the perceived need for psychological support. Additionally, a significant negative correlation was found between sex (0 = female, 1 = male) and FCR levels, suggesting that women report higher levels of FCR than men.

3.3. Testing the direct and indirect relationships between FCR, distress, and quality of life

A weak but significant positive correlation was found between the FCR and HADS-Depression scales and a moderate and significant positive correlation between the FCR and HADS-Anxiety scales ($r = 0.23$, $p = 0.0325$; $r = 0.46$, $p < 0.001$, respectively). Regarding the subscales of the QLQ, the emotional functioning subscale showed a strong negative correlation with anxiety and depression ($r = -0.75$, $p < 0.001$; $r = -0.63$, $p < 0.001$, respectively) and a moderate negative relationship with the FCR ($r = -0.37$, $p < 0.001$). In other words, higher levels of anxiety, depression, and FCR are associated with worse emotional functioning in the AYA sample. The other subscales used to assess functionality did not show a significant association with FCR, except for cognitive functioning, although the correlation was weak ($r = -0.22$, $p = 0.03$). Additionally, associations were found between the dimensions of quality of life and psychological distress. As for the physical functioning subscale, it showed a moderate negative correlation with anxiety and a strong one with depression ($r = -0.4$, $p < 0.001$; $r = -0.54$, $p < 0.001$). In other words, the higher the levels of anxiety and depression, the worse the participant's physical state. The cognitive functioning subscale shows a moderate negative correlation with depression ($r = -0.42$, $p < 0.001$). Role functioning, on the other hand, shows a weak negative correlation with anxiety and depression ($r = -0.3$, $p = 0.003$; $r = -0.45$, $p < 0.001$). Finally, the social subscale shows a moderate negative relationship with anxiety and depression ($r = -0.34$, $p < 0.001$; $r = -0.4$, $p < 0.001$, respectively) (see **Table 2**).

Table 2. Pearson correlations: Relationships between fear of recurrence, distress, and quality of life.

Variables	Mean ± SD	1	2	3	4	5	6	7	8	9
1. Emotional	60.76 ± 2.65	1								
2. Physical	81.18 ± 1.98	0.44**	1							
3. Cognitive	68.58 ± 2.95	0.43**	0.36**	1						
4. Role	75.52 ± 2.93	0.46**	0.67**	0.55**	1					
5. Social	63.02 ± 3.33	0.39**	0.43**	0.43**	0.66**	1				
6. QLQ	33.16 ± 2.09	−0.45**	−0.43**	−0.28**	−0.47**	−0.38**	1			
7. HADS-anxiety	8.11 ± .42	−0.75**	−0.4**	−0.26**	−0.3**	−0.34**	0.28**	1		
8. HADS-depression	4.57 ± .36	−0.63**	−0.54**	−0.42**	−0.45**	−0.40**	0.44**	0.65**	1	
9. FCR7	24.02 ± .82	−0.37**	−0.18	−0.22*	−0.1	−0.18	0.03	0.46**	0.23*	1

Note: * $p < 0.05$; ** $p < 0.001$; SD = standard deviation.

Based on the correlation results, a simple moderation model was tested to explore the role of fear of recurrence as a moderator in the relationship between anxiety and emotional functioning. For this, the PROCESS macro for SPSS (version 4.2; Hayes,

2022) was used, specifically Model 1. The overall model was significant, explaining 54.4% of the variance in emotional functioning ($R^2 = 0.54$, $F(3,92) = 36.52$, $p < 0.001$), suggesting that the combination of predictor variables significantly contributes to variations in emotional functioning. However, the analysis of the interaction effect between anxiety and FCR indicated that the interaction was not significant ($F(1,92) = 0.07$, $p = 0.79$; CI 95% (−0.11; 0.09), suggesting that the impact of anxiety on emotional functioning did not vary significantly as a function of FCR levels in the present sample.

4. Discussion

This study aimed to analyze the moderating effect of FCR on the relationship between emotional distress and quality of life in AYA cancer survivors. Our results did not find a significant moderation effect of FCR, meaning that having a higher or lower level of FCR does not alter the relationship between anxiety and emotional distress. Previous studies showed that high levels of FCR are associated with lower emotional functioning [28]. Our results suggest that, despite the association between FCR and emotional distress, it is unclear how these two variables together lead to AYAs' emotional functioning. One possible explanation is that some additional variables may be influencing this mechanism. Further investigation is needed to find which variables these may be, and that may be important to tackle in future interventions to improve AYAs' emotional well-being. More specifically, regarding the relationship between anxiety and emotional functioning, our results showed that anxiety is related to emotional functioning, suggesting that high levels of anxiety can impair the emotional regulation and psychosocial adaptation of AYAs. However, it is important to consider that this relationship can be influenced by factors such as social support, coping strategies, stress levels, and individual characteristics such as resilience and self-esteem. In addition, sociodemographic variables such as age, gender, and stage of treatment can play a significant role in the intensity of this association [22,28], which is in line with previous studies [22]. High levels of anxiety may therefore be associated with a decline in the emotional functioning of AYAs. This negative impact can be explained by the effect of anxiety on mental health, which exacerbates stress and constant worry, resulting in a cycle of negative emotions. Such a relationship makes emotional regulation difficult and contributes to impaired psychological wellness, affecting the quality of life and the ability to cope with daily challenges [22]. Therefore, in order to develop effective interventions, it is essential to carry out further studies that explore how these factors interact and influence the emotional experience of AYAs. Understanding these dynamics will facilitate the creation of support strategies that are more specific and sensitive to the specific needs of this population [22,28].

Furthermore, in the correlation analysis, it was found that higher levels of anxiety, depression, and FCR are associated with lower emotional functioning, which is corroborated by the literature. FCR tends to trigger psychological and behavioral responses and is, therefore, related to high levels of anxiety and depression. These levels reflect the fear and worry experienced by cancer survivors [1,8,13,18,22,36].

This study identified an association between FCR and sociodemographic aspects, where gender was the only variable significantly associated with FCR. It was found that being female is associated with higher levels of FCR. One possible explanation for this is that, compared to young people in general, young women face additional challenges due to their stage of life, such as uncertainty about the future, interruptions in daily life, and continuing emotional development. In addition, these young women deal with issues specific to their emotional and social development, such as building a career, starting a family, and adapting to the responsibilities of young adulthood. These factors can make FCR even more difficult to cope with, as they feel that the illness could interrupt or negatively impact their future plans and dreams [37]. That said, some caution is needed when interpreting these results, since the sample studied is mostly female, which may have generated some bias in the results. Even so, these results are in line with those reported in other studies, which found that women report higher levels of FCR compared to men [9,38–40]. However, these results have the same limitation and risk of interpretation as this research, since the samples were mostly female [38]. In contrast to the present study, it is important to note that Cohee et al. [41] found that FCR levels were not associated with the female gender.

The limitations of this study relate to the fact that it is a cross-sectional design, which may limit the exploration of symptoms over time and will not allow causal associations to be established between the variables under study. The fact that the majority of the sample was female (83.3%) could bias the results. Consequently, the results should be interpreted with caution and cannot be generalized to all AYA cancer survivors in Portugal. Similarly, the fact that the results are based on self-report may also lead to recall bias.

In the future, it may be important to use a sample of AYA with a time limit after diagnosis to understand whether the limited or extended period of diagnosis influences the degree of FCR, since there are several articles that reveal inconsistencies on this parameter. Future research could consist of more extensive data collection to have a significant sample and be able to generalize the results to all AYA cancer survivors in Portugal. In addition, it would be relevant to integrate multidimensional data, such as medical records, caregiver reports, and physiological indicators, to complement the self-reports and improve the validity of the results. The analyses in the results should also take into account other variables, such as social support and coping styles, in order to clarify the moderating effects of FCR and provide a more complete understanding of the factors affecting the emotional experience of AYA. It would also be relevant to carry out a longitudinal study to assess the causal relationships between the levels of FCR, anxiety, and depression experienced by AYA or to examine the long-term evolution of the influence of FCR. In addition, it would be relevant for psychological interventions aimed at AYA survivors to be developed and evaluated for their viability and effectiveness in real contexts. Finally, it would be important to build specific programs for AYA in healthcare, including interdisciplinary teams that address needs specific to this age group, such as body image, infertility, the future consequences of cancer treatments and disease, possible entry into the job market, the risk of future pregnancies, and future quality of life.

This study has contributed to understanding the association between FCR, emotional distress, and quality of life in AYAs who have survived cancer. The results

showed that higher levels of FCR are significantly associated with higher levels of depression and anxiety, as well as lower emotional functioning. However, the moderation analysis of FCR on the relationship between anxiety and emotional functioning did not reveal a significant effect, suggesting that the influence of anxiety on this dimension occurs independently of FCR levels.

5. Conclusion

This study is the first attempt to understand whether high or low levels of FCR alter the relationship between anxiety and emotional functioning in AYAs. Our results suggest that FCR levels do not change the relationship between anxiety and emotional functioning in Portuguese AYAs. Researchers all over the world should look to better understand the relationship between FCR, psychosocial adjustment, and quality of life in AYAs. This would improve the comparability of results between studies and allow us to learn more about these aspects in this specific population.

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References

1. Shay LA, Carpentier MY, Vernon SW. Prevalence and correlates of fear of recurrence among adolescent and young adult versus older adult post-treatment cancer survivors. 2016; 24(11): 4689–4696.
2. World Health Organization (WHO). Cancer. Available online: https://www.who.int/health-topics/cancer#tab = tab_1 (accessed on 25 March 2025).
3. Crist JV, Grunfeld EA. Factors reported to influence fear of recurrence in cancer patients: A systematic review. Psycho-Oncology. 2013; 22(5): 978–986.
4. Simard S, Thewes B, Humphris G, et al. Fear of cancer recurrence in adult cancer survivors: A systematic review of quantitative studies. Journal of Cancer Survivorship. 2013; 7(3): 300–322.

5. Walburg V, Rueter M, Lamy S, et al. Fear of cancer recurrence in Non- and Hodgkin lymphoma survivors during their first three years of survivorship among French patients. Psychology, Health and Medicine. 2019; 24(7): 781–787.
6. Jones JM, Fitch M, Bongard J, et al. The needs and experiences of post-treatment adolescent and young adult cancer survivors. Journal of Clinical Medicine. 2020; 9(5).
7. Vandraas KF, Reinertsen KV, Kiserud CE, Lie HC. Fear of cancer recurrence among young adult cancer survivors—exploring long-term contributing factors in a large, population-based cohort. Journal of Cancer Survivorship. 2021; 15(4): 497–508.
8. Luo X, Li W, Yang Y, et al. High fear of cancer recurrence in Chinese newly diagnosed cancer patients. Frontiers in Psychology. 2020; 11.
9. Götze H, Taubenheim S, Dietz A, et al. Fear of cancer recurrence across the survivorship trajectory: Results from a survey of adult long-term cancer survivors. Psycho-Oncology. 2019; 28(10): 2033–2041.
10. Thewes B, Bell ML, Butow P, et al. Psychological morbidity and stress but not social factors influence level of fear of cancer recurrence in young women with early breast cancer: Results of a cross-sectional study. Psycho-Oncology. 2013; 22(12): 2797–2806.
11. Almeida SN, Elliott R, Silva ER, Sales CMD. Fear of cancer recurrence: A qualitative systematic review and meta-synthesis of patients' experiences. Clinical Psychology Review. 2019; 68: 13–24.
12. Lebel S, Ozakinci G, Humphris G, et al. From normal response to clinical problem: definition and clinical features of fear of cancer recurrence. Supportive Care in Cancer. 2016; 24(8): 3265–3268.
13. Liu J, Peh CX, Simard S, et al. Beyond the fear that lingers: The interaction between fear of cancer recurrence and rumination in relation to depression and anxiety symptoms. Journal of Psychosomatic Research. 2018; 111: 120–126.
14. Mutsaers B, Jones G, Rutkowski N, et al. When fear of cancer recurrence becomes a clinical issue: a qualitative analysis of features associated with clinical fear of cancer recurrence. Supportive care in cancer. 2016; 24(10): 4207–4218.
15. Rha SY, Park JS, Choi YY, et al. Fear of cancer recurrence and its predictors and outcomes among cancer survivors: a descriptive correlational study. European Journal of Oncology Nursing. 2022; 58.
16. Handschel J, Naujoks C, Kübler NR, Krüskemper G. Fear of recurrence significantly influences quality of life in oral cancer patients. Oral Oncology. 2012; 48(12): 1276–1280.
17. Chen WY, Wang S, Peng X, Zhu Y. Trait emotional intelligence and quality of life among breast cancer patients: the mediating role of fear of cancer recurrence. International Journal of Nursing Practice. 2022; 28(4).
18. Lang MJ, David V, Giese-Davis J. The age conundrum: A scoping review of younger age or adolescent and young adult as a risk factor for clinical distress, depression, or anxiety in cancer. Journal of Adolescent and Young Adult Oncology. 2015; 4(4): 157–173.
19. Adolescent and Young Adult Oncology Progress Review Group. Closing the gap: Research and care imperatives for adolescents and young adults with cancer. Available online: https://www.cancer.gov/types/aya/research/ayao-august-2006.pdf (accessed on 25 March 2025).
20. Organização das Nações Unidas (ONU). Statistics on youth (Portuguese). Available online: https://unric.org/pt/juventude/ (accessed on 25 March 2025).
21. Ferlay J, Ervik M, Lam F, et al. Global cancer observatory: Cancer today. Available online: https://gco.iarc.fr/today (accessed on 25 March 2025).
22. Sun H, Yang Y, Zhang J, et al. Fear of cancer recurrence, anxiety and depressive symptoms in adolescent and young adult cancer patients. Neuropsychiatric Disease and Treatment. 2019; 15: 857–865.
23. Osmani V, Hörner L, Klug SJ, Tanaka LF. Prevalence and risk of psychological distress, anxiety and depression in adolescent and young adult (AYA) cancer survivors: A systematic review and meta-analysis. Cancer Medicine. 2023; 12(17): 18354–18367.
24. Teo T, Ling Poon EY. P30-2 A scoping review on prevalence of anxiety and depression (AnD) in adolescent and young adult cancer (AYAO) patients. Annals of Oncology. 2024; 35: S1375.
25. Luigjes-Huizer YL, Tauber NM, Humphris G, et al. What is the prevalence of fear of cancer recurrence in cancer survivors and patients? a systematic review and individual participant data meta-analysis. Psycho-Oncology. 2022; 31(6): 879–892.
26. Loughan AR, Lanoye A, Aslanzadeh FJ, et al. Fear of Cancer Recurrence and Death Anxiety: Unaddressed Concerns for Adult Neuro-oncology Patients. Journal of Clinical Psychology in Medical Settings. 2021; 28(1): 16–30.

27. Mattsson E, Einhorn K, Ljungman L, et al. Women treated for gynaecological cancer during young adulthood–A mixed-methods study of perceived psychological distress and experiences of support from health care following end-of-treatment. Gynecologic Oncology. 2018; 149(3): 464–469.
28. Yang Y, Li W, Wen Y, et al. Fear of cancer recurrence in adolescent and young adult cancer survivors: A systematic review of the literature. Psycho-Oncology. 2019; 28(4): 675–686.
29. Humphris GM, Watson E, Sharpe M, Ozakinci G. Unidimensional scales for fears of cancer recurrence and their psychometric properties: the FCR4 and FCR7. Health and Quality of Life Outcomes. 2018; 16(1).
30. Neves MC, Sales CMD, Oliveira J, et al. Assessing Fear of Cancer Recurrence among Adolescents and Young Adults: The Portuguese Validation and Psychometric Assessment of the "Fear of Cancer Recurrence 7" Scale. Acta Médica Portuguesa. 2025; 38(3): 148–159.
31. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiatrica Scandinavica. 1983; 67(6): 361–370.
32. Pais-Ribeiro J, Silva I, Ferreira T, et al. Validation study of a Portuguese version of the Hospital Anxiety and Depression Scale. Psychology, Health and Medicine. 2007; 12(2): 225–237.
33. Aaronson NK, Ahmedzai S, Bergman B, et al. The European organization for research and treatment of cancer QLQ-C30: A quality-of-life instrument for use in international clinical trials in oncology. JNCI: Journal of the National Cancer Institute. 1993; 85(5): 365–376.
34. Pais-Ribeiro J, Pinto C, Santos C. Validation study of the Portuguese version of the QLC-C30-V.3. Psicologia, Saúde e Doenças. 2008; 9(1): 89–102.
35. IBM Corp. IBM SPSS Statistics for Windows, Version 29.0. IBM Corp; 2022.
36. Yang Y, Sun H, Luo X, et al. Network connectivity between fear of cancer recurrence, anxiety, and depression in breast cancer patients. Journal of Affective Disorders. 2022; 309: 358–367.
37. van de Wal M, van de Poll-Franse L, Prins J, Gielissen M. Does fear of cancer recurrence differ between cancer types? A study from the population-based PROFILES registry. Psycho-Oncology. 2016; 25(7): 772–778.
38. Adashek JJ, Jordan A, Redwine LS, et al. Pan-cancer analysis of fear of cancer recurrence among cancer survivors. ESMO Open. 2022; 7(4).
39. Pang C, Humphris G. The Relationship Between Fears of Cancer Recurrence and Patient Gender: A Systematic Review and Meta-Analysis. Frontiers in Psychology. 2021; 12.
40. Smith AB, Costa D, Galica J, et al. Spotlight on the Fear of Cancer Recurrence Inventory (FCRI). Psychology Research and Behavior Management. 2020; 13: 1257–1268.
41. Cohee AA, Adams RN, Johns SA, et al. Long-term fear of recurrence in young breast cancer survivors and partners. Psycho-Oncology. 2017; 26(1): 22–28.

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Article

The impact of timed narrative nursing on the psychological stress status and PTGI score of suspected breast cancer patients during physical examination

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Abstract: Background: Patients with suspected breast cancer, identified through physical examination, often experience a range of negative emotions that significantly impact their mental health and quality of life. Timed narrative nursing involves clinical nursing practices where nurses listen to patients' experiences to identify key points for intervention, followed by implementing targeted nursing measures. This study aims to evaluate the effect of timed narrative nursing on psychological stress and Post-traumatic Growth Inventory (PTGI) scores in patients with suspected breast cancer detected through physical examination. **Methods:** A total of 111 patients with suspected breast cancer, identified through physical examinations at Nanchang Third Hospital during July 2022–2024, were retrospectively analyzed. Among them, 53 patients received routine care, while 58 patients underwent timed narrative nursing. The general characteristics of the patients were collected using a questionnaire. A difference analysis was conducted to compare the mental health status and PTGI scores of patients under the two nursing models. **Results:** Patients receiving timed narrative nursing demonstrated lower Self-Rating Anxiety Scale and Self-Rating Depression Scale scores, along with higher Connor–Davidson Resilience Scale and PTGI scores. These patients reported reduced stress levels and an improved quality of life. Linear regression analysis identified several independent factors influencing psychological stress, including age of ≥50 years (P = 0.017), having a spouse (P = 0.023), lower education level (P = 0.027), household income of <5000 yuan per month (P = 0.014), undergoing routine physical examinations (P = 0.009), and self-paid medical treatment (P = 0.001). **Conclusion:** Timed narrative nursing effectively reduces anxiety, depression, and stress in patients with suspected breast cancer. This approach plays a crucial role in improving the psychological well-being of these patients.

Keywords: timed narrative nursing care; breast cancer; psychological stress; PTGI; influencing factors

1. Introduction

Breast cancer currently accounts for 31% of all cancer diagnoses in women [1] and remains the leading cause of death in women aged 30–60 years globally [2]. The absolute burden of disease is substantial, and global projections indicate a 40% increase by 2040 [3]. In its early stages, breast cancer typically presents with axillary lymph node enlargement and breast masses. As the disease advances, metastasis leads to organ damage and ultimately death [4], underscoring its significant impact on women's health and well-being [5]. A breast cancer diagnosis places immense psychological strain on patients, who face a host of challenges, including navigating complex treatment protocols, understanding their prognosis, managing side effects, and confronting the possibility of recurrence. These stress-inducing experiences often contribute to psychological instability and emotional distress [6]. Approximately 50%

of women with early-stage breast cancer experience negative emotions within the first year after diagnosis [7], with anxiety being one of the most common psychological symptoms, affecting 10%–30% of patients [8]. Severe psychological distress profoundly diminishes the quality of life [9].

Narrative nursing, an innovative approach to nursing care, focuses on understanding patients' experiences by listening to their stories. Through this process, nurses identify key intervention points and help patients reconstruct meaning in their lives [10]. Narrative nursing, particularly for end-stage patients, can uncover life-affirming perspectives, alleviate emotional pain, enhance life's meaning, and foster acceptance of life and death [11]. Additionally, narrative nursing reduces negative emotions, strengthens the nurse-patient relationship, and supports collaborative decision-making in care [12]. A key principle of narrative nursing is guiding patients to articulate their deepest thoughts and feelings. Selecting the appropriate timing for such conversations allows patients to express themselves more openly and thoroughly. This timing not only facilitates honest emotional disclosure but also enables richer storytelling. In contrast, conventional nursing focuses predominantly on physical symptoms, often neglecting the psychological and emotional dimensions of care. Narrative nursing shifts the focus to patients as central figures in their care, using storytelling as a therapeutic tool to stabilize emotions, foster trust between patients and nurses, and cultivate a positive outlook. This patient-centered approach ultimately improves disease management outcomes [13]. Despite its proven potential, narrative nursing remains in a developmental stage in many countries, with a need for more comprehensive research to establish its feasibility and efficacy. This study integrates the concepts of timing and narrative nursing in the care of patients with suspected breast cancer, aiming to provide a novel model for reducing psychological stress and enhancing emotional well-being.

2. Methods

Materials and methods

A total of 111 patients with suspected breast cancer, identified through physical examinations at Nanchang Third Hospital between July 2022 and July 2024, were included in this retrospective study. Of these, 53 patients received routine care, while 58 patients underwent timed narrative nursing. Patients were randomly assigned to their respective groups using a lottery system.

The inclusion criteria were as follows:

1) Patients presenting with clinical signs such as nipple eczema-like changes, breast skin ulceration, or peau d'orange (orange peel-like texture) of the breast skin.
2) Patients classified according to the Breast Imaging Reporting and Data System based on mammography, breast magnetic resonance imaging, and breast color Doppler ultrasound: four categories of suspicious abnormalities, five categories of highly suggestive malignant tumors, and six categories of confirmed malignant tumors without biopsy.
3) Patients with no other severe diseases or malignancies.
4) Patients with complete clinical data, no mental health disorders, and the ability to cooperate with treatment.

The exclusion criteria were as follows:

1) Patients with a confirmed breast cancer diagnosis based on pathological examination.
2) Patients with severe comorbidities or other malignancies.
3) Patients who were unable to comply with treatment due to incomplete medical records or lack of cooperation.

This retrospective study was guided by findings from previous research and existing literature, suggesting that approximately 80% of patients receiving routine care experience psychological problems, whereas only 40% of those receiving timed narrative nursing report negative emotions. Using PASS 15 software with a significance level of $\alpha = 0.05$ and a confidence level of 90%, the minimum sample size required for each group was 30 patients (N1 = N2 = 30). After an initial screening of 138 patients, 111 who met the eligibility criteria were included: 53 in the routine care group and 58 in the timed narrative nursing group.

The study was approved by the Ethics Committee of Nanchang Third Hospital (Approval No. K-Iw2025001) and conducted in compliance with the Declaration of Helsinki (2013 revision). Informed consent was obtained from all participants before enrollment.

General information questionnaire

Data on demographic characteristics and clinical history were collected using a structured questionnaire. Demographic variables included age, educational background, place of residence, marital status, number of children, household income, and payment method for healthcare services. Clinical variables captured included the presence of comorbid conditions such as diabetes, hypertension, and coronary heart disease, as well as smoking and alcohol consumption history, frequency of routine physical examinations, and the completeness of diagnostic evaluations.

Nursing model

In the traditional nursing group, patients received standard care involving the distribution of health manuals, verbal explanations of health-related knowledge, and guidance for further examinations based on the doctor's advice. Additionally, communication between nurses and patients was prioritized to alleviate negative emotions and provide psychological support.

The timed narrative nursing group followed a structured model. A seven-member team was formed, comprising one head nurse as the team leader responsible for coordination and management, three nurses who implemented timed narrative nursing and maintained personal nursing files for each patient, two psychologists who trained and guided the team on the concepts, significance, methods, and skills of timed narrative nursing, and one nursing graduate student responsible for data collection and analysis.

The key psychological themes were identified by consulting breast cancer literature and incorporating clinical experience. These themes centered on psychological distress, self-efficacy, and coping strategies in patients with suspected breast cancer. Intervention plans were designed based on the psychological characteristics of patients during different stages, including the initial disbelief after receiving a suspected breast cancer diagnosis, the perioperative period, and times of emotional fluctuation during diagnostic evaluations.

The nursing interventions were executed using narrative strategies. Externalization involves guiding patients to express their emotions and recall personal experiences, allowing nurses to identify negative emotions and their underlying causes. Nurses named challenging situations to concretize and reframe them, redirecting the focus from fear to problem-solving. For instance, further testing was metaphorically called "beating the boss," breast cancer was described as a "thunderstorm," and the pain was termed "grueling goblins." This shift helped patients focus on overcoming challenges rather than dwelling on distress.

Next was deconstructing, wherein the nursing process focuses on exploring the patient's narrative and identifying the positive aspects, including both positive events and the positive components of otherwise negative events. For example, a guiding question might be, "Who or what do you think will help you the most during the boss fight?" Paraphrasing involved the nursing staff carefully reviewing the patient's narrative, highlighting the negative and positive aspects of their experiences. Using various methods, the nurses work to reconstruct these events, transforming them into new, coherent, and positive life experiences. Nurses also used questioning techniques to prompt patients to focus on the positive aspects of their situations, such as commending the patient for their resilience in facing the disease and encouraging them with positive feedback. For instance, a nurse might ask, "What gives you the strength to lead an active life despite being diagnosed with suspected breast cancer?" When dealing with patients diagnosed with breast cancer, nurses tailor their approach according to each patient's condition and experiences, enhancing cooperation by sharing personal cancer-fighting stories. This approach helps shift patients' perspectives, fostering a more positive outlook on their diagnosis. In the deepening part, throughout the nursing process, patients are actively guided to reflect on and express their thoughts. This encourages continuous self-reflection, allowing patients to modify their cognitive behaviors and deepen the narrative's impact. The study period was 4 weeks for both groups, providing ample time for these processes to unfold.

Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS)

All patients completed SAS [14] before and after receiving nursing care. This scale consists of 20 items, with each item scored from 1 to 4. The scoring categories are as follows: no anxiety (<50), mild anxiety (50–59), moderate anxiety (60–69), and severe anxiety (≥70). Similarly, all patients completed SDS [14] before and after nursing care. The SDS also includes 20 items, with the following scoring criteria: no depression (<53), mild depression (53–62), moderate depression (63–72), and severe depression (≥72). A patient is considered to have a negative mood if they exhibit symptoms of either anxiety, depression, or both.

PTGI and Connor–Davidson Resilience Scale (CD-RISC)

The Post-traumatic Growth Inventory (PTGI) [15] is a 21-item Likert scale designed to assess positive psychological changes that may occur following traumatic experiences. The scale consists of five factors: Relating to others (7 items), New Possibilities (5 items), Personal Strength (4 items), Spiritual Change (2 items), and Appreciation of Life (3 items). Each item is rated on a 6-point Likert scale ranging from 0 to 5, with total scores ranging from 0 to 105. A higher total score indicates greater reported positive changes, reflecting the extent to which an individual

perceives growth following trauma.

CD-RISC is used to evaluate the psychological resilience of patients in both groups. This scale measures three key dimensions of resilience: optimism, tenacity, and self-improvement. The total score ranges from 0 to 75, with higher scores indicating stronger psychological resilience.

Chinese Perceived Stress Scale (CPSS) and Depression, Anxiety, and Stress Scale -21 Items (DASS-21)

CPSS is based on the original version developed by Cohen et al. [16] and was revised for use in Chinese populations. The scale consists of 14 items, which measure two dimensions: tension and a sense of loss of control. The total score ranges from 0 to 56, with higher scores indicating a higher level of perceived stress. A total score greater than 25 suggests an excessive level of perceived stress. The Cronbach's alpha for the scale is 0.85, demonstrating good internal consistency.

DASS-21 is a simplified version of the original DASS [15] designed to assess emotional states related to depression, anxiety, and stress. The DASS-21 retains the same three subscales as the original, but each subscale consists of seven items that reflect negative emotional experiences or corresponding physiological reactions within the past week. The scoring for the DASS-21 is on a 4-point scale from 0 to 3, with 0 indicating "did not apply to me at all" and 3 indicating "applied to me very much or most of the time." The items are distributed across three subscales: the depression subscale, comprising items 3, 5, 10, 13, 16, 17, and 21; the anxiety subscale, comprising items 2, 4, 7, 9, 15, 19, and 20; and the stress subscale, comprising items 1, 6, 8, 11, 12, 14, and 18. Each subscale score is calculated by summing the item scores and then multiplying by 2 to obtain the final score. The classification of scores is as follows: for the stress subscale, scores of ≤14 are considered normal, 15–18 as mild, 19–25 as moderate, and ≥26 as severe; for the depression subscale, scores of ≤9 are normal, 10–13 as mild, 14–20 as moderate, and ≥21 as severe; for the anxiety subscale, scores of ≤7 are normal, 8–9 as mild, 10–14 as moderate, and ≥15 as severe.

European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 (EORTC QLQ-C30)

EORTC QLQ-C30 is a comprehensive scale designed to assess the quality of life in patients with cancer. It comprises 30 items and evaluates four key dimensions: physical functioning, social functioning, vitality, and general health. Items 29 and 30 are scored on a seven-point scale, ranging from 1 to 7, based on the response options provided. The remaining items are scored on a four-point scale, with options ranging from "none" to "a lot," and are assigned scores from 1 to 4 points. The total maximum score is 100, with higher scores indicating better quality of life.

Statistical analysis

Statistical analysis was performed using SPSS version 26 (IBM SPSS, USA). Continuous data were expressed as means and standard deviations, while categorical data were reported as frequencies and percentages. The results of each scale were analyzed using Fisher's exact probability test, *t*-test, and rank-sum test. Bonferroni correction was applied to adjust for differences between multiple datasets. Categorical data were analyzed using the Pearson chi-square test. A two-sided *p*-value of <0.05 was considered statistically significant.

3. Results

Baseline data

Of the two groups included in the study, 29 women in the traditional nursing group and 31 women in the timed narrative nursing group were aged 50 years or older. No significant differences were found between the two groups in terms of age, body mass index, number of children, spouse status, education level, place of residence, monthly income, regular physical examination, history of hypertension, diabetes, coronary heart disease, or payment method ($P > 0.05$), as shown in **Table 1**.

Table 1. Baseline data.

Item *N* (%)	Traditional nursing group	Timed narrative nursing group	X^2	*P*
Age(year)				
<50	24 (45.3)	27 (46.6)	0.018	0.893
≥50	29 (54.7)	31 (53.4)		
BMI (kg/m^2)				
<24	40 (75.5)	44 (75.9)	0.002	0.962
≥24	13 (24.5)	14 (24.1)		
Fertility or not				
Have children	47 (88.7)	50 (86.2)	0.154	0.695
No children	6 (11.3)	8 (13.8)		
Spouse or not				
Have spouse	50 (94.3)	52 (89.8)	0.768	0.381
No spouse	3 (5.7)	6 (10.2)		
Education level				
High School and below	42 (79.2)	47 (81.0)	0.056	0.813
High School or above	11 (20.8)	11 (19.0)		
Address				
Countryside	15 (28.3)	16 (27.6)	0.007	0.933
City	38 (71.7)	42 (72.4)		
Monthly household income (yuan)				
<5000	31 (58.5)	29 (50.0)	0.804	0.370
≥5000	22 (41.5)	29 (50.0)		
Regular physical examination				
Yes	17 (32.1)	21 (36.2)	0.210	0.647
No	36 (67.9)	37 (63.8)		
With hypertension				
Yes	12 (22.6)	11 (19.0)	0.228	0.633
No	41 (77.4)	47 (81.0)		
With diabetes				
Yes	6 (11.3)	10 (17.2)	0.787	0.375
No	47 (88.7)	48 (82.8)		

Table 1. (*Continued*).

Item *N* (%)	Traditional nursing group	Timed narrative nursing group	X^2	*P*
With coronary heart disease				
Yes	3 (5.7)	3 (5.2)	0.013	0.910
No	50 (94.3)	55 (94.8)		
Fee payment method				
Medical insurance	49 (92.5)	55 (94.8)	0.264	0.607
Self-financing	4 (7.5)	3 (5.2)		

SAS and SDS scores of the two groups

The results of the *t*-test indicated that all patients with suspected breast cancer experienced anxiety or depression. Both SAS and SDS scores showed a downward trend after nursing intervention. However, only the difference in SAS scores between the timed narrative nursing group and the pre-nursing scores was statistically significant (55.89 ± 6.22 vs. 47.57 ± 4.43), with a notable decrease in the timed narrative nursing group compared with the traditional nursing group (53.66 ± 3.74 vs. 47.57 ± 4.43). After the nursing intervention, both groups showed significant improvement in SDS scores ($P < 0.05$). No significant difference was observed between the two groups in post-nursing SDS scores (53.15 ± 4.06 vs. 50.87 ± 4.33). However, the mean SDS score in the traditional nursing group remained above 52, while the timed narrative nursing group showed a lower score, which indirectly suggests that the nursing intervention in the timed narrative nursing group was more effective, as shown in **Figure 1**.

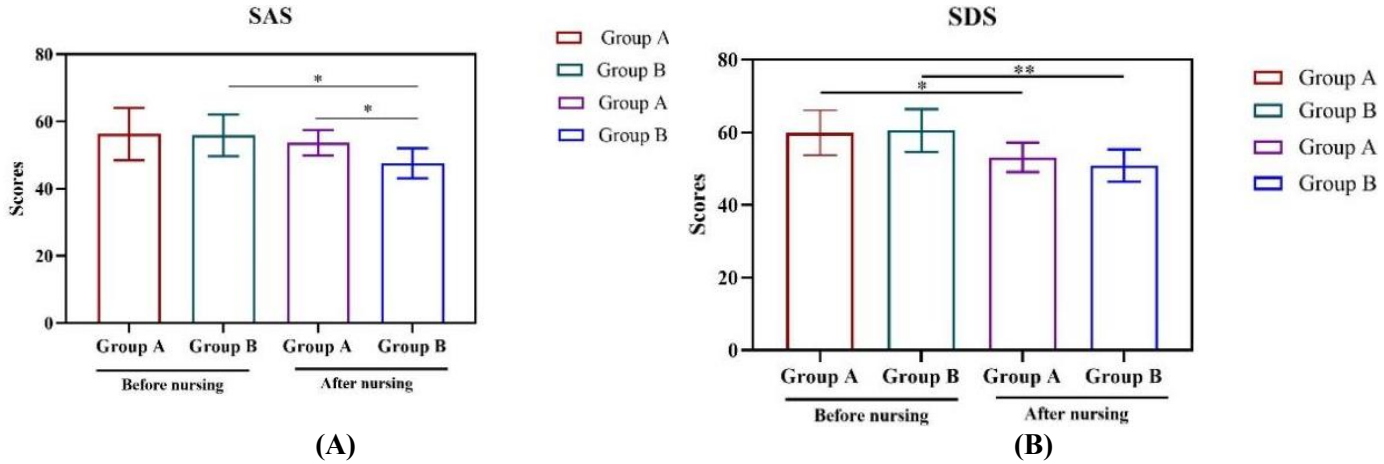


Figure 1. Comparison of SAS and SDS scores between the two groups **(A)** comparison of SAS scores between the two groups; **(B)** comparison of SDS scores between the two groups.

SAS, Self-Rating Anxiety Scale; SDS, Self-Rating Depression Scale; * means $P < 0.05$; ** means $P < 0.01$; Group A: Traditional nursing group; Group B: Timed narrative nursing group.

PTGI and CD-RISC scores of the two groups

Both groups showed a significant increase in CD-RISC scores after nursing treatment ($P < 0.05$). However, the timed narrative nursing group experienced a more substantial increase, from 54.36 ± 9.34 to 66.37 ± 8.63 ($P < 0.01$), which was significantly higher than the increase observed in the traditional nursing group (see **Figure 2**).

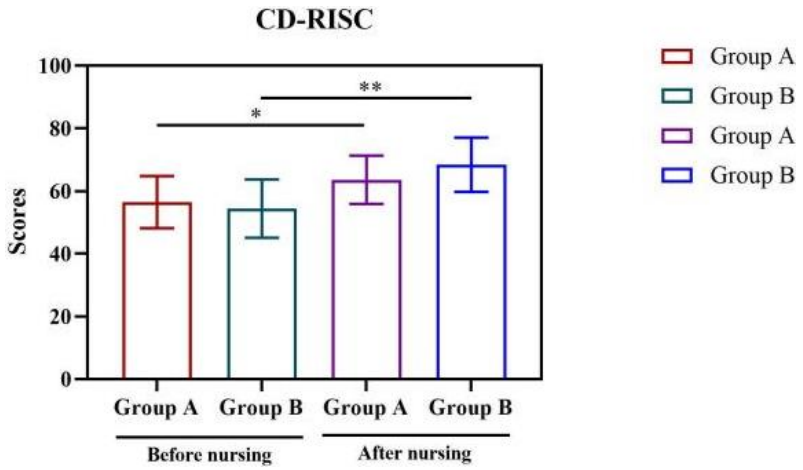


Figure 2. Comparison of CD-RISC scores between the two groups.

* means $P < 0.05$; ** means $P < 0.01$; Group A: Traditional nursing group; Group B: Timed narrative nursing group.

Before the nursing intervention, there was no significant difference in the PTGI scores between the two groups ($P > 0.05$). After nursing treatment, significant improvements were observed in Personal Strength (14.02 ± 3.02 vs. 16.24 ± 2.95), Appreciation of Life (10.65 ± 1.42 vs. 11.52 ± 1.09), and Spiritual Change (6.44 ± 0.76 vs. 7.16 ± 0.89) dimensions of both groups ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of PTGI scores between the two groups.

Item	Before nursing				After nursing			
	Traditional nursing group	Timed narrative nursing group	*t*	*p*	Traditional nursing group	Timed narrative nursing group	*t*	*p*
Personal strength	13.24 ± 3.76	13.46 ± 3.53	0.765	0.284	14.02 ± 3.02	16.24 ± 2.95	6.128	0.002
Relating to others	17.89 ± 4.78	17.46 ± 4.19	−0.189	0.692	20.36 ± 3.17	20.99 ± 3.09	1.189	0.087
New possibilities	12.19 ± 1.98	12.28 ± 2.01	0.097	0.871	14.76 ± 2.13	14.31 ± 2.34	−1.012	0.143
Appreciation of life	8.91 ± 2.48	8.85 ± 2.67	−0.175	0.724	10.65 ± 1.42	11.52 ± 1.09	4.989	0.023
Spiritual change	4.12 ± 1.02	4.13 ± 0.98	0.013	0.917	6.44 ± 0.76	7.16 ± 0.89	4.518	0.028

CPSS and DASS-21 scores of the two groups

The results indicated that both groups had stress perception scores exceeding 25 before nursing intervention. Following the nursing treatment, CPSS scores significantly decreased in both groups ($P < 0.05$). However, the difference in CPSS scores between the traditional nursing group before treatment (26.90 ± 5.12) and after treatment (24.37 ± 4.73) was not statistically significant, with the post-treatment scores falling below 25, as shown in **Figure 3**. Before the nursing intervention, there were no significant differences in DASS-21 scores between the two groups, either in the total score or in the scores for each dimension. After receiving nursing care, all scores in both groups decreased. However, the stress score and total score in the timed narrative nursing group were significantly lower than those in the traditional nursing

group ($P < 0.05$). No statistical difference was observed between the two groups in the anxiety and depression dimensions, as shown in **Table 3**.

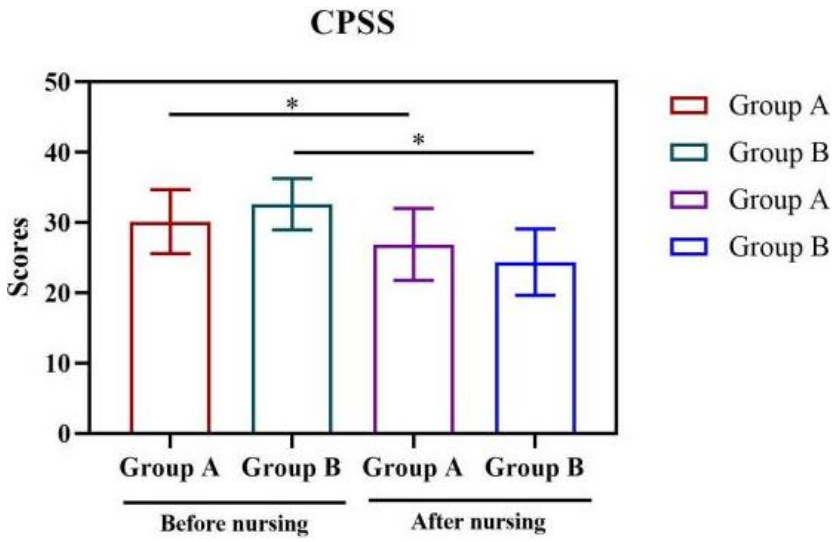


Figure 3. Comparison of CPSS scores between the two groups.

* means $P < 0.05$; Group A: Traditional nursing group; Group B: Timed narrative nursing group.

Table 3. Comparison of DASS-21 scores between the two groups.

Item		Stress	Depression	Anxiety	Total
Before nursing	Traditional nursing group	20.35 ± 5.24	11.74 ± 3.12	12.56 ± 5.92	47.30 ± 7.28
	Timed narrative nursing group	22.03 ± 4.95	11.66 ± 3.01	11.98 ± 6.11	48.25 ± 7.58
t		0.045	−0.050	−0.062	0.191
P		0.938	0.965	0.950	0.892
After nursing	Traditional nursing group	18.47 ± 4.72	9.43 ± 2.62	10.33 ± 4.04	40.68 ± 8.34
	Timed narrative nursing group	14.95 ± 5.05	8.34 ± 3.31	9.75 ± 4.73	34.13 ± 7.93
t		−2.619	−1.637	−1.552	−2.883
P		0.020	0.103	0.122	0.009

EORTC QLQ-C30 scores of the two groups

There were no significant differences in the quality-of-life scores of patients with suspected breast cancer between the two groups before nursing treatment ($P > 0.05$). However, significant improvements were observed in both groups following nursing intervention. Notably, in the Vitality and Social Function dimensions, the timed narrative nursing group showed a much more significant improvement than the traditional nursing group ($P < 0.05$), as demonstrated in **Table 4**.

Table 4. Comparison of EORTC QLQ-C30 scores between the two groups.

Item		Physiological function	Social function	Vitality	General health
Before nursing	Traditional nursing group	68.24 ± 9.35	65.74 ± 10.34	60.20 ± 8.83	63.62 ± 9.23
	Timed narrative nursing group	66.71 ± 8.80	67.23 ± 8.56	62.55 ± 11.25	64.57 ± 10.84
t		−2.642	0.063	0.124	0.058
p		0.879	0.934	0.863	0.880

Table 4. (*Continued*).

Item		Physiological function	Social function	Vitality	General health
After nursing	Traditional nursing group	70.35 ± 7.54	68.43 ± 9.35	65.38 ± 9.66	70.75 ± 9.65
	Timed narrative nursing group	72.28 ± 8.83	74.93 ± 10.44	70.46 ± 8.23	72.65 ± 11.49
t		6.342	4.324	3.056	0.084
p		0.502	0.035	0.020	0.849

4. Discussion

On average, 1 in every 8 women will develop breast cancer in their lifetime [17]. For many patients with breast cancer, negative emotions such as psychological stress and anxiety often arise after diagnosis, with the incidence ranging from 10% to 30% [8]. Prior to receiving a definitive diagnosis, patients frequently experience anxiety or depression due to uncertainty about the future and fear of potential negative outcomes [6]. Among all patients with cancer, the prevalence of depression in patients with breast cancer is second only to that of pancreatic and head and neck cancers [18]. In this study, pre-nursing treatment, anxiety, and depression were present in 17.12% and 13.51% of patients with suspected breast cancer, respectively, as indicated by their SAS and SDS scores. The process of receiving a diagnosis or understanding the prognosis can often lead to anxiety, depression, or other mood disorders. Timed narrative nursing, a novel intervention method, focuses on listening to and absorbing patients' stories. By reconstructing the meaning of their disease narratives, this approach identifies key points for nursing intervention, ultimately alleviating anxiety and depression [19]. The results of this study showed that timed narrative nursing significantly alleviated patients' anxiety. Narrative nursing, which employs reflective practices, guides nurses to improve future interventions by analyzing the actions and processes inherent in patients' stories [10,20]. By encouraging patients to describe their experience with discovering breast disease and expressing their emotions, appropriate timing helps them open up and vent their feelings. Furthermore, this timing enables patients to provide detailed and accurate accounts of their experiences, facilitating a deeper understanding of the progress and specifics of breast nodules or tumors.

In addition to experiencing negative emotions, patients with breast cancer often face significant psychological pressure. A study by Sarah Suet Shan Wong et al. [21] demonstrated that patients with breast cancer have poorer mental health than healthy individuals, highlighting the necessity of rehabilitation interventions. Post-traumatic growth refers to the positive psychological development that individuals may experience following traumatic events [22]. Those who have encountered trauma not only endure the physical and emotional pain it causes but also actively seek opportunities for personal growth, which fosters the development of positive psychological outcomes [23]. For patients with breast cancer, receiving a definitive diagnosis is a traumatic event that imposes considerable psychological stress [24]. In the present study, before nursing care, patients exhibited low scores for psychological resilience and PTGI. Timed narrative nursing facilitates the reconstruction of patients' cognitive understanding of their experience, guiding them to adopt a more accurate, positive, and optimistic perspective on both their illness and life in general. This

approach also encourages patients to tap into their potential for self-growth and recovery. These findings were corroborated in our study, where both psychological resilience and post-traumatic growth scores significantly improved in the timed narrative nursing group. Additionally, patients in this group showed a notable reduction in stress levels. These results suggest that timed narrative nursing plays a crucial role in restoring positive beliefs that promote survival, thus alleviating psychological pressure and supporting patients throughout their disease diagnosis and treatment journey. Furthermore, regarding the study of quality-of-life scores, the results revealed that both Vitality and Social Function scores significantly improved following nursing intervention. Cancer-related changes in bodily functions often lead to disruptions in emotional, role, social, and cognitive functions [25]. Through the positive reinforcement provided during narrative sessions, narrative nursing encourages patients to explore the value and meaning of their work and life, affirm their accomplishments, and recognize their importance. This process empowers patients to rediscover their self-worth, gain confidence, and find satisfaction in helping others, which ultimately rebuilds their belief in fighting the disease and improves their social functioning.

In summary, timed narrative nursing, as an innovative nursing intervention, effectively alleviates anxiety and depression, reduces psychological pressure, and enhances post-traumatic growth in patients with breast cancer. However, future research should include larger sample sizes to further validate these findings. The current study's sample was limited to a single center, and there may be sampling biases. Additionally, the theoretical framework of narrative nursing needs further standardization and clinical verification.

5. Conclusion

Timed narrative nursing can alleviate anxiety and depression in patients with suspected breast cancer, reduce their psychological pressure, and foster post-traumatic growth.

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Ethics approval: The procedures for both T1 and T2 surveys adhered to the (i) Declaration of Helsinki, and (ii) ethical principles for medical, psychological, and sociological research involving human participants. The Nanchang Third Hospital Research Ethics Committee approved the study protocol (protocol code: K-Iw2025001).

Informed consent statement: Informed consent was obtained from all subjects involved in the study.

Conflict of interest: The authors declare no conflict of interest.

References

1. Siegel RL, Miller KD, Wagle NS, et al. Cancer statistics, 2023. CA: A Cancer Journal for Clinicians. 2023; 73(1): 17–48. doi: 10.3322/caac.21763
2. Harris MA, Savas P, Virassamy B, et al. Towards targeting the breast cancer immune microenvironment. Nature Reviews Cancer. 2024; 24(8): 554–577. doi: 10.1038/s41568-024-00714-6
3. Arnold M, Morgan E, Rumgay H, et al. Current and future burden of breast cancer: Global statistics for 2020 and 2040. The Breast. 2022; 66: 15–23. doi: 10.1016/j.breast.2022.08.010
4. Goldfarb SB, Saban S, Arkema A, et al. Objective and subjective vulvovaginal symptoms in breast cancer patients. 2020; 38(15_suppl): e24056–e24056.
5. Nicholson WK, Silverstein M, et al. Screening for Breast Cancer. JAMA. 2024; 331(22): 1918. doi: 10.1001/jama.2024.5534
6. Dinapoli L, Colloca G, Di Capua B, et al. Psychological Aspects to Consider in Breast Cancer Diagnosis and Treatment. Current Oncology Reports. 2021; 23(3). doi: 10.1007/s11912-021-01049-3
7. Liu W, Liu J, Ma L, et al. Effect of mindfulness yoga on anxiety and depression in early breast cancer patients received adjuvant chemotherapy: a randomized clinical trial. Journal of Cancer Research and Clinical Oncology. 2022; 148(9): 2549–2560. doi: 10.1007/s00432-022-04167-y
8. Ng CG, Mohamed S, Kaur K, et al. Perceived distress and its association with depression and anxiety in breast cancer patients. Ho YS, ed. PLOS ONE. 2017; 12(3): e0172975. doi: 10.1371/journal.pone.0172975
9. Freitas PHB de, Meireles AL, Ribeiro IK da S, et al. Symptoms of depression, anxiety and stress in health students and impact on quality of life. Revista Latino-Americana de Enfermagem. 2023; 31. doi: 10.1590/1518-8345.6315.3885
10. Fitzpatrick JJ. Narrative Nursing: Applications in Practice, Education, and Research. Applied Nursing Research. 2017; 37: 67. doi: 10.1016/j.apnr.2017.08.005
11. Enzman Hines M, Gaughan J. Advanced Holistic Nursing Practice Narratives: A View of Caring Praxis. Journal of Holistic Nursing. 2017; 35(4): 328–341. doi: 10.1177/0898010117715849
12. Ekman I, Swedberg K, Taft C, et al. Person-Centered Care—Ready for Prime Time. European Journal of Cardiovascular Nursing. 2011; 10(4): 248-251. doi: 10.1016/j.ejcnurse.2011.06.008
13. Maagaard CA, Laerkner E. Writing a Diary for "You"—Intensive care nurses' narrative practices in diaries for patients: A qualitative study. International Journal of Nursing Studies. 2022; 136: 104363. doi: 10.1016/j.ijnurstu.2022.104363
14. Zigmond AS, Snaith RP. The Hospital Anxiety and Depression Scale. Acta Psychiatrica Scandinavica. 1983; 67(6): 361–370. doi: 10.1111/j.1600-0447.1983.tb09716.x
15. Tedeschi RG, Calhoun LG. The posttraumatic growth inventory: Measuring the positive legacy of trauma. Journal of Traumatic Stress. 1996; 9(3): 455–471. doi: 10.1002/jts.2490090305
16. Cohen S, Kamarck T, Mermelstein R. A Global Measure of Perceived Stress. Journal of Health and Social Behavior. 1983; 24(4): 385. doi: 10.2307/2136404
17. DeSantis C, Ma J, Bryan L, et al. Breast cancer statistics, 2013. CA: A Cancer Journal for Clinicians. 2013; 64(1): 52–62. doi: 10.3322/caac.21203
18. Golden-Kreutz DM, Andersen BL. Depressive symptoms after breast cancer surgery: Relationships with global, cancer-related, and life event stress. Psycho-Oncology. 2004; 13(3): 211–220. doi: 10.1002/pon.736
19. Wood PJ. Historical imagination, narrative learning and nursing practice: Graduate nursing students' reader-responses to a nurse's storytelling from the past. Nurse Education in Practice. 2014; 14(5): 473–478. doi: 10.1016/j.nepr.2014.05.001
20. Lee W, Jang SG, Pyo J, et al. Bridging Experience and Practice: A Grounded Theory Study of Nurses' Hospitalisation Experiences as Patients or Family Members. Journal of advanced nursing. 2025. doi: 10.1111/jan.16764
21. Wong SSS, Liu TW, Ng SSM. Performance of physical, cardiovascular, and psychological functions in middle-aged women with and without breast cancer. European Journal of Oncology Nursing. 2023; 66: 102399. doi: 10.1016/j.ejon.2023.102399
22. Magne H, Jaafari N, Voyer M. Post-traumatic growth: Some conceptual considerations (French). L'Encephale. 2021; 47(2): 143–150. doi: 10.1016/j.encep.2020.05.021
23. Henson C, Truchot D, Canevello A. Factors that hinder post-traumatic growth: A systematic review. L'Encéphale. 2022; 48(5): 560–562. doi: 10.1016/j.encep.2022.02.001
24. Chen X, Wang M, Yu K, et al. Chronic stress-induced immune dysregulation in breast cancer: Implications of psychosocial factors. Journal of Translational Internal Medicine. 2022; 11(3): 226–233. doi: 10.2478/jtim-2021-0050

25. Suarez-Almazor M, Pinnix C, Bhoo-Pathy N, et al. Quality of life in cancer care. Med. 2021; 2(8): 885–888. doi: 10.1016/j.medj.2021.07.005

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Article

Narratives of terminal illness: A psychological exploration of identity and meaning

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Abstract: Aims: This study aims to investigate the death narratives of terminally ill patients, with particular emphasis on the significant challenges they confront. By clarifying the intricate dimensions of their inner experiences, the study further seeks to understand how these individuals construct and manage their sense of identity within the context of illness and mortality. **Methods:** Drawing on death narratives related to terminal patients from "Terminal: Living with Dying" in Healthtalk database, this study applied Labov's narrative model and conducted thematic analysis to gain a deeper understanding of patients' lived experiences. **Results:** The analysis identified key themes within the death narratives, including coping with terminal illness, unraveling the role of the caregiver and family dynamics, navigating healthcare and palliative support, and exploring identity and self-perception. Additionally, the study stated the importance of narrative as a tool for identity construction, wherein terminal patients express their values and beliefs through self-narrative. **Conclusion:** This study highlights the potential of incorporating narratives into the care of terminal patients as a means of enhancing psychological support and therapeutic outcomes. By gaining a deep insight into patient's narratives, healthcare providers can develop personalized treatment plans, thereby improving the quality of life for terminal patients.

Keywords: terminal illness; Labov's narrative model; identity construction

1. Introduction

Death is an inevitable part of human existence. The various forms of discourse related to discussions of death or dying events are referred to as "death discourse" [1]. It uncovers much about social attitudes, cultural norms, and individual psychological state. In recent years, death discourse has gained significant attention in the fields of linguistics, psychology, sociology, and medical humanities [2]. Carpentier and Brussel pointed out that death is one of the most ubiquitous phenomena in society. It is sometimes described, with a touch of drama, as the "only certainty in life". Furthermore, death is a discourse that seeks to capture human decay, associated with keywords such as ending, cessation, termination, negativity, irreversibility, and inevitability. The contingent nature of death implies that specific cultural and historical backgrounds can influence the discourse of death over time [3]. In sociology, Tony Walter advocated for a comprehensive understanding of death that transcends disciplinary boundaries, focusing on marginalized groups' death experiences. He also urged the revision of sociological theories of death to tackle contemporary global challenges while preserving ties to mainstream sociology [4]. In the same vein, Thompson et al. emphasized the significant role of broader social factors in shaping individuals' life experiences, highlighting the need to

understand and cope with death, dying, and grief through the interaction between individuals and society from a sociological perspective [5]. The discourse of death within the framework of medical rationalism also indicates the instability and contingency surrounding death. In medical humanities, the discussion on death has expanded to encompass the narratives surrounding illness. Early studies by Frank explored illness narratives, particularly those related to terminal illness, highlighting how these stories influence both personal and cultural perceptions of mortality [6]. This interdisciplinary interest stems from the recognition that the discourse of death is not merely descriptive but also profoundly formative [7], which influences how individuals and societies perceive and cope with the end of life.

In the context of terminal illness, death discourse takes on a particularly important role. Terminally ill patients, who are acutely aware of their impending mortality, engage in conversations about death that are rich with meaning and emotion. These conversations can occur in many settings—during clinical consultations [8], with family members [9], or in personal reflections [10]—and serve as a crucial means for patients to process their experiences. For these individuals, death discourse is not just a matter of discussing a distant event, but a reality that shapes their remaining time, relationships, and sense of self.

To date, researchers have explored various forms of discourse related to death, including metaphors [11,12], euphemisms [13], and narratives that individuals use to discuss illness and death [14]. Seale's foundational works on the social construction of death has significantly influenced our understanding of how individuals and society perceive death. Specifically, the social aspects of death he explored included the healthcare system, family dynamics, social norms, and how individuals cope with death and loss [15]. Research on end-of-life communication has further enriched this area of study. Molzahn et al. indicated that end-of-life care for heart failure patients centered on effective communication between healthcare providers and patients. While patients accepted their prognosis, they sought frank yet compassionate discussions that balance acknowledging mortality with maintaining hope. This delicate balance requires improved palliative care services and better communication training for healthcare providers [9]. Building on this foundation, researchers have explored autothanatography, a concept that is defined as stories of dying. It emphasized the immediate experience of terminal illness rather than retrospective reflections [16]. Other studies argued that such narratives are heavily influenced by sociomedical discourse and editorial practices which challenged the authors' attempts to maintain narrative control and authentic self-representation. Unlike traditional autobiographies, autothanatography captured the urgency and immediacy of the dying process, revealing the complex interplay of personal experiences, social stigma, and medical interpretations of illness [17]. Thus, this genre illustrated how individuals negotiate their identities and bodily experiences under the constraints of terminal illness and the broader cultural narratives about death and dying.

The study of death narrative embodies both linguistic exploration and practical relevance for multiple fields such as palliative care [18], mental health [19,20] and communication [21]. To date, contemporary research presents a psychological exploration of how individuals confront the end of life [22]. Through these narratives, terminally ill patients can identify complex emotions such as fear,

acceptance, hope, and despair, while grappling with the redefinition of their identities in light of their treatment. This echoes the study of Gabay that was engaged with affect and identity through a non-heroic death narrative of a terminally ill cancer patient. Through in-depth narrative interviews with a cancer patient Dan, she concluded that the decline of Dan's physical body, along with the simultaneous development of cognition and emotion resulted in a clear sense of self-identity and a feeling of completeness [23].

Death narratives, a subset of illness narratives, describe the process of dying. It has led to a re-examination of the doctor-patient relationship, advocating for a more humane and respectful medical service model. As a clinical and literary extension of literature-and-medicine and relationship-centered care, narrative medicine looks at patients' illness narratives as an important and credible source of knowledge [24]. Three focuses of narrative medicine are the relevance of doctor-patient relationship, empathy and negative emotions [25]. It shoulders the mission of finding and bridging the differences between doctors and patients. Those are the two subjects of medical care in which discussing life and death is part of doctor-patient communication. It is not simply about copying the human life story on a technical level, but more about seeking the meaning of life stories. Doctors often have more scientific judgments of diseases with evidence-based medical view, while patients experience physical and mental torture, blending worry and fear. In hospice care, where patients are on the brink of death, the need for humanistic care is particularly acute.

Knowledge of how illness impacts on the patients with incurable cancer in hospice care is quite conducive to developing patient-centred cancer nursing and offering patient support. These narratives are particularly compassionate as they represent the final opportunity for individuals to express their identities and the meanings they ascribe to their lives. Many patients facing serious illnesses, such as advanced cancer, frequently feel a loss of dignity and a deficiency in spiritual support. The sense of dignity in cancer patients is an important indicator of their well-being [26]. Engaging in narrative process enables these patients to actively pursue meaning in their life events, which is crucial for their mental and emotional health [27]. Bluck et al. showed that cancer patients often explore various ways to meaning making in their experiences while sharing their life stories during dignity therapy (DT) [28]. By constructing narratives, patients not only process their challenges but also create a sense of purpose, which enhances their dignity and quality of life. Froggatt and Leder [29,30] proposed that terminally ill patients can gradually lose their sense of identity and personhood as their illness becomes increasingly isolating and difficult to communicate about. This notion was further elaborated by Ho et al. [31], who found that terminal cancer patients maintained their dignity through narrative and meaning-making. These processes enabled them to reconstruct their personal and collective identities during the ambiguous state between life and death, ultimately facilitating healing amid their suffering. The study also discovered that personal autonomy and family connections are two key themes for patients in preserving their dignity as they approach the end of life. Existing literature on illness narratives has demonstrated that storytelling serves as a vital coping mechanism for patients [10]. By organizing their experiences into coherent

narratives, individuals can make sense of their suffering, maintain a sense of continuity in their identities, and find purpose despite the inevitability of death [32]. However, much of research only focused on the external environment of the dying, rather than probe into the dying themselves. Thus, it failed to reveal the psychological state of the dying at a deeper level. Furthermore, there has been less emphasis on the structural aspects of death narratives and how these structures relate to the psychological process of identity and meaning-making.

Other relevant studies on narrative analysis of death or dying focus on the role of healthcare professionals and family members in constructing these narratives. These key figures provide multiple perspectives on the social relationships for the patients during the end of life. Walsh et al. [33] employed narrative inquiry to explore caregivers' experiences of cancer patients' final day. Their study informed the complex and multifaceted nature of the caregiving experience at the end of life and emphasized the need for comprehensive, compassionate support systems. Tarberg et al. [34] investigated family caregivers' experiences of involvement in palliative care through narrative interviews. Their findings revealed limited caregiver involvement across different phases of care, with emphasis on patient-centered rather than family-centered approaches. Laperle et al. [35] used narrative analysis to explore the experiences of family members who have lost loved ones. They discovered the emotional challenges patients faced and the strategies they used to cope with grief. The research indicated the importance of social support and communication in managing the complexities of death and bereavement and it confirmed that collective narratives can provide comfort and meaning in the face of loss.

Building on the role of collective storytelling, digital storytelling has emerged as a powerful tool for exploring death narratives, particularly in the context of bereavement. It leverages modern technology to facilitate the sharing and preservation of personal stories, thus extending the therapeutic benefits of narratives. Rolbiecki et al. utilized digital storytelling as a meaning-centered intervention, allowing individuals to create and share their experiences of loss [36]. Ryu & Price introduced the VoicingHan project which used avatar technology for life review. This intervention enabled cancer patients to reconstruct narratives and make meaning. The results indicated that avatar-mediated life review facilitated spontaneous narrative reconstruction and enhanced participants' psychological well-being and meaning-making in end-of-life care [37].

To further understand the structure of these death narratives, Labov's narrative model has been of significance in the study of death related narratives. By providing a systematic approach to analyzing the components of a story, Labov's six-stage model—abstract, orientation, complicating action, evaluation, resolution, and coda—offers an overall framework for dissecting how stories are constructed and conveyed [38]. The Labovian approach provides a useful perspective for understanding narrative structure, particularly in oral narratives of personal experience. However, it is crucial to recognize that this framework may not fully capture the complexity and diversity of narrative forms across different contexts and cultures. Johnston explained that when Labov referred to a "complete", "normal", or "fully-formed" narrative, he was describing a more elaborate form that includes additional elements

such as orientation and evaluation beyond the basic temporal sequence. This was not meant to imply that other forms of narrative are incomplete or inferior [39]. Labov's model has been utilized in many different spheres and settings, including education [40], health care [41], courtroom discursive practices [42], and rape narratives [43]. Regarding the construction mode and influence of illness and death related narratives, Rosenblatt employed Labov's narrative model to analyze the narratives of women with advanced cancer. The results showed that patients used narrative elements to express their illness experiences and their coping mechanisms for the emotional challenges [44]. Similarly, Duncan utilized Labov's narrative model to analyze the 'death knock' interview narratives gathered from the bereaved, in order to reveal how the bereaved talk about grief and how the journalists interpret it [45]. By using Labov's narrative framework to examine the structures of the bereaved's narratives, Stemen explored how After Death Communication (ADC) affects their social convoys and continuing bonds with deceased persons [46]. Taken together, previous studies demonstrated that Labov's narrative model plays an important role in understanding and constructing death-related narratives. Furthermore, narrative structure influences individuals' comprehension and emotional processing of illness, grief, and relationships with the deceased.

Building upon this, the present study aimed to analyze the narrative structures of terminally ill patients based on Labov's narrative model. Specifically, it investigates the narrative components—abstract, orientation, complicating action, evaluation, resolution, and coda—in the patients' lived experience stories. This study seeks to answer three research questions: (1) What are the narrative structures employed by terminally ill patients? (2) What are the main themes and sub-themes of the death narrative of terminally ill patients? (3) How do terminally ill patients construct their identity through their narratives? The purpose is to better understand the ways in which patients derive meaning from their experiences and provide healthcare and caregivers with useful suggestions on how to enhance the quality of care and support.

2. Methods

Data collection

All interview data used in this study were collected from the Healthtalk website (https://healthtalk.org/), which is an open platform database [47]. The data is protected under its copyright. We conducted a secondary analysis. All analyses were conducted in strict accordance with Healthtalk's terms of use and privacy policy to ensure the privacy and security of the participants' information.

The death narrative corpus of terminally ill patients was manually selected from "Healthtalk: Terminal: Living with Dying" (https://healthtalk.org/introduction/living-dying). Demographic data was obtained for a total of 39 terminally ill patients, including details such as age, gender, and type of illness. **Table 1** provides the demographic data collected by researchers on the Healthtalk database. The corpus itself consists of almost 200 narrative articles. These articles provided detailed descriptions of the patients' experiences and perspectives on a range of topics related to death and dying.

Table 1. Demographic data of terminally ill patients.

Patient ID	Sex	Age at interview	Age at diagnosis	Diagnosed with
1	M	32	31	A brain tumour and epilepsy
2	F	61	39	Breast cancer
3	F	71	71	Bowel cancer
4	F	63	61	Leukaemia
5	M	64	62	Cancer of the colon
6	M	53	50	Multiple System Atrophy
7	F	82	64	Breast cancer
8	F	51	49	Breast cancer
9	M	52	37	Testicular cancer
10	F	67	56	Lymphoma
11	F	65	57	Breast cancer
12	F	50	42	Breast cancer
13	M	59	57	Prostate cancer
14	F	68	57	Breast cancer
15	M	75	73	prostate cancer
16	F	58	56	Cancer of the kidney
17	M	74	72	Bladder cancer and prostate cancer
18	M	54	53	Mesothelioma
19	M	72	70	Cancer of the pancreas
20	M	66	66	Oesophageal cancer
21	F	67	57	Hydrocephalus
22	F	76	74	Breast cancer
23	F	61	57	Chronic obstructive pulmonary disease
24	F	41	24	End stage Chronic Obstructive Pulmonary Disease
25	F	75	74	Colorectal cancer
26	M	70	68	Secondary progressive multiple sclerosis
27	F	43	38	Breast cancer
28	F	61	41	Parkinson’s disease
29	M	58	56	Colorectal cancer
30	M	72	71	Non-Hodgkin’s lymphoma
31	F	50	48	Colorectal cancer
32	M	62	61	Lung cancer
33	F	70	62	Developed motor neurone disease
34	F	56	55	Multiple myeloma and AL amyloidosis
35	F	57	52	Ovarian cancer
36	M	84	82	Bladder cancer
37	F	63	56	Non-small cell lung cancer
38	F	58	49	Ovarian cancer
39	M	66	63	Prostate cancer

This study comprised a total of 39 patients, among whom 32 were diagnosed with different types of cancer, such as breast cancer, colorectal cancer, testicular cancer, and prostate cancer. The remaining seven patients presented with non-oncological conditions: one case of multiple system atrophy, one of hydrocephalus, and one of chronic obstructive pulmonary disease (COPD). Additionally, one patient had end-stage COPD, one was diagnosed with secondary progressive multiple sclerosis, one had Parkinson's disease, and one had developed motor neurone disease.

According to the broad definition by a prominent sociolinguist Yihong Gao, death discourse pertains to written, textual, or multimodal presentations related to death or dying, including their products, the process of their production, the contexts that influence them, and those that they construct [48]. In alignment with our objective to explore patient-constructed lived experiences through a narrative perspective, the term "death narrative" was employed in data analysis. Most patients, particularly those with cancer, discussed topics such as preferred place of care in their final days, palliative care, living wills, suicide, assisted death, euthanasia, and their spiritual or religious beliefs. Therefore, our analysis covered the vast majority of the patients' narratives.

For the structural analysis of the narrative, this study followed certain criteria for narrative selection, which was based on the underlying requirement of whether it constituted a narrative. We screened out the 'narrative' as a sequence of clauses with at least one temporal juncture defined by Labov. Narratives that were too short and highly engaged by the interviewer were all excluded. For the thematic analysis, we exhaustively utilized each interview texts.

3. Data analysis

This study combined Labov's narrative model and thematic analysis through Nvivo 14 software. The data analysis aimed to comprehensively understand the narrative structures and the deeper psychological state expressed by the patients. The three procedures involved are identifying narrative elements, extracting themes, and engaging in an iterative process of theme refinement.

According to Braun and Clarke's six-step approach [49,50], two members of our team started by independently reading the transcripts and understanding the breadth and depth of the data. We performed a comprehensive coding framework. This framework incorporated both narrative elements (e.g., abstract, orientation, complicating action, evaluation, resolution, and coda) and thematic categories. Data was coded using the agreed-upon framework. We used open coding, focusing on both narrative structures and potential thematic elements. After initial coding, we compared each element of the Labov's narrative model in our individual codes. We discussed any differences, explored the reasons underlying each code, and collaboratively resolved any disagreements to reach a consensus. If needed, we referred back to the original data to clarify our decisions. We categorized the codes into broad overarching themes based on code similarities. Subsequently, we defined and named the themes.

To reach the final consensus, we considered four important factors. First, we ensured that each participant's story was fully represented in our analysis. Second, we maintained theme saturation during the extraction process. It means that we conducted continuing analysis until no new themes emerged. Third, we noted the points of agreement and inconsistency between the two data analysis methods. Our readings were complementary and validated each other, with no points of disagreement. Lastly, we consistently reflected on our interpretations to identify any biases.

3.1. Identifying narrative elements

The first step in the analysis involved identifying and coding the narrative elements based on Labov's narrative model in the interview texts. Labov's model provides a structured framework for understanding how narratives are constructed. Specifically, the abstract typically captures the summary or main point of the story, while the orientation provides background information about the context in which the narrative takes place. The complicating action elaborates on the sequence of events or the central issue. During the evaluation, the narrator reflects on the significance of the events. The resolution presents the outcome, and the coda brings the narrative to a close, linking the story back to the present [51,52]. Each element serves a specific function in the narrative, contributing to the overall coherence and meaning of the story. The analysis was conducted on a carefully selected set of interview texts, and 77 texts that were short or had close conversations with the interviewers were manually excluded.

In this study, Nvivo14 software was used to systematically analyze interview transcripts, and each of Labov's six narrative elements was taken as a coding node. By coding these elements, the study divided the narratives into their constituent parts, allowing for a detailed analysis of how terminally ill patients organize their stories. This step laid the groundwork for identifying broader themes in the subsequent stages of analysis.

3.2. Extracting narrative themes

Following the identification of narrative elements, the next step was thematic analysis. Thematic analysis helps us go beyond the structure to explore the underlying meanings conveyed by the patients. Themes such as identity reconstruction, meaning-making, coping mechanisms, and emotional responses were identified and analyzed. We derived the themes from the data, and then selected the relevant excerpts from the death narratives to present the findings. This comprehensive approach ensured that the analysis captured the full spectrum of the patients' experiences, providing a view of how they navigated their identities and searched for meaning in the face of terminal illness.

3.3. Iterative process

The final stage of the analysis involved an iterative process of refining and interpreting the identified themes. During this stage, the initial themes were revisited and further subdivided into more specific sub-themes. For instance, the theme of

"coping with terminal illness" might be broken down into sub-themes such as "emotional struggles and acceptance" and "fear and awareness of death". By continuously refining the themes, we aimed to better understand the psychological aspects presented in the illness narratives of terminally ill patients. It's important to note that these narratives do not provide direct access to patients' psychological states, but rather offer a reconstruction of their lived experiences. As Williams pointed out that illness narratives were carefully curated accounts by patients, which reflected their interpretation and presentation of their experiences [53]. Our analysis on psychological exploration in these narratives recognized that they represented a selective retelling of events. This selection by the patients is a significant aspect of illness narratives, as highlighted by Patterson's analysis of the "liminal zone" in illness narratives. Patients choose which events to include or exclude in their death narratives, shaping the overall narrative structure and content [54].

4. Results

The aim of this study is to capture the narrative construction of patients from their lived experiences. By doing so, we can explore their psychological state and provide evidence for their meaning-making process, which further exhibits the dynamic characteristics of their identity. The following narrative patterns, themes and sub-themes highlight their experiences.

4.1. Patterns in narrative structure

4.1.1. Unstructured presentation in narratives

Findings show that out of 123 narratives examined, only 30 narratives included all six elements of the Labov's model. The absence of certain narrative elements, such as the abstract and coda, may suggest that patients paid more attention to the direct and urgent aspects when they described their illnesses. This way of expressing themselves does not require a summary or conclusion; rather, it reflects their genuine experiences and feelings. In short, this unstructured pattern indicates that patients need to deal with current challenges instead of framing their experiences within a traditional storytelling structure.

4.1.2. The element of evaluation in narratives

Another noteworthy finding is that, despite the lack of a complete structure in many narratives, the evaluation element occurred frequently throughout most patients' accounts. Evaluation refers to the patients' reflections and assessments of their experiences. The prevalence of evaluation denotes that patients are not just telling their stories but also sharing deep emotions and psychological experiences related to these events. Patients are encouraged to share their struggles with others who may be facing similar challenges. This shared understanding can be beneficial because it acknowledges their feelings and experiences and strengthens their sense of identity during the challenges of illness.

4.1.3. The combination of orientation, complicating action, evaluation, and resolution

Most narratives include the elements of orientation, complicating action, evaluation, and resolution. The combination of these four elements forms the core of the patients' narratives. Orientation provides background information, allowing listeners to understand the time, place, and characters involved in the story. Complicating action depicts the challenges or conflicts within the narrative, serving as its driving force. Evaluation reflects the patients' subjective feelings and assessments regarding these events. Resolution completes the narrative by showing how the conflicts or challenges are settled and provides a sense of closure or understanding for the listener [55]. This narrative pattern showcases the complex psychological state that patients experience in the face of illness, including their anxieties, fears, hopes, and outlooks for the future. One example (see **Table 2**) of this narrative comes from a patient who was diagnosed with Ovarian cancer.

Table 2. Narrative structure of patient 38.

Elements	Illustrative quotes	Descriptive analysis
Abstract		
Orientation	"The other thing is I want to find out what to do with my body because I wanted to leave it."	This introduces the context of the narrator's concern about the disposition of her body after death. It provides the setting for the subsequent narrative about her plans and thoughts.
Complicating action	"I have actually left it in my Will to anatomy, to go to be recycled, rather. I'd much rather my body's used for somebody to experiment with or fine but they won't…, I don't think they want it with its disease and especially if it's malignant, so now I have to find out if there is any other way that I can dispose of it that way."	The complication arises from the narrator's realization that her plan to donate their body to anatomy might not be feasible due to the presence of disease, leading her to seek alternative ways to handle her body after death.
Evaluation	"It's something that's not going to cause any problem. It's got to be easy for them because obviously it's going to be a sad time so I hope…, I shall go into this during my next chemo, when I've got time, and see if I can come up with something."	The narrator evaluates the situation by expressing concern for her family and a desire to make the process as smooth as possible for her, indicating her thoughtfulness about her family's emotional burden.
Resolution	"If not, it's where my kids want to bury me and whether it's helpful or whether it's cremated."	The resolution is provided here as the narrator considers alternative options based on her family's preferences, indicating flexibility in her plans for after her death.
Coda		

Many patient narratives lack abstracts and codas as mentioned, which differs from the traditional narrative structure. As the beginning of the narrative, abstracts are often missing. Some patients feel they do not need to or do not have the mental space to frame their stories in this way. Similarly, the absence of codas might reflect the continuing and unresolved nature of the patients' experiences, where definitive conclusions are difficult to express.

In summary, the findings from the analysis of patients' narratives indicate the distinct ways in which individuals facing terminal illness construct their stories, focusing primarily on the core elements of orientation, complicating action, evaluation, and resolution. The frequent presence of these elements agrees with the centrality of contextualizing their experiences. The absence of abstracts and codas in many narratives suggests that patients may be less concerned with framing or

concluding their stories in a traditional way. The results identify these narratives as fluid structures that mirror the patients' ongoing efforts to make sense of their situation, maintain a sense of identity, and find meaning from uncertainty.

4.2. Themes and sub-themes of the narratives of terminally ill patients

These narrative interview texts present the lived experiences of individuals confronting terminal illness. Several key themes emerge based on detailed analysis,. **Figure 1** outlines the themes from the results. It establishes a clear internal logic between the main themes and sub-themes by illustrating the internal and external dimensions surrounding patient-centered lived experience. The themes are deeply interconnected and collectively illustrate how the patients manage their reality, seek understanding, and attempt to find meaning and control in the face of profound life changes. The following sections conduct an in-depth analysis of these themes, using interview excerpts as illustrative examples for each theme.

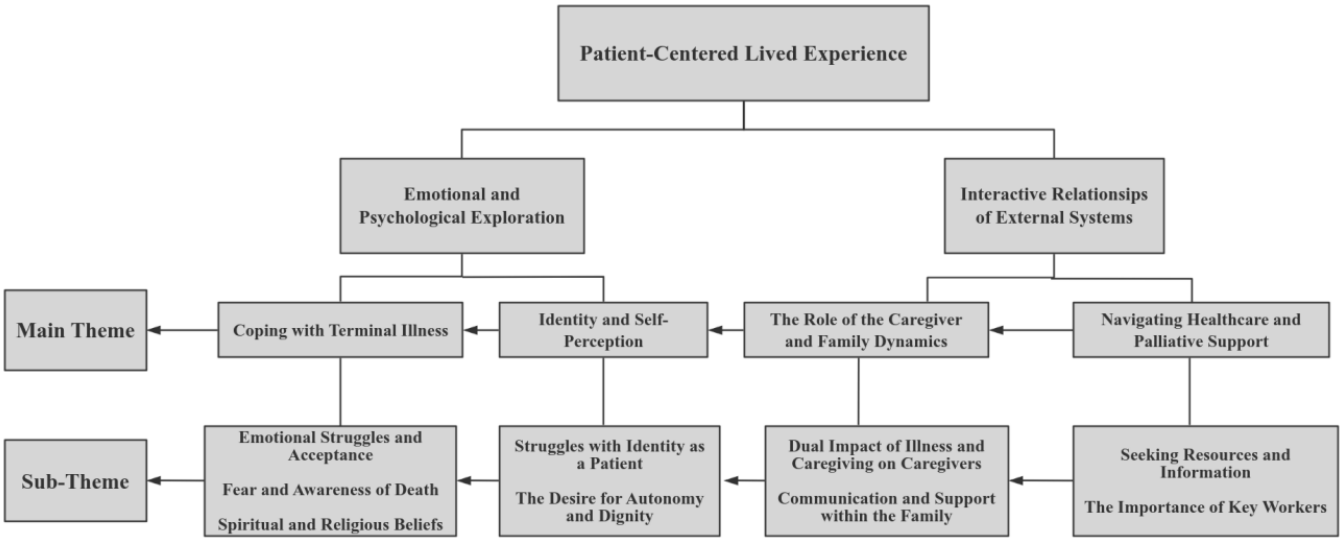


Figure 1. Themes and sub-themes of narratives of terminally ill patients.

4.2.1. Coping with terminal illness

Emotional struggles and acceptance

Patient's struggle with accepting their terminal illness is palpable in statements like, "I can't accept it, I just can't believe this is happening to me". This clarified the emotional resistance to the reality of their diagnosis. The repeated use of "I just can't believe" emphasizes the lasting internal conflict and denial, which is common among terminally ill patients facing a sudden and life-altering prognosis. One patient's mention of seeing others decline rapidly in the hospice—"I saw them come in on day one they'd be fine, chatting, and by about day four or five they'd gone"—adds to his fear and emotional turmoil. The observation of the dying process leads to the patient's difficulty in coming to terms with their own impending death, intensifying their emotional struggle.

Fear and awareness of death

The fear of death and the process of dying is vividly expressed when the patients say, "I have seen what happens at the end, and if I could avoid it happening to me I would, simple as that". The words show a clear awareness of the inevitability of death and the fear of the suffering that might precede it. The contemplation of assisted suicide, as in the statement, "If somebody wanted to help me…, if somebody was brave enough to help me, I'd be grateful to them", reflects the patient's desire to maintain control over their dying process. Accordingly, this consideration manifests a fear not just of death itself, but of a prolonged, painful, and undignified dying process.

Spiritual and religious beliefs

A patient clearly expressed her spiritual beliefs: "I think probably I'm a humanist". Her philosophical outlook is reflected in her positive approach to life, choosing not to ask "Why me?" but instead gratefully saying "Hey, lucky me, I responded well to the treatment". This demonstrates her rational and optimistic way of dealing with illness, rather than rely on traditional religious beliefs.

Another patient shared an open-minded perspective towards diverse religious traditions, acknowledging that "there's a lot of incredible comfort to be drawn from other religions, even if you're not religious". This suggests an inclusive approach to finding meaning in different belief systems. The patient found solace in various religious philosophies about death, particularly the concept that death is "just the end of this part of existing. Not necessarily the end of everything". This interpretation offers a broader perspective on mortality providing for understanding death as a transition rather than an absolute end. Their reflection that death is "something to be mourned by others but you're not going to be doing the mourning" shows a practical and philosophical acceptance of mortality.

A patient's narrative reflects her struggles with her spiritual and religious beliefs when dealing with her terminal illness. As she stated, "When I had the breast cancer I decided there was nobody up there, regardless. I did used to go to church, I was confirmed, I did used to take confirmation but I dropped it some years ago, but still at the back of me I thought yes there is a God". This shows her initial questioning of God's existence after her breast cancer diagnosis, despite her previous religious involvement.

4.2.2. The role of the caregiver and family dynamics

The dual impact of illness and caregiving on the caregiver

A patient discussed the impact of illness on her husband, noting, "He wasn't going to the gym, and so he put on weight and then he was found to have high blood pressure". It illustrates how the caregiver's health can deteriorate as a result of the increased responsibilities and stress in caring for a terminally ill loved one.

The fact that the caregiver's health was being neglected—"It was actually over a year before we realized that his health was suffering because of my illness"—indicates the focus on the patient's needs often overshadow the well-being of the caregiver. This phenomenon is common in terminal illness scenarios, where the caregiver's physical and emotional needs may be inadvertently overlooked.

Communication and support within the family

The importance of open communication can be seen in a patient's appreciation of being able to talk with her husband: "I'm very fortunate in that respect that my husband and I do talk about things". This suggests that maintaining open lines of communication is conducive to emotional support within the family during such a difficult time.

Patients also touch on the challenge of discussing their illness with family members: "It's a huge shock to realize that perhaps the person isn't going to live very long". This underscores the emotional burden of not only dealing with their own mortality but also managing the emotional responses of their loved ones. Another patient described her experience of actually sharing the news with her son, who responded with a simple "Oh" and did not display an overt emotional reaction. The patient's recollection of this interaction, where she said "I can't quite remember but I think my son phoned me one day when I was crying. I was having a bad day and so he said, 'Oh, what's the matter?' And I said, 'I have to tell you, I've got cancer'. And he just said, 'Oh'". It demonstrates the immense emotional burden the patient experienced in breaking the news to her family. But she then said again "having four children was a great help because they all came to my house". This shows the dynamics within her family as they face the challenges regarding her terminal illness.

4.2.3. Navigating healthcare and palliative support

Seeking resources and information

The patients' proactive approach to managing their illness is evident when they mention, "And another nurse told me that I could apply for palliative care through my GP". This shows the importance of seeking out available resources to improve their quality of life.

Additionally, the use of a TENS (Trans Electrical Nerve Stimulation) machine, as mentioned in "One thing that she suggested to me at one stage was a TENS machine…, and I was able to hire one from the local pharmacy for a week and try it out", illustrates the patient's willingness to explore various options for pain management, including those that might seem unconventional or unfamiliar at first.

The importance of key workers

The hospice nurse's role is crucial, as a patient stated, "My hospice nurse says that she is my key worker". This indicates that the nurse not only provides medical care but also acts as a central figure in coordinating the various aspects of the narrator's care. The key worker's role is highlighted again when a patient describes how the nurse facilitated services like meal delivery: "She pointed out that there were two things in the neighborhood that could help with that".

The patient's reliance on the hospice nurse for prescriptions—"If I haven't got enough of some particular prescription, then she has very close contact with the GPs and she can just get any prescription"—further emphasizes the significance of having a dedicated key worker who can manage both medical and logistical needs.

4.2.4. Identity and self-perception

Struggles with identity as a patient

The patients' reluctance to accept their identity as someone who is "old" or terminally ill is reflected in their statement, "We never see ourselves as old do we"? This suggests a disconnection between the patient's self-perception and the reality of their situation, a common struggle for those facing life-limiting illnesses.

Another patient's comparison to their mother and aunt who lived to over 100—"My mother lived to 101 and her sister lived to 103…, I thought I'd got another forty years to live"—unveils his expectation of longevity and the shock of having that expectation shattered by illness. This also indicates that it is hard to reconcile their self-identity with their new reality as a terminally ill patient.

The desire for autonomy and dignity

The patient's consideration on the right to die—"It's almost a nonsense if we can't decide what to do with our life at the end, isn't it?"—recognizes a strong desire to retain control over their own destiny. This desire for autonomy is a significant theme, as it represents the patient's struggle to maintain dignity and self-determination.

"Why should a judge be able to say no I can't kill myself if I want to?" shows the frustration at the lack of autonomy and exposes the deep conflict between the patient's personal values and the social or legal restrictions placed upon end-of-life choices. This underlines the broader issue of patient autonomy in the context of terminal illness.

In the context of terminal illness, patients are suffering both physically and mentally, but at the same time they are constantly pursuing control, autonomy and dignity. This makes concerns about the patient's inner psychological struggles, family relationships, and health care support become more important. Exploring terminal illness through personal stories gives us a glimpse into the psychological process of building identity and finding meaning at the end of life.

Our findings directly respond to the three research questions that guided this study. First, regarding the narrative structures employed by terminally ill patients (RQ1), we identified distinct patterns in how patients construct their stories, with most narratives featuring a core combination of orientation, complicating action, evaluation, resolution. Second, our analysis revealed four main themes with corresponding sub-themes in the death narrative of terminally ill patients (RQ2). Notably, these themes showed that the challenges patients faced with terminal illness encompassed both profound personal exploration and external interactions and support systems. Patients' emotional, psychological, and social relationships were intertwined to form their overall experience of coping with the illness. Different patients show different psychological state in the face of death, such as fear, denial, and acceptance. Some patients' personal beliefs are related to psychological adaptation, which plays an important role in alleviating fear, and providing emotional support. Finally, our examination of how patients construct their identity through narratives (RQ3) is evidenced by interactions among personal, social, and relational levels. This process reflects that patients strive to maintain a sense of self, to cope with changes, and to redefine their position within their relational networks as they approached the end of life.

5. Discussion

This study explores the narrative of terminally ill patients based on Labov's narrative model. Examining the narrative structure and theme of patients' interviews reveals how they summarize their lived experiences and shape their self-identities within the context of terminal illness.

The results of the narrative analysis demonstrate that only a small number of narratives (30 out of 123) followed the structure of the Labov's narrative model. This suggests that terminally ill patients do not present their life stories in the usual, complete narrative. This is evidenced by the absence of an abstract and a coda within these narratives. In fact, narratives are diverse in nature. Turner et al. analyzed narratives of participants with highest and lowest mood boosts after the life story interview. They identified two forms of storytelling, namely autobiographical and episodic. The former integrates individual events into a coherent life story and connect them to their overall identity, while the later describes meaningful events in isolation without linking them to their broader life narrative or sense of self. Hence, there are diverse narrative structures for various life issues [56]. The current finding resonates with previous research on illness narratives, which has noted that patients often struggle to impose a traditional narrative structure on their experience [57]. As exemplified by the work of Frank [6] and Kleinman [58], patients' narratives often diverged from traditional narrative structures, opting for various alternative forms instead. Frank identified several types of illness narratives, including restitution, quest, and chaos narratives [6]. Kleinman emphasized the cultural and personal meanings embedded in illness narratives, which can lead to diverse narrative structures [58]. Our findings align with more contemporary interpretations of what Frank initially described as chaos narratives. While Frank's original concept emphasized the seemingly 'incomprehensible' nature of these narratives, recent scholarship has reframed chaos narratives not as deficient forms of storytelling, but as valid challenges to conventional narrative expectations. Donnelly argued that these narratives actively refused to conform to traditional forms [59], which was further explained by Nicholson in her study that chaos need not be anti-narrative but can be expressed in alternative narrative forms [60]. The absence of clear beginnings (abstracts) and conclusions (codas) in patients' narratives is consistent with unstructured narrative. These narratives challenge traditional storytelling conventions, embodying the disruption and uncertainty that characterize the lived experience of terminal illness. The findings of the present study reinforce the idea that narratives of terminal illness are frequently fragmented. Many narratives place more emphasis on the immediacy and urgency of the patient's description than on an attempt to tell a complete story. This particular narrative pattern actually serves as a window into the living conditions of the patients, highlighting their struggle to tell an ending or define their own life story.

Through constantly reading the interview texts of terminally ill patients, we found that their death narratives exhibited distinct thematic characteristics. These themes revolve around "coping with the emotional and psychological impact of illness", "dealing with the complexities of caregiving and family relationships", "interacting with the healthcare system", and "exploring identity and autonomy".

Some of the themes align with existing literature, highlighting the centrality of emotional struggles, family roles, and medical navigation to the experience of terminally ill patients. Taladay et al. discovered that patients' narratives largely demonstrated emotional struggles related to coping with change and perseverance. In contrast, caregiver narratives emphasized grief and the significance of family roles, while physicians' narratives focused on the importance of humanism in medical practice [61]. In the context a terminal illness, different subjects showed various emotional responses and coping mechanisms.

While previous research has focused on the emotional burden of terminal illness [62], the present study further discovered sub-themes from multiple perspectives, such as inner thoughts about coping with terminal illness and the struggle for autonomy in life. The present study also expands on existing research by illustrating the dual impact of terminal illness on both patients and their caregivers. The narratives reveal the relationships between patients and caregivers, in which the strain on one directly impacts the other. By establishing a support system that caters to the well-being of both patients and their caregivers, the two parties can collaborate to cope with the terminal illness.

Additionally, the study found that patients' identities are deeply influenced by both their illness experience and the prospect of dying. While the immediate physical impacts of the illness shape their day-to-day sense of self, the prospect of dying influences their broader life perspectives and decision-making processes. Many narratives reflect a tension between the patients' past selves and their current status as terminally ill individuals. The identity construction process is complex and multifaceted, encompassing both the patients' internal self-perception and their external interactions with others. Patients struggled to maintain a sense of autonomy and control in the face of a life-limiting illness. Therefore, some narratives exhibit the patients' desire to make decisions about their care. This may encompass exploring alternatives such as assisted suicide or stating their treatment preferences. Such desire for control can be viewed as an effort to keep a sense of identity in the face of the end of life. Moreover, some narratives show a conflict between how patients view themselves and how they are perceived by others. Many patients express frustration with being seen as "old" or "sick", because they contend that these labels do not adequately represent their entire identity. This finding is consistent with existing research that pointed to the importance of continuing to maintain a sense of self-identity and self-awareness when stigmatizing labels are associated with terminal illness [63]. Building on this foundation, Ternestedt's work emphasized that maintaining identity is intrinsically linked to preserving dignity at the end of life. A dignified death was defined as being allowed to be the person one is until the end. Furthermore, healthcare practices can support patients' sense of self during terminal illness [64]. Rodr ǵuez et al. reaffirmed that dignity, to some extent, was seen as part of identity. They reinforced the importance of preserving dignity at the end of life by focusing on autonomy as a determining factor that significantly affect patients' dignity at the end of life. The loss of autonomy often leads to a decrease in dignity, while maintaining them can help preserve dignity in the face of terminal illness [65].

Any approach to palliative care must consider the well-being of both parties. Many patients define themselves in relation to their caregivers and loved ones, which uncovers the significance of relational identity. This relates to recent calls for more integrative, family-centered approaches to palliative care [66]. Patient narratives in the present study frequently inform the reciprocal nature of care, with the patients' identity being shaped by their role within the family and their interactions with those who provide support. This relational aspect of identity construction adds a layer of complexity to the patients' self-perception, as they navigate the dual roles of being cared for and, in some cases, of continuing to care for others.

Through narrative analysis of terminally ill patients' lived experiences, this study can provide more targeted suggestions for psychological and medical interventions. By identifying common narrative elements and concerns, healthcare providers can refine their communication strategies to better summarize patients' experiences so that tailored psychological support can be offered to help them navigate identity and meaning-making issues. Collaborative programs can also be created to assist patients and families in discovering the complexities of terminal illness. Overall, these suggestions facilitate a more compassionate and effective approach to patient care.

Although this study sheds light on the narrative structures and psychological state of terminally ill patients, it is important to acknowledge several limitations that may affect the scope and generalizability of the findings. While Labov's narrative analysis model provides a valuable structural framework for examining personal narratives through its six elements (abstract, orientation, complicating action, evaluation, resolution, and coda), we must recognize its inherent limitations. According to Langellier, the Labovian approach tends to adopt a reductionist view of narratives by primarily focusing on their structural components while potentially overlooking the broader social and cultural contexts that shape narrative construction and meaning-making processes [67]. In this study, we conducted thematic analysis to complement the narrative structure analysis. Furthermore, the Labovian framework's linear and structured approach to narrative analysis may not fully capture the dynamic and non-linear nature of storytelling in different cultural contexts. This limitation indicates the need for a more flexible approach to narrative analysis that can accommodate diverse storytelling traditions and practices. Nicholson's work has shifted the focus from traditional narrative structures, such as restitution, chaos, and quest, to more flexible forms of narrative [60]. As Nicholson stated, chaos should not be seen as an anti-narrative, but rather be understood as another valid narrative strategy. Drawing on Jane Alison's concepts of "radial narratives" and "fractal narratives" [68], Nicholson illustrated that these alternative narratives could better reflect the experiences of chronic or terminal illness, which often lack linear progression. Our analysis revealed that such resistance to traditional narrative structures should not be viewed as a limitation, but rather as a conscious deviation from audience expectations of transformation or inspiration. The unstructured nature of the narratives in the present study may, in fact, be a reflection of alternative narrative structures. We might consider them as examples of alternative narrative strategies rather than view these fragmented or non-linear narratives as failures to make meaning. Methodologically, our sample size and demographic composition

may limit the generalizability of findings to broader populations or different cultural contexts. Future research can include more diverse and larger samples in order to reveal the evolving nature of illness narratives and their impact on identity and psychological well-being.

6. Conclusion

By observing the narratives of terminally ill patients as they express their own experiences and cope with illness and death, this study identified the clues for enhancing psychological support for patients. It further presents a detailed analysis of how terminally ill patients construct their stories and, by extension, their identities. This in-depth narrative analysis contributes to the broader field of narrative medicine and illness narratives. The findings challenge the assumption that illness narratives adhere to traditional narrative structures, suggesting that the fragmented, incomplete nature of these narratives may be a more authentic reflection of the patients' lived experiences. The study enriches the existing body of research on the emotional and psychological aspects of terminal illness by highlighting the specific themes and sub-themes that emerge from patient narratives.

Narratives reconstruct the experiences of patients, thereby opening a window into communication for healthcare providers and providing a tool to explore the patients' psychological state. Based on the narrative analysis of terminal illness experiences, this study offers insights into practical intervention. Specifically, these insights can assist medical professionals in offering effective support to their patients. Consequently, the study of death narratives contributes to clinical practice by addressing the psychological needs of terminally ill patients.

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Data availability statement: The interview transcripts in this study are available under licence to researchers for second analysis, subject to approval from Healthtalk website and compliance with ethical guidelines. (http://www.healthtalk.org).

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References

1. Wan JY. A review of studies on death discourse (Chinese). J. Tianjin Foreign Stud. Univ. 2016; (2):1–7.
2. Huang F. A Bibliometric Analysis of Death Discourse Research in SSCI Journals (1992–2016) (Chinese). The Journal of Chinese Sociolinguistics. 2017; (4): 3–15.
3. Carpentier N, Van Brussel L. On the contingency of death: A discourse-theoretical perspective on the construction of death. Critical Discourse Studies. 2012; 9(2): 99–115.
4. Jacobsen MH. Contemplating a career in death and dying—an interview with Tony Walter. Mortality. 2022; 27(2): 228–253.
5. Thompson N, Allan J, Carverhill PA, et al. The case for a sociology of dying, death, and bereavement. Death Stud. 2016; 40(3): 172–181.
6. Frank AW. The Wounded Storyteller: Body, Illness, and Ethics. University of Chicago Press; 1995.
7. de Saussure F. Course in general linguistics. Columbia University Press; 1959.
8. Ford J, Hepburn A, Parry R. What do displays of empathy do in palliative care consultations? Discourse Stud. 2019; 21(1): 22–37.
9. Molzahn AE, Sheilds L, Bruce A, et al. Life and priorities before death: A narrative inquiry of uncertainty and end of life in people with heart failure and their family members. European Journal of Cardiovascular Nursing. 2020; 19(7): 629–637.
10. Weng J, Pachman DR, Wild E, Ingram CJ. Dignity Conserving Therapy: An Intervention for Addressing Psychosocial and Existential Distress in Patients with Serious Illness. Palliat. Med. Rep. 2022; 3(1): 206–210.
11. Lakoff G, Turner M. More than cool reason: A field guide to poetic metaphor. University of Chicago Press; 1989.
12. Gustafsson AW, Hommerberg C, Sandgren A. Coping by metaphors: The versatile function of metaphors in blogs about living with advanced cancer. Med. Humanities. 2020; 46(3): 267–277.
13. Tsai MH. Managing topics of birth and death in doctor-patient communication. J. Pragmat. 2010; 42(5): 1350–1363.
14. Gärtner HS, Blix BH, Raunkiær M, Timm H. There is nothing beautiful or life-affirming in it: Experiences of harm in a narrative course combining rehabilitative and palliative care approaches for people who have or have had cancer. Mortality. 2024; (6): 1–17.
15. Seale C. Constructing death: The Sociology of Dying and Bereavement. Cambridge University Press; 1998.
16. Callus I. (Auto) Thanatography or (Auto) Thanatology?: Mark C. Taylor, Simon Critchley and the Writing of the Dead. Forum for Modern Language Studies. 2005; 41(4): 427–438.
17. Hane-Devore TM. Constructed bodies, edited deaths: The negotiation of sociomedical discourse in autothanatographers' writing of terminal illness [PhD thesis]. Case Western Reserve University; 2011.
18. Moniz T, Melro C, Watling C. In many voices: Exploring end-of-life care through patient, caregiver and physician narratives. Med. Humanities. 2024.
19. Yehene E, Manevich A, Rubin SS. Caregivers' Grief in Acquired Non-death Interpersonal Loss (NoDIL): A Process Based Model with Implications for Theory, Research, and Intervention. Front. Psychol. 2021; 12: 676536.
20. Hong Y, Yuhan L, Youhui G, et al. Death anxiety among advanced cancer patients: A cross-sectional survey. Support. Care. Cancer. 2022; 30(4): 3531–3539.
21. Jenkins L, Parry R, Pino M. Providing Opportunities for Patients to Say More about Their Pain without Overtly Asking: A Conversation Analysis of Doctors Repeating Patient Answers in Palliative Care Pain Assessment. Appl. Lingusit. 2021; 42(5): 990–1013.
22. Lall P, Dutta O, Tan WS, et al. "I decide myself"—A qualitative exploration of end of life decision making processes of patients and caregivers through Advance Care Planning. PLoS One. 2021;16(6): e0252598.
23. Gabay G. A Nonheroic Cancer Narrative: Body Deterioration, Grief, Disenfranchised Grief, and Growth. Omega (Westport). 2021; 83(2): 287–309.
24. Charon R. Narrative medicine: Honoring the stories of illness. Oxford University Press; 2006.
25. Guo L. What is Narrative Medicine. Journal of Zhejiang University, Medical Sciences. 2019;48(5): 467–473.

26. Chochinov HM, Hack T, Hassard T, et al. Dignity therapy: A novel psychotherapeutic intervention for patients near the end of life. J. Clin. Oncol. 2005; 23(24): 5520–5525.
27. Winger JG, Ramos K, Steinhauser KE, et al. Enhancing meaning in the face of advanced cancer and pain: Qualitative evaluation of a meaning-centered psychosocial pain management intervention. Palliat. Support. Care. 2020; 18(3): 263–270.
28. Bluck S, Mroz EL, Wilkie DJ. Quality of Life for Older Cancer Patients: Relation of Psychospiritual Distress to Meaning-Making During Dignity Therapy. Am. J. Hosp. Palliat. Care. 2022; 39(1): 54–61.
29. Froggatt K. (1997). Rites of passage and the hospice culture. Mortality, 2, 123–136.
30. Leder, D. The absent body. University of Chicago Press; 1990.
31. Ho AHY, Leung PPY, Tse DMW, et al. Dignity Amidst Liminality: Healing Within Suffering Among Chinese Terminal Cancer Patients. Death Stud. 2013; 37(10): 953–970.
32. Synnes O. Narratives of nostalgia in the face of death: The importance of lighter stories of the past in palliative care. J. Aging. Stud. 2015; 34: 169–176.
33. Walsh EP, Flanagan JM, Mathew P. The Last Day Narratives: An Exploration of the End of Life for Patients with Cancer from a Caregivers' Perspective. J. Palliat. Med. 2020; 23(9): 1172–1176.
34. Tarberg AS, Kvangarsnes M, Hole T, et al. Silent voices: Family caregivers' narratives of involvement in palliative care. Nurs. Open. 2019; 6(4): 1446–1454.
35. Laperle P, Achille M, Ummel D. To Lose a Loved One by Medical Assistance in Dying or by Natural Death with Palliative Care: A Mixed Methods Comparison of Grief Experiences. Omega (Westport). 2022; 1–23.
36. Rolbiecki AJ, Washington K, Bitsicas K. Digital Storytelling: Families' Search for Meaning after Child Death. J. Soc. Work. End. Life. Palliat. Care. 2017; 13(4): 239–250.
37. Ryu S, Price SK. Embodied storytelling and meaning-making at the end of life: VoicingHan avatar life-review for palliative care in cancer patients. Arts & Health. 2022; 14(3): 326–340.
38. Labov W. Uncovering the event structure of narrative. Georgetown University round table on language and linguistics. Georgetown University Press; 2001. pp. 63–83.
39. Johnstone B. 'Oral versions of personal experience': Labovian narrative analysis and its uptake. Journal of Sociolinguistics. 2016; 20(4): 542–560.
40. Özyıldırım I. Narrative analysis: An analysis of oral and written strategies in personal experience narratives. Journal of Pragmatics. 2009; 41(6): 1209–1222.
41. Brookes G, McEnery T, McGlashan M, et al. Narrative evaluation in patient feedback: A study of online comments about UK healthcare services. Narrative Inquiry. 2022; 32(1): 9–35.
42. Boginskaya OA. Narrative as a communicative mode in the courtroom (Russian). Tomsk State Univ. J. 2022; 484: 5–12.
43. Ahmad S. A Narrative Structure Analysis of Alice Sebold's The Lovely Bones. Pertanika Journal of Social Sciences & Humanities. 2023; 31(1): 383–400.
44. Rosenblatt L, Lakoma M, Alexander V. So short a lease: Women's accounts of living with advanced cancer. Storytelling, Self, Society. 2004; 1(1): 44–56.
45. Duncan S. Sadly missed: The death knock news story as a personal narrative of grief. Journalism. 2012; 13(5): 589–603.
46. Stemen SE. "I can't explain it": An examination of social convoys and after death communication narratives. Death Studies. 2022; 46(7): 1631–1640.
47. Available online: http://www.healthtalk.org/ (accessed on 11 October 2023).
48. Gao Y. Genre Types of Death Discourse and Social Changes (Chinese). Foreign Language Research. 2019; 36(2): 1–6.
49. Braun V, Clarke V. Using thematic analysis in psychology. Qualitative Research in Psychology. 2006; 3(2): 77–101.
50. Braun V, Clarke V. Reflecting on reflexive thematic analysis. Qualitative Research in Sport, Exercise and Health. 2019; 11(4): 589–597.
51. Labov W, Waletsky J. Narrative Analysis: Oral Versions of Personal Experience. University of Washington Press; 1967. pp. 3–38.
52. Labov W. The Language of Life and Death: The Transformation of Experience in Oral Narrative. Cambridge University Press; 2013.
53. Williams G, The genesis of chronic illness: Narrative re-construction. Sociology of Health & Illness. 1984; 6: 175–200.
54. Patterson W. Strategic Narrative: New Perspectives on the Power of Personal and Cultural Stories. Lexington Books; 2002.
55. Labov, W. Narratives of Uncontrollable Grief. Narrative. 2020; 28(2): 125–142.

56. Turner AF, Cowan HR, Otto-Meyer R, McAdams DP. The power of narrative: The emotional impact of the life story interview. Narrative Inquiry. 2024; 34(1): 1–29.
57. Hydén LC. Illness and narrative. Sociol. Health. Illn. 1997; 19(1): 48–69.
58. Kleinman A. The illness narratives: Suffering, healing, and the human condition. Basic Books, 1988.
59. Donnelly C. Claiming chaos narrative, emerging from silence. Disabil. Soc. 2024; 39(1): 1–15.
60. Nicholson RK. Anti And Alt Narratives: Illness and Chaos. Available online: https://medicalhealthhumanities.com/2024/05/03/anti-and-alt-narratives-illness-and-chaos/ (accessed on 16 November 2024).
61. Taladay-Carter CR, Kellas JK. "We've Had to Relearn All of Our Family Dynamics": Communicated Narrative Sense-Making of Bereavement Following Terminal Illness in U.S. Families. Journal of Family Communication. 2024; 1–17.
62. Zimmermann C. Acceptance of dying: A discourse analysis of palliative care literature. Social Science & Medicine. 2012; 75(1): 217–224.
63. Charmaz K. Good Days, Bad Days: The Self in Chronic Illness and Time. Rutgers University Press; 1991.
64. Ternestedt BM. A dignified death and identity-promoting care. Wiley-Blackwell; 2009. pp. 146–167.
65. Rodriguez-Prat A, Monforte-Royo C, Porta-Sales J, et al. Patient Perspectives of Dignity, Autonomy and Control at the End of Life: Systematic Review and Meta-Ethnography. PLoS One. 2016; 11(3): e0151435.
66. Ben-Arye E, Samuels N, Keshet Y, et al. Exploring unmet concerns in home hospice cancer care: Perspectives of patients, informal caregivers, palliative care providers, and family physicians. Pall. Supp. Care. 2024; 1–9.
67. Langellier KM. Personal narratives: Perspectives on theory and research. Text and Performance Quarterly. 1989; 9(4): 243–276.
68. Alison J. Meander, Spiral, Explode: Design and Pattern in Narrative. Catapult; 2019.

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Review

Impact of breathing exercises on anxiety and depression in cancer patients: A systematic review and meta-analysis

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Abstract: Background: Anxiety and depression are prevalent emotional disorders with significant socio-economic impacts. They are particularly common in cancer patients, affecting up to 20% and 10% of patients, respectively, compared to 3.15% and 4.8% in the general population. While medication is a common treatment, it can have side effects and may not address the psychosocial aspects of these conditions. Breathing exercises have emerged as a potential non-pharmacological approach to controlling anxiety and depression. **Objective:** This systematic review and meta-analysis aimed to assess the efficacy of breathing exercises, to determine if these exercises help reduce anxiety and depression, and to measure the impact compared to a control group. **Methods:** We conducted a comprehensive literature search across several databases from 1 January 2000 to 1 July 2024, following the PRISMA guidelines. Screening, data extraction, and quality assessment were undertaken independently by two researchers and adjudicated by another. Outcomes included anxiety and depression scores. In meta-analyses, the I^2 statistic was used to explore heterogeneity. Random effects models were used in the presence of moderate heterogeneity. Sources of heterogeneity were investigated by subgroup analyses and meta-regression. **Results:** The search yielded 14 eligible studies involving 1067 participants with a mean age of 46.35 years and a female/male ratio of 1.19. Meta-analysis revealed a significant reduction in anxiety (−0.49; 95% CI, −0.68 to −0.30; $p < 0.001$) and depression (−0.38; 95% CI, −0.53 to −0.23; $p < 0.001$) following breathing exercises compared to control interventions. Subgroup analysis indicated that yoga breathing exercises had a more pronounced effect on anxiety reduction. **Conclusion:** Breathing exercises may help reduce anxiety and depression in individuals managing cancer. Further exploration is needed in the future to alleviate anxiety and depression through breathing exercises as the first step in promoting this potentially valuable adjunct therapy.

Keywords: anxiety; depression; cancer; breathing exercises; systematic review; meta-analysis

1. Introduction

Emotional disorders, particularly anxiety and depression, are becoming increasingly common in today's society [1]. Depression and anxiety are also common complications in patients with cancer, affecting up to 20% and 10% of patients [2], respectively, compared to 3.15% and 4.8% in the general population [3].

These disorders not only lead to chronic symptoms and higher mortality rates [4], challenging public health systems, but also can significantly influence quality of life, treatment adherence, cancer survival, and treatment costs [2], imposing a significant socio-economic burden on society.

Some cancers, such as pancreatic and lung, can release chemicals that are thought to cause depression, and certain cancer treatments, such as chemotherapy and corticosteroids, are associated with depression [5]. Therapies for psychological

disorders are diverse, including medication, various forms of therapy, and exercise. Medication is frequently the go-to treatment but can come with side effects such as weight changes, sexual dysfunction, and sleep disturbances [6]. Additionally, there's the risk of tolerance and dependency [4]. Some patients may not adhere to treatment due to concerns about these side effects or doubts about the medication's efficacy, which may exacerbate cancer symptoms [7]. Medication often addresses symptoms without fully considering the psychosocial aspects of anxiety and depression, which are vital for recovery [8].

Recent research suggests that breathing exercises may positively influence mental health outcomes through various mechanisms, including the reduction of cortisol levels, attention deviation, modulation of heart rate variability (HRV), and lowering of blood pressure [9]. Systematic reviews indicate that these exercises, used in conjunction with or separate from physical therapy, can significantly reduce anxiety and exhibit antidepressant effects [10,11], Mind-body fitness modalities, which incorporate breathing techniques as a fundamental component, have gained popularity as effective anti-stress methods [12].

Breathing exercises encompass a broad range, including yoga breathing exercises, or Pranayama, an ancient practice that harnesses life energy through breath control [13]. Breathing exercises also include clinically focused practices like deep breathing, the use of Triflo equipment [14], the Active Cycle of Breathing Technique (ACBT) [15], walking with controlled breathing [16], and box breathing [17], which are particularly relevant in physical and exercise therapy.

These exercises encourage lifestyle changes crucial for mental health improvement. Breathing techniques promote autonomic and psychophysiological changes in brain-body interactions to reduce symptoms of arousal, anxiety, and depression [12]. They enhance oxygen intake, facilitate carbon dioxide release, boost cellular metabolism, and increase blood oxygen levels [14]. Patients can learn to alleviate breathing difficulties by adjusting their breathing patterns, which is particularly helpful for asthma [18] or chronic lung disease sufferers [15]. Breathing exercises also increase heart rate variability [16], influence the autonomic nervous system's balance, and activate the parasympathetic response for relaxation [9]. They can lower stress hormone levels, such as cortisol, and promote the production of chemicals associated with positive emotions, thereby improving mood [17]. Breathing exercises have been increasingly recognized for their potential in mitigating the symptoms of anxiety and depression in cancer patients [19,20]. A recent systematic review and meta-analysis of randomized controlled trials found that breathing exercises can significantly reduce anxiety and exhibit antidepressant effects in various populations, including cancer patients [21].

Breathing exercises provide a non-pharmacological treatment option, but they are not meant to replace medication entirely. In many cases, medication is still necessary, with breathing exercises offering a valuable supplementary or alternative therapy. This comprehensive treatment approach acknowledges the importance of both the physiological and psychological facets of health, offering a well-rounded strategy for managing the mental health conditions of cancer patients and promoting their recovery [15,22,23].

With this aim, we conducted a systematic review and meta-analysis of 14 Randomized Controlled Trials (RCTs) to assess the effects of breathing exercises on anxiety and depression levels.

2. Methods

This systematic review and meta-analysis were conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Supplementary File 1). The review has been registered on PROSPERO (ID: CRD42024575235). We used the GRADE (Grading of Recommendations, Assessment, Development, and Evaluation) approach to assess the quality of evidence for the outcomes of interest.

2.1. Literature search

Our study conducted a comprehensive search across several databases to gather empirical research on the effects of breathing exercises on anxiety. The databases consulted included PubMed, Embase, and the Cochrane Library.

The online search was carried out between 21 May 2024 and 1 July 2024, encompassing studies published from 1 January 2000 to 1 July 2024. Additional studies were identified through reference lists of previous original articles or systematic reviews. The overall search terms used were ("anxiety/ physiopathology", "anxiety/therapy", "anxiety/analysis", "anxiety/prevention and control", "anxiety/psychology", "anxiety/etiology") and ("breathing exercises" or "respiratory training") and (clinical trial or randomized controlled trial), with keywords derived from titles or MeSH terms.

2.2. Eligibility criteria

Inclusion criteria were guided by the PICOS framework (Population, Intervention, Comparison, Outcome, Study Design). We included randomized clinical trials that assessed the efficacy of breathing exercise interventions in individuals clinically diagnosed with anxiety or depressive disorders across different age groups. Diagnoses were based on any version of the Diagnostic and Statistical Manual of Mental Disorders (DSM) criteria or the 11th Revision of the International Classification of Diseases (ICD-11) for mental, behavioral, or neurodevelopmental disorders (https://icd.who.int/browse11/l-m/en). Anxiety or depressive symptoms measured using self-report tools were the outcomes of interest. The control groups included no intervention, waitlist, and active intervention groups. Conference abstracts, dissertations, and any clinical trials without sufficient data reported were excluded from our meta-analysis.

2.3. Study selection

The study selection process was conducted based on the PRISMA 4-phase flow diagram. Firstly, duplicates were identified and removed using EndNote 21 software. Additionally, any duplicates not identified by the software were manually removed. Next, two reviewers independently screened the titles and abstracts of the studies retrieved from the search, removing irrelevant studies based on predefined eligibility

criteria. Subsequently, two independent reviewers examined the full-text articles of the selected studies to ascertain their inclusion status. All disagreements between the two reviewers were resolved through discussion or with the assistance of a third reviewer. The Cohen's kappa coefficient (k) between the two reviewers was 0.80, indicating a substantial level of inter-rater reliability.

2.4. Data extraction

The study characteristics form included author, year, country/region, trial duration, number of participants, gender, mean age at baseline, health status, type of disease, changes in treatment during the trial, intervention and control usual care or nursing, intervention protocol, study design, and outcome analysis. We also extracted details about the intervention protocol, study design, and the methods used for outcome analysis. To assess the impact of the interventions, we recorded the mean baseline levels of anxiety and depression. Furthermore, we documented any significant changes in these levels from the beginning to the end of the trial period. This thorough extraction of data allowed for a detailed analysis of the effectiveness of breathing exercises on anxiety and depression across the included studies.

2.5. Risk of bias assessment

We used Cochrane's risk of bias version 2 (RoB 2) tool to assess the risk of bias in each included RCT. The specific versions of the tool were used for crossover and parallel trials, respectively. The tool consists of five domains, each containing a list of signaling questions linked to specific aspects of the RCT. An algorithm marks the risk of bias in each domain as 'low', 'some concerns', or 'high' depending on the answers to the signaling questions. The final judgment of risk of bias in each domain and the overall study was assessed independently by two researchers and discussed when conflicts between assessments occurred.

2.6. Data synthesis and statistical analysis

We extracted the mean and standard deviation (SD) of anxiety and depression for both the intervention and control groups at baseline and post-intervention. Some studies reported post-intervention measures at multiple time points—only the data from the last time point were extracted for further analysis. When group SDs were not directly provided, we calculated the group mean SD using the formulas from Section 6.5.2.2 of the Cochrane Handbook: [SD = SEM × √n or SD = √n × (upper limit − lower limit)/3.92]. When scores were provided as medians and interquartile ranges, we converted them to means ± SD using the formulas by Wan, et al. [24] (see Section 6.5.2.5 of the Cochrane Handbook and Department of Mathematics at Hkbu [25]).

We performed all statistical analyses using Stata/SE 18.0 (StataCorp LLC., College Station, TX). The random-effects model described by DerSimonian and Laird was used to account for variability within and between studies.

The I^2 statistic assessed the heterogeneity between studies. The I^2 values were interpreted as follows: 0%–40% may not be important, 30%–60% may represent moderate heterogeneity, 50%–90% may represent substantial heterogeneity, and 75%–100% indicates considerable heterogeneity, with the latter three ranges

depending on the effect size and evidence of heterogeneity [26]. The Cochran Q statistic was used to calculate the test for subgroup analyses. This test investigated differences in the overall effect sizes between groups.

We conducted sensitivity analyses using a leave-one-out approach in the meta-analysis to assess whether there were significant differences in the estimated effects on anxiety and depression when each study was excluded from the meta-analysis. Additionally, we checked for publication bias in each meta-analysis by examining the funnel plots and used Egger's linear regression test to test the asymmetry of the plots.

3. Results

A search of 4 electronic databases yielded 3345 records, which were reduced to 1595 after the removal of duplicates (**Figure 1**). We reviewed the full text of 65 studies, of which 14 met our inclusion criteria. These 14 studies included 1067 participants (**Table 1**).

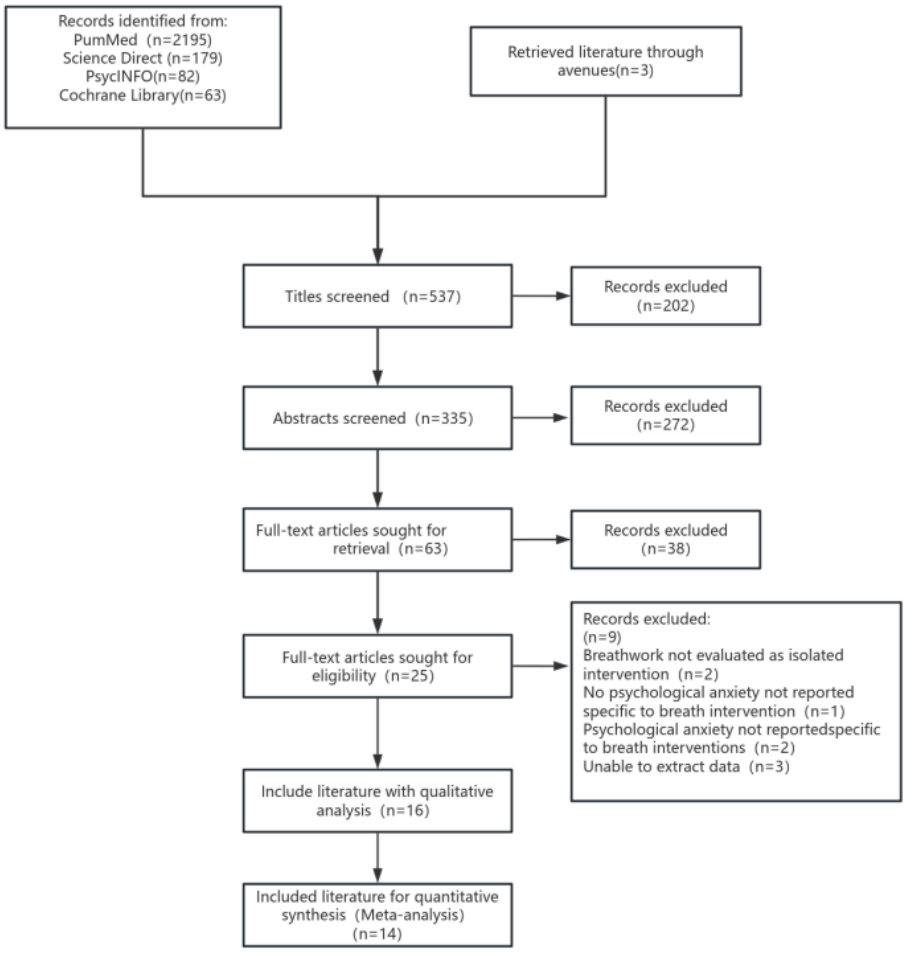


Figure 1. PRISMA flow diagram showing the identification of eligible studies via databases, registers, and citation searching. The total number of included studies was 14. Trial registries searched primary outcome only.

Table 1. Included studies.

References	Age (Mean)	gender(F/M)	Disease type	Study Design	Intervention Group	Control Group	Measure used	Duration and Frequency of Study Period
Lu, et al. [15]	IN: 62.12 ± 8.03 CON: 57.03 ± 12.34	IN: 19/16 CON: 21/13	Lung cancer	single-blind, RCT	Active Cycle of Breathing Technique, ACBT	routine preoperative and postoperative care	Hospital Anxiety and Depression Scale	March 2019 to January 2020, the intervention group twice daily ACBT, 15–20 min each session
Thomas, et al. [18]	IN: 45.4 ± 18.3 CON: 46 ± 16.6	IN: 52/42 CON: 60/29	Asthma	single-blind, RCT	Papworth method Breathing Exercise	standard treatment	Hospital Anxiety and Depression Scale	Three sessions per group, including one 60-minute group meeting and two 30-minute individual sessions, twice daily, 10 min each
Andreasson, et al. [27]	IN: 55.1 ± 3.8 CON: 51 ± 4.0	IN: 58/36 CON: 67/35	Asthma	two-armed assessor-blinded, RCT	Breathing Exercises	Usual Care, UC	Hospital Anxiety and Depression Scale	January 2021 to April 2021, 5–10 times daily, approximately 5–10 min each session
Ismail, et al. [28]	IN: 69.50 ± 4.08 CON: 70 ± 4.29	IN: 12/18 CON: 10/20	Hypertension induced Glaucoma	single-blind, RCT	Yoga breathing training (Alternate Nostril Breathing Exercise, ANBE)	Usual Care, UC	Hospital Anxiety and Depression Scale	Within 3 months, twice weekly, 40 min each session
Öner Cengiz, et al. [14]	IN: 49.18 ± 13.50 CON: 54.09 ± 14.68	IN: 12/10 CON: 11/11	COVID-19/ Cancer	single-blind, RCT	patients received deep breathing exercises using the Triflo device	standard treatment and care	Beck Anxiety Inventory	3 days, from after breakfast until before going to sleep, with 5–10 sessions conducted each hour.
Moghadam, et al. [29]	IN: 37.9 ± 9.4 CON: 36.3 ± 10.1	IN: 14/16 CON: 15/15	Moderate or severe depression	RCT	Yoga Breathing Exercise	Usual Care, UC	21-item self-report	4 months, received breathing exercises 10 min before treatment.
Evaristo, et al. [30]	IN: 50.6 ± 9.2 CON: 49.8 ± 9.7	IN: 8/17 CON: 7/22	Asthma	RCT	Yoga (Pranayama)Breathing Exercise	Aerobic Training Group	Hospital Anxiety and Depression Scale	8 weeks, daily, 20 min daily
Yıldırım and Akman [31]	IN: 43.98 ± 17.50 CON: 47.50 ± 18.79	IN: 30/20 CON: 31/19	Chronic disease/Cancer	single-blind RCT	Mindfulness Breathing-therapy	non-intervention sitting	Beck Depression Screening Scale	Intervention group twice daily ACBT, 15–20 min each session

Table 1. (*Continued).*

References	Age (Mean)	gender(F/M)	Disease type	Study Design	Intervention Group	Control Group	Measure used	Duration and Frequency of Study Period
Teng, et al. [16]	IN: 51.64 ± 10.48 CON: 51.91 ± 15.20	IN: 7/38 CON: 11/34	Heart failure	four repeated measurement time points, RCT	Walking with Breathing, WwB	Usual Care, UC	Hospital Anxiety and Depression Scale	12 weeks total, twice daily, 30 min each session
Hakked, et al. [13]	IN: 15.23 ± 1.59 CON: 15.08 ± 1.26	IN: 7/7 CON: 7/6	None (swimmer)	RCT	Yogic Breathing Practices	regular physical exercise	Sport Anxiety Scale-2	January 2021 to April 2021, 5–10 times daily, approximately 5–10 min each session
Hayama and Inoue [22]	IN: 53.6 ± 9.4 CON: 61.7 ± 9.8)	IN: 11/0 CON: 12/0	Cancer	RCT	Deep abdominal breathing	standard treatment	Anxiety (POMS-Short Form)	Within 3 months, twice weekly, 40 min each session
Dhruva, et al. [23]	IN: 52.4 ± 14.6 CON: 56.0 ± 11.9	IN: 6/2 CON: 5/3	Cancer	RCT	Yoga Breathing Exercise (Pranayama)	Usual Care, UC	Hospital Anxiety and Depression Scale	12 weeks total, twice daily, 40 min each session
Saoji, et al. [32]	IN: 21 ± 2.7 CON: 20 ± 2.9	IN: 34/26 CON: 38/14	None (healthy individual)	Single-blind, RCT	Yoga Breathing Exercise (Pranayama)	usual yoga practice	State Anxiety Inventory-Short Form	intervention on day 2, day 4, and day 6, approximately 10 min each session
Aktaş and İlgin [33]	IN: 35.30 ± 10.32 CON: 33.50 ± 7.57	IN: 7/23 CON: 16/14	bariatric surgery	RCT	4-7-8Breathing Exercise	Usual Care, UC	State anxiety scale	8 weeks, daily, 20 min daily

Note: IN: Breathing Exercise intervention group; CON: control group.

3.1. Study characteristics

A total of 14 randomized controlled trials (RCTs) ultimately met our inclusion criteria, encompassing self-reported primary outcomes of anxiety and secondary outcomes of depression.

The characteristics of the included studies are shown in **Table 1**. These studies were conducted in following countries and regions: China [15], Taiwan [16], the United Kingdom [18], Denmark [27], Egypt [28], Turkey [14,31], Iran [29], Brazil [30], India [13,32,33], Japan [22], and the United States [23]. The duration of the studies ranged from one day to seven months. The meta-analysis included 1067 participants, more than half of whom were female. Approximately half of the participants were randomly assigned to either the breathing intervention group (n = 525) or the non-breathing control group (n = 542). The attrition rate, which is the percentage of participants who withdrew from the study after the breathing intervention began, ranged from 0% to 24.6%. Based on the PICO framework: Among the 14 clinical studies, we identified that 5 were specific to cancer patient populations [14,15,22,23,31], 7 to populations with other diseases (asthma [18,27,30], hypertension-induced glaucoma [28], heart failure [16], bariatric surgery [31], moderate or severe depression [29]), and 2 focused on physically healthy individuals [13,32]. Although various techniques were included in some interventions, the primary focus of the 14 studies was on breathing exercises. The minimum total estimated durations of an intervention/home practice ranged from 1 to 6, 60 min; the minimum total estimated number of intervention/home practice sessions ranged from 1 to 120. Although intervention/home practice sessions differed in length, the intervention/home practice session frequency ranged from 2 to 24 times per week. All studies regarding anxiety and depression included results measured by psychometrically validated instruments.

3.2. Risk of bias assessment of included studies

The risk of bias scoring for the 14 studies on the primary outcome is reported using RoB 2 in **Figure 2.** Three studies were algorithmically assessed as having a high risk of bias. The overall risk of bias for the remaining four studies was rated as having some concerns. The last six studies were algorithmically evaluated as having a low overall risk of bias.

Risk of bias scoring using Cochrane Collaboration's RoB 2 tool. Green and red colors correspond to low and high risk of bias, respectively. Yellow represents some concerns. D1 Randomization process, D2 Deviations from the intended interventions, D3 Missing outcome data, D4 Measurement of the outcome, D5 Selection of the reported result.

3.3. Anxiety and Depression Levels

For anxiety, all experiments presented baseline levels, end-of-experiment values, and changes in anxiety. Six studies provided sufficient data on depression at baseline, end-of-experiment, or changes in anxiety. Anxiety and depression after intervention were measured post-intervention, with some studies reporting data at follow-up times after the intervention ended. In the meta-analysis, compared to the usual care control group, the overall anxiety effect size was g = −0.49 (−0.68, −0.30; p < 0.001,

I^2 = 47.65%, T^2 = 0.05), and the overall depression effect size was g = −0.38 (−0.53, −0.23; p = 0.00, I^2 = 5.69%, T^2 = 0.00) (**Figures 3** and **4**).

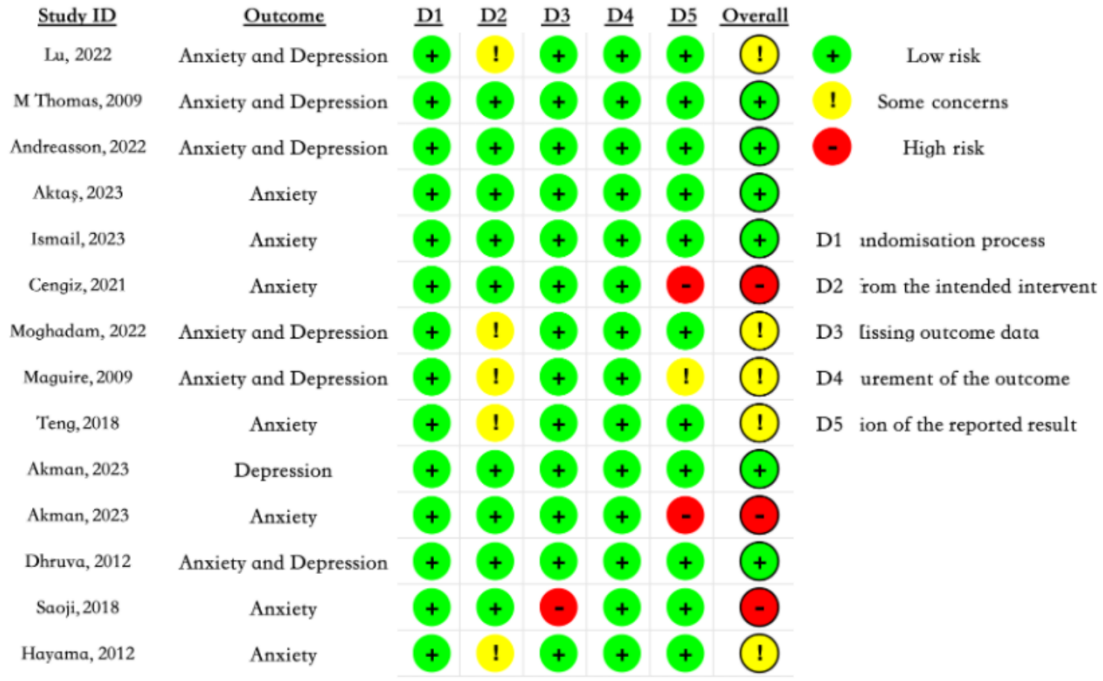


Figure 2. Risk of bias scoring using Cochrane Collaboration's RoB 2 tool. Green and red colors correspond to low and high risk of bias, respectively. Yellow represents some concerns. D1 Randomization process, D2 Deviations from the intended interventions, D3 Missing outcome data, D4 Measurement of the outcome, D5 Selection of the reported result.

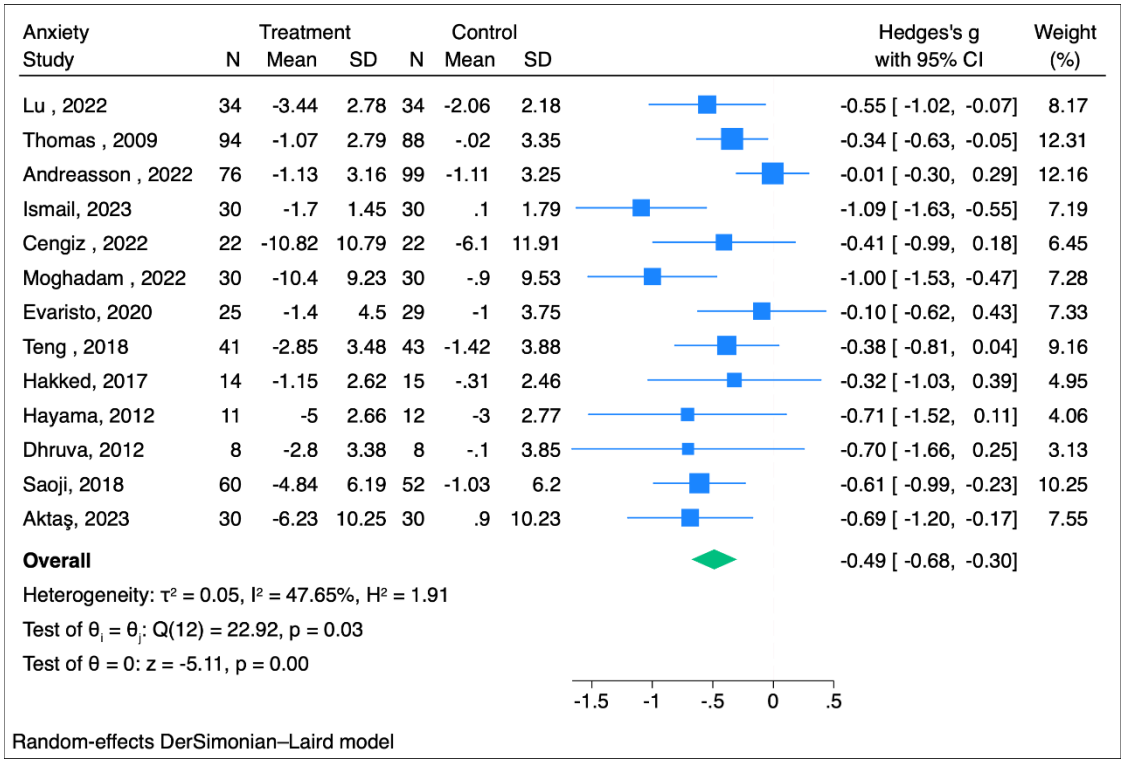


Figure 3. Forest plot comparing interventions to control groups on the primary outcome of self-reported/subjective anxiety at post-intervention.

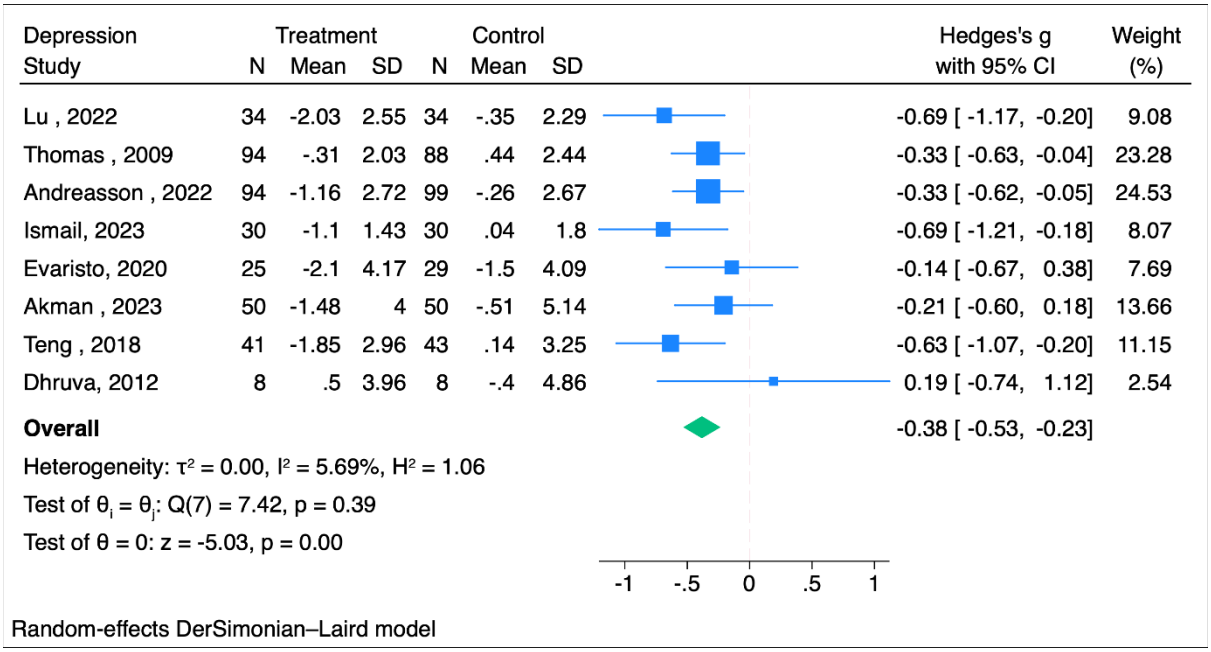


Figure 4. Forest plot comparing interventions to control groups on the secondary outcome of self-reported/subjective depression at post-intervention.

Our findings indicate that breathing exercises could effectively alleviate anxiety and depression in cancer patients and those with other chronic diseases, with a more pronounced impact on anxiety compared to depression. The heterogeneity (I^2) of the depression meta-analysis was not important (5.69%), while the results for anxiety showed moderate heterogeneity (47.65%).

3.4. Subgroup analysis and meta-regression

The forest plot for subgroup analysis (**Figure 5**) showed significant differences in anxiety between the breathing training methods subgroup (yoga breathing exercises, non-yoga breathing exercises) and the results of the analysis ($p < 0.001$).

Figure 5 displays the outcomes of subgroup analyses conducted to explore factors associated with heterogeneity, specifically differences in intervention methods. For the Yoga Breathing Exercise Group, the overall anxiety value was −0.76 (−1.02, −0.51; $p < 0.001$, $I^2 = 7.18\%$, $T^2 = 0.01$). For the Non-Yoga Breathing Exercise Group, the overall anxiety value was −0.33 (−0.50, −0.15; $p < 0.001$, $I^2 = 20.64$, $T^2 = 0.01$). To further evaluate the impact of the type of intervention on anxiety levels, a regression model was utilized for assessment. When a mixed-effects model was fitted to the data, the subgroup emerged as a significant predictor, with a coefficient of 0.43 (0.06, 0.81, $p = 0.02$, $R = 68.44\%$, $I^2 = 13.75\%$). This indicates a positive influence on the effect size. Other covariates showed no significant correlation. The results of the meta-regression analysis and the bubble plot are presented in Appendix A.

The remaining subgroup analyses regarding duration, age, health status, etc., did not show significant differences between groups. For the depression outcome, given the negligible heterogeneity and the relatively small sample of studies available for analysis, no subgroup analysis was performed.

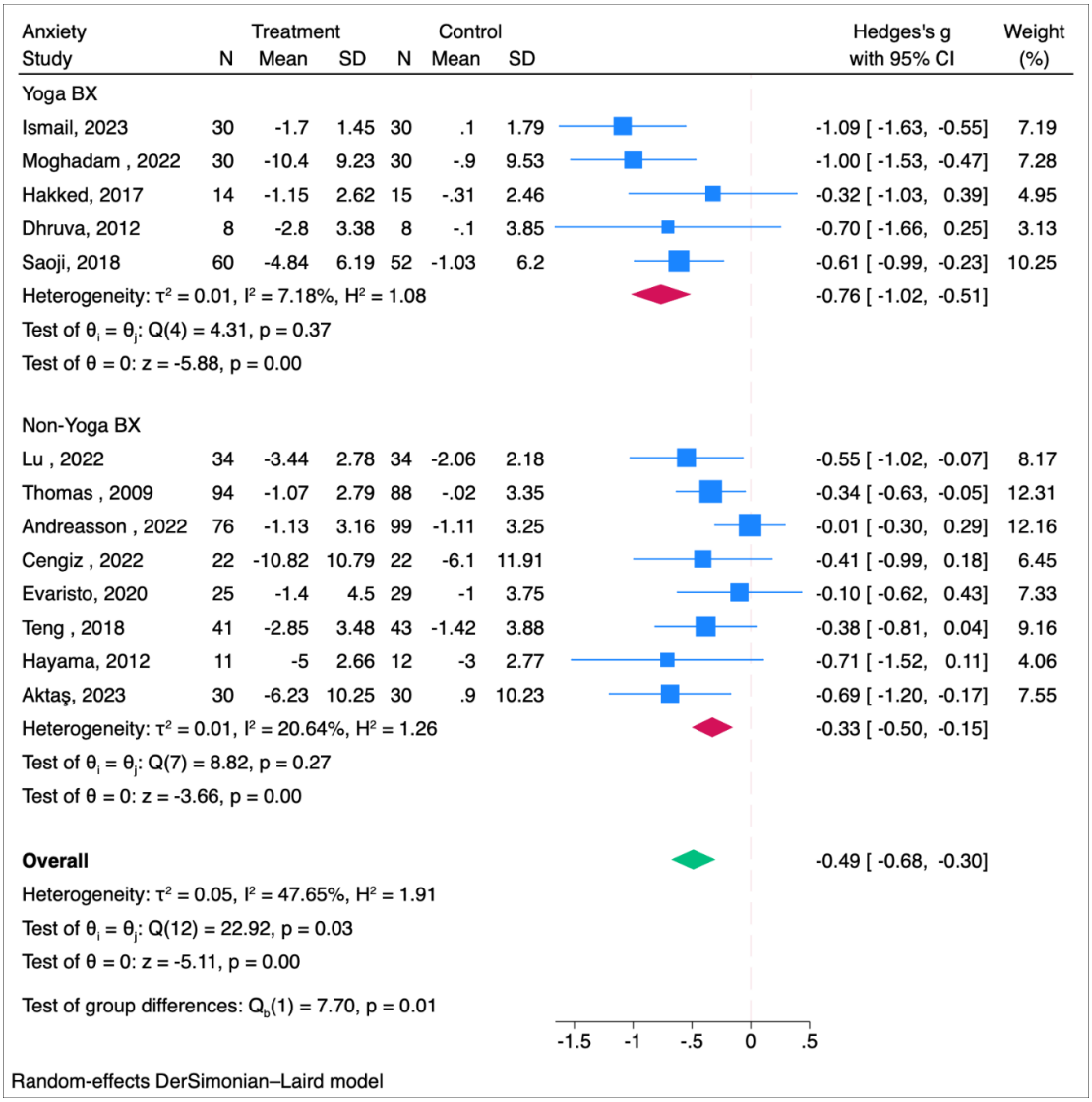


Figure 5. Subgroup analysis. Forest plot of the comparison of the effects between yoga breathing exercises and non-yoga breathing exercises intervention methods.

3.5. Sensitivity analysis, publication bias

The leave-one-out meta-analysis indicates that the effect size of anxiety data remained non-significantly altered with the exclusion of each study (refer to the sensitivity plot in Appendix B). The funnel plots for anxiety showed a basic symmetry (**Figure 6**). Egger's regression test was employed to statistically analyze publication bias, revealing no publication bias (*p*-value = 0.089, 95% CI = −4.240, 0.352). Given the limited research data, a sensitivity analysis for depressive values was not performed.

3.6. Evidence certainty

We evaluated the limitations, consistency, directness, precision, and publication bias of the studies. According to the GRADE framework, randomized controlled trials (RCTs) are initially regarded as having a high level of evidence certainty. No factors were identified that would warrant downgrading the level of evidence concerning limitations, consistency, directness, and precision. We identified eighteen studies,

including six at low, five at moderate, and three at high risk of bias. Although there was potential for publication bias, we did not downgrade the evidence in this review due to publication bias. Consequently, the evidence regarding anxiety and depression was ultimately rated as having a high level of evidence certainty.

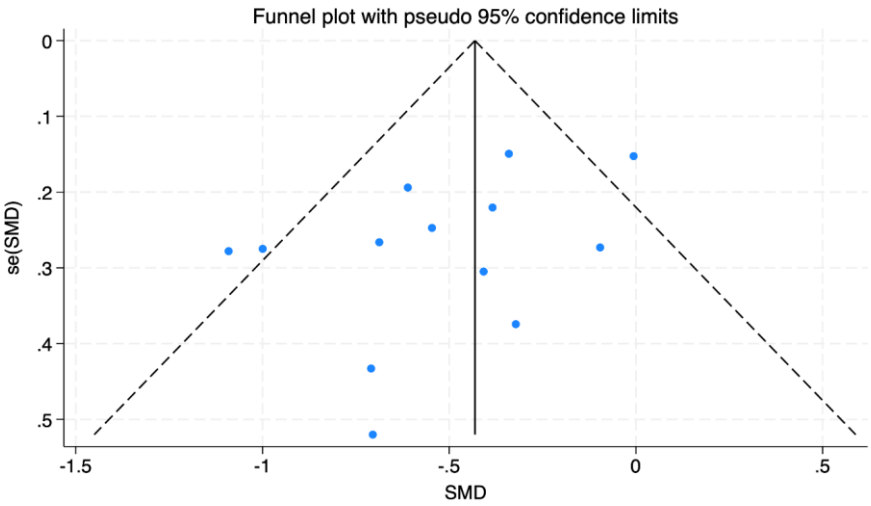


Figure 6. Anxiety funnel plot with pseudo 95% confidence limits.

4. Discussion

4.1. Cancer patients, breathing exercises, anxiety and depression

This meta-analysis aimed to evaluate the effectiveness of breathing exercises on anxiety and depression in cancer patients and other chronic disease patients across 14 randomized controlled trials. While a 2023 systematic review examined the stress and anxiety reduction effects of breathing exercises [11], it did not perform a meta-analysis or a comprehensive subgroup analysis. Our study offers fresh perspectives on the effectiveness and reliability of respiratory training, considering participant and study characteristics.

After scrutinizing 16 randomized clinical trials, we identified two outliers and excluded them from our analysis. Among the remaining studies, no significant group differences were detected. We determined that breathing exercise interventions were more effective in alleviating anxiety symptoms in cancer patients than control interventions. Similarly, these interventions showed superiority in reducing depressive symptoms compared to the control group.

The meta-analysis results are largely consistent with previous studies and provide an extension of their findings. For instance, our findings are somewhat in line with Rakic et al.'s recent review that breathing exercises might be beneficial for the long-term management of cancer [15,22,23], chronic diseases [31], and mental disorders by reducing anxiety. By focusing on breath training, cancer patients have shifted their attention away from the disease and related stress, placing more emphasis on awareness and control of their own physical and emotional states. The findings of our study align with previous research demonstrating the benefits of various forms of physical activity and exercise in enhancing mental health outcomes for cancer

patients [19,20]. Collectively, breathing exercises are a promising approach for helping individuals manage their emotional well-being.

4.2. Comparison to anxiety-reduction interventions

Subgroup analysis of intervention measures reveals clinically relevant nuances among the interventions, with specific respiratory training methods which can provide better relief for anxiety symptoms in cancer patients.

Within the realm of breathing exercises for cancer patients, yoga-based breathing exercises have been found to be more effective than non-yoga breathing exercises. Individuals suffering from cancer often exhibit chronically rapid and irregular breathing patterns [13,23,32]. However, as meditation practices are intensified, the respiratory rate tends to slow down, which may lead to improved health and emotional states. Non-yoga breathing exercises, on the other hand, require guidance from healthcare professionals, incurring higher costs and potentially limiting the frequency of practice sessions, thereby affecting the overall efficacy of the intervention.

Subgroup analyses are not conclusive on their own but can reveal trends and inspire new hypotheses. The heterogeneity observed across studies, due to variations in participant demographics, breathing exercise specifics, outcome measurements, and statistical methodologies, suggests that respiratory training interventions may effectively reduce anxiety, underscoring their significance.

4.3. Strengths and limitations

Clinical intervention standards suggest that the observed heterogeneity is relatively high and only partially explicable through meta-analysis. This high heterogeneity might also indicate the absence of influential covariates or measurement errors across multiple studies, potentially affecting the estimated effect sizes.

A strength of our study is the transparent aggregation of diverse symptoms and case definitions to construct a more comprehensive meta-analysis outcome. Limiting our meta-analysis to uniform case definitions would have artificially minimized the breadth of the evidence.

Our assessment has limitations, including the inherent risk of bias from the original study designs. Firstly, it was not feasible to include all participants receiving respiratory treatments. Secondly, the symptoms in our primary outcomes were often based on care reports or self-reports, which, despite the blinding of outcome assessors, still carry a risk of bias. This could lead to an overestimation of effects, but such overestimation might be counterbalanced by factors like insufficient participation of the target population in the intervention or low compliance. Additionally, our review process did not systematically search for gray literature, potentially overlooking studies not published in indexed journals. Future research should investigate the long-term effects of breathing exercises on mental health outcomes in cancer patients and explore the potential benefits of incorporating these exercises into standard care protocols.

Modern populations face increasing disease risks due to environmental pollution, unhealthy lifestyles, and inadequate disease prevention strategies. Addressing not only physical health but also mental health is crucial for achieving the United Nations

Sustainable Development Goals, specifically SDG 3 [34], which focuses on Good Health and Well-being.

Breathing exercises may help reduce anxiety in individuals managing cancer and other chronic conditions. For effective respiratory training, the guidance of a professional physiotherapist or a systematically trained professional is essential. The training program should include initial manual guidance and clear, specific standards for long-term practice.

5. Conclusion

This systematic review and meta-analysis were conducted to assess the impact of breathing exercises on the management of anxiety and depressive symptoms in adults. Our analysis, which included 14 randomized clinical trials encompassing a subset of cancer patients, indicates that breathing exercise interventions are effective in alleviating symptoms of anxiety.

Based on the fourteen studies mentioned, we cannot provide specific clinical recommendations. However, our review suggests that the widespread promotion of respiratory training has the potential to alleviate the negative emotions associated with anxiety and depression.

Author contributions: Conceptualization, MH; data curation, MH; formal analysis, MH; methodology, MH; project administration, MH and THK; resources, MH; supervision, THK and MH; validation, THK and MH; visualization, MH; writing-original draft, MH; writing—review and editing, MH and THK. All authors have read and agreed to the published version of the manuscript.

Ethical approval: Not applicable.

Informed consent statement: Informed consent was obtained from all subjects involved in the study.

Conflict of interest: The authors declare no conflict of interests.

References

1. Remes O, Brayne C, van der Linde R, Lafortune L. A systematic review of reviews on the prevalence of anxiety disorders in adult populations. Brain and Behavior. 2016; 6(7): e00497. doi: 10.1002/BRB3.497
2. Pitman A, Suleman S, Hyde N, Hodgkiss A. Depression and anxiety in patients with cancer. BMJ. 2018; 361. doi: 10.1136/bmj.k1415
3. GBD 2019 Mental Disorders Collaborators. Global, regional, and national burden of 12 mental disorders in 204 countries and territories, 1990–2019: A systematic analysis for the Global Burden of Disease Study 2019. The Lancet Psychiatry. 2022; 9(2): 137–150. doi: 10.1016/S2215-0366(21)00395-3
4. Penninx BWJH, Pine DS, Holmes EA, Reif A. Anxiety disorders. The Lancet. 2021; 397(10277): 914–927.
5. Mitchell AJ, Chan M, Bhatti H, et al. Prevalence of depression, anxiety, and adjustment disorder in oncological, haematological, and palliative-care settings: A meta-analysis of 94 interview-based studies. The Lancet Oncology. 2011; 12(2): 160–174. doi: 10.1016/S1470-2045(11)70002-X
6. Ferguson JM. SSRI antidepressant medications: Adverse effects and tolerability. Primary Care Companion to the Journal of Clinical Psychiatry. 2001; 3(1): 22–27. doi: 10.4088/PCC.V03N0105
7. Reshma V, Chacko AM, Abdulla N, et al. Medication adherence in cancer patients: A comprehensive review. Cureus. 2024; 16(1): e52721.
8. Kartalova-O'Doherty Y, Doherty DT. Recovering from mental health problems: Perceived positive and negative effects of medication on reconnecting with life. International Journal of Social Psychiatry. 2011; 57(6): 610–618.

9. Nakamura NH, Oku Y, Fukunaga M. “Brain–breath” interactions: Respiration-timing–dependent impact on functional brain networks and beyond. Reviews in the Neurosciences. 2024; 35(2): 165–182.
10. Banushi B, Brendle M, Ragnhildstveit A, et al. Breathwork interventions for adults with clinically diagnosed anxiety disorders: a scoping review. Brain Sciences. 2023; 13(2): 256.
11. Bentley TGK, D’Andrea-Penna G, Rakic M, et al. Breathing practices for stress and anxiety reduction: conceptual framework of implementation guidelines based on a systematic review of the published literature. Brain Sciences. 2023; 13(12): 1612.
12. Zaccaro A, Piarulli A, Laurino M, et al. How breath-control can change your life: A systematic review on psycho-physiological correlates of slow breathing. Frontiers in Human Neuroscience. 2018; 12. doi: 10.3389/FNHUM.2018.0035
13. Hakked CS, Balakrishnan R, Krishnamurthy MN. Yogic breathing practices improve lung functions of competitive young swimmers. Journal of Ayurveda and Integrative Medicine. 2017; 8(2): 99–104. doi: 10.1016/J.JAIM.2016.12.005
14. Öner Cengiz H, Ayhan M, Güner R. Effect of deep breathing exercise with Triflo on dyspnoea, anxiety and quality of life in patients receiving covid-19 treatment: A randomized controlled trial. Journal of Clinical Nursing. 2022; 31(23–24): 3439–3453.
15. Lu HB, Liu X, Wang YQ, et al. Active cycle of breathing technique: A respiratory modality to improve perioperative outcomes in patients with lung cancer. Clinical Journal of Oncology Nursing. 2022; 26(2): 176–182.
16. Teng HC, Yeh ML, Wang MH. Walking with controlled breathing improves exercise tolerance, anxiety, and quality of life in heart failure patients: A randomized controlled trial. European Journal of Cardiovascular Nursing. 2018; 17(8): 717–727.
17. Ma X, Yue ZQ, Gong ZQ, et al. The effect of diaphragmatic breathing on attention, negative affect and stress in healthy adults. Frontiers in Psychology. 2017; 8: 874. doi: 10.3389/fpsyg.2017.00874
18. Thomas M, McKinley RK, Mellor S, et al. Breathing exercises for asthma: A randomised controlled trial. Thorax. 2009; 64(1): 55–61.
19. Cramer H, Lauche R, Klose P, et al. Yoga for improving health-related quality of life, mental health and cancer-related symptoms in women diagnosed with breast cancer. Cochrane Database of Systematic Reviews. 2017; (1): CD010802.
20. Mustian KM, Sprod LK, Janelsins M, et al. Multicenter, randomized controlled trial of yoga for sleep quality among cancer survivors. Journal of Clinical Oncology. 2013; 31(26): 3233–3241.
21. Fernández-Lázaro D, Corchete LA, García JF, et al. Effects on respiratory pressures, spirometry biomarkers, and sports performance after inspiratory muscle training in a physically active population by powerbreath®: A systematic review and meta-analysis. Biology. 2023; 12(1): 56. doi: 10.3390/biology12010056
22. Hayama Y, Inoue T. The effects of deep breathing on 'tension-anxiety' and fatigue in cancer patients undergoing adjuvant chemotherapy. Complementary Therapies in Clinical Practice. 2012; 18(2): 94–98.
23. Dhruva A, Miaskowski C, Abrams D, et al. Yoga breathing for cancer chemotherapy-associated symptoms and quality of life: Results of a pilot randomized controlled trial. Journal of Alternative and Complementary Medicine. 2012; 18(5): 473–479. doi: 10.1089/ACM.2011.0555
24. Wan X, Wang W, Liu J, Tong T. Estimating the sample mean and standard deviation from the sample size, median, range and/or interquartile range. BMC Medical Research Methodology. 2014; 14(1). doi: 10.1186/1471-2288-14-135
25. Department of Mathematics at HKBU. (n.d.). Estimating the sample mean and standard deviation (sd) from the five-number summary and its application in meta-analysis Hong Kong Baptist University. Available online: https://www.math.hkbu.edu.hk/~tongt/papers/median2mean.html (accessed on 2 November 2024).
26. Deeks JJ, Higgins JPT, Altman DG, on behalf of the Cochrane Statistical Methods Group. Analysing data and undertaking meta-analyses. In: Higgins JPT, Thomas J, Chandler J, et al. (eds.) Cochrane Handbook for Systematic Reviews of Interventions. Wiley; 2022. pp. 241–284.
27. Andreasso KH, Skou ST, Ulrik CS, et al. Breathing exercises for patients with asthma in specialist care a multicenter randomized clinical trial. Annals of the American Thoracic Society. 2022; 19(9): 1498–1506.
28. Ismail AMA, Saif HFAEA, Taha MM. Effect of alternate nostril breathing exercise on autonomic functions, ocular hypertension, and quality of life in elderly with systemic hypertension and high-tension primary open-angle glaucoma: Nose respiratory exercise in glaucoma. Geriatric Nursing. 2023; 52: 91–97.
29. Moghadam ZE, Delmoradi F, Aemmi SZ, et al. Effectiveness of aromatherapy with inhaled lavender essential oil and breathing exercises on ECT-related anxiety in depressed patients. Explore. 2022; 18(6): 683–687.
30. Evaristo KB, Mendes FAR, Saccomani MG, et al. Effects of aerobic training versus breathing exercises on asthma control: A randomized trial. Journal of Allergy and Clinical Immunology: In Practice. 2020; 8(9): 2989–2996.e2984. doi: 10.1016/J.JAIP.2020.06.042
31. Yıldırım D, Akman Ö. The effect of mindfulness breathing-exercise on stress and depression symptoms in patients with chronic diseases. Journal of Academic Research in Nursing. 2023; 9(3): 197–204.
32. Saoji AA, Raghavendra BR, Madle K, Manjunath NK. Additional practice of yoga breathing with intermittent breath holding enhances psychological functions in yoga practitioners: A randomized controlled trial. Explore. 2018; 14(5): 379–384.
33. Aktaş GK, İlgin VE. The effect of deep breathing exercise and 4-7-8 breathing techniques applied to patients after bariatric surgery on anxiety and quality of life. Obesity Surgery. 2023; 33(3): 920–929.
34. United Nations in China. Sustainable development goal3 good health and well-being. Available online: https://china.un.org/en/sdgs/3 (accessed on 2 November 2024).

Appendix A

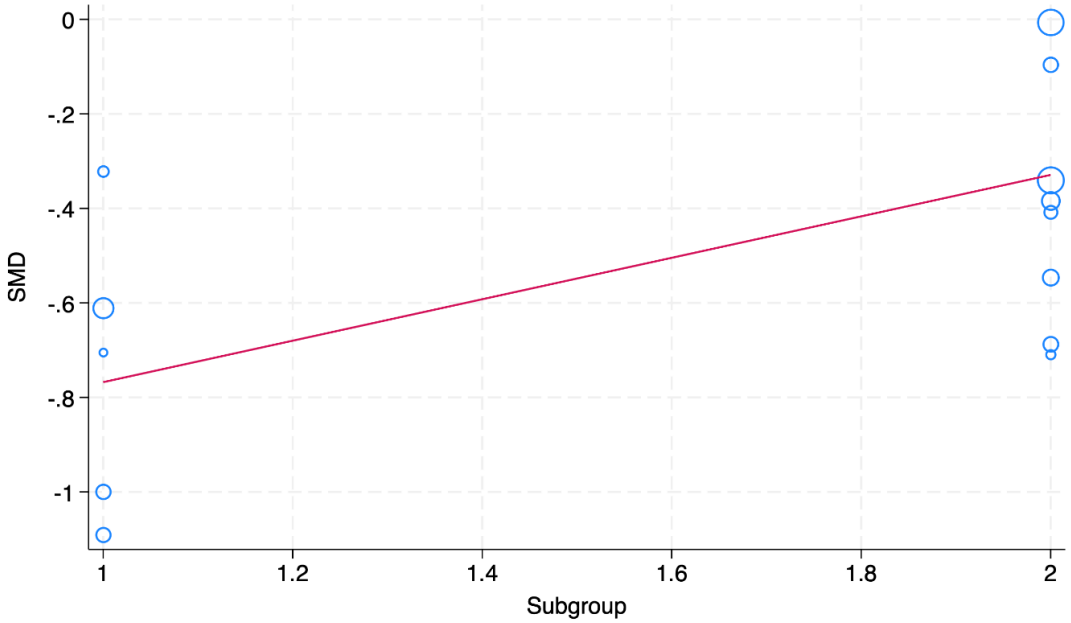


Figure A1. Meta regression analysis (anxiety).
Subgroup: 0.43 (95% CI 0.06–0.81), $p = 0.02$, $I^2 = 13.75\%$, $R^2 = 68.44\%$.

Appendix B

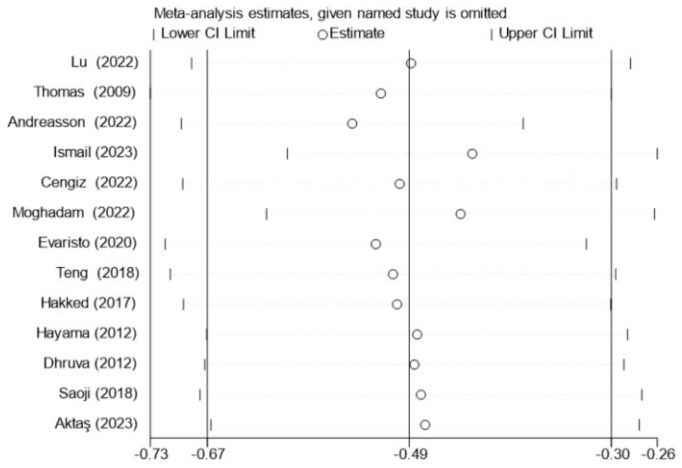


Figure B1. Sensitivity analysis (anxiety).

Appendix C

Breathing exercises groups compared to control groups for anxiety and depression in cancer patients

Patient or population: anxiety and depression in cancer patients
Setting:
Intervention: breathing exercises groups
Comparison: control groups

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with control groups	Risk difference with breathing exercises groups
Anxiety	967 (13 RCTs)	⨁⨁⨁⨁ High	-	-	SMD **0.49 SD lower** (0.68 lower to 0.3 lower)
depression	757 (8 RCTs)	⨁⨁⨁⨁ High	-	-	SMD **0.38 SD lower** (0.53 lower to 0.23 lower)

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: confidence interval; **SMD:** standardised mean difference

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.
Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

Figure C1. Certainty of evidence.

Psycho-Oncologie 2025, 19(2), 3618.
https://doi.org/10.18282/po3618

Review

Impact of breathing exercises on anxiety and depression in cancer patients: A systematic review and meta-analysis

Supplementary file

Table S1. PRISMA 2020 checklist.

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	1,2
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	3
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	3
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	3,4
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	3
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	4
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	4

Table S1. (*Continued*).

Section and Topic	Item #	Checklist item	Location where item is reported
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	4
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	5
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	4
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	4
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	4
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	4
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	5
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	5
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	5
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	5
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	5
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	3
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	**Figure 1**
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	9
Study characteristics	17	Cite each included study and present its characteristics.	9, **Table 1**
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	9,10, **Figure 2**

Table S1. (*Continued*).

Section and Topic	Item #	Checklist item	Location where item is reported
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	**Figure 3**, **Figure 4**
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	10,11
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	11
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	12,13, **Figure 5**
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	13
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	**Figure 6**
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	13
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	14,15
	23b	Discuss any limitations of the evidence included in the review.	15
	23c	Discuss any limitations of the review processes used.	15
	23d	Discuss implications of the results for practice, policy, and future research.	15
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	3
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	3
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	-
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	16
Competing interests	26	Declare any competing interests of review authors.	16
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	16

Note: *From:* Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71. This work is licensed under CC BY 4.0. To view a copy of this license, visit https://creativecommons.org/licenses/by/4.0/

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Review

Lung cancer and risk factors for negative emotions in COPD patients with depression: A meta-analysis and systematic review

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Abstract: Objective: To explore the incidence of lung cancer and risk factors for negative emotions in patients with chronic obstructive pulmonary disease (COPD) and depression through systematic reviews and meta-analyses. **Methods:** Case-control studies, cohort studies, and cross-sectional studies on the incidence of lung cancer and negative emotional risk factors in COPD patients with depression were searched in PubMed, Embase, Cochrane Library, Web of Science, China National Knowledge Infrastructure (CNKI), Wanfang Data, VIP and other databases. The search was up to October 2024, and Stata 15.1 was used for data analysis. **Results:** 34 articles were included, with 181,585 people with COPD and depression and 193,882 people with COPD without depression. The results of the meta-analysis showed that the lung cancer incidence rate in COPD patients with depression was 32.6% (95% CI: 0.33–0.45); females [OR = 1.40, 95% CI (1.24, 1.58), $p < 0.001$], never married [OR = 1.89, 95% CI (1.41, 2.52), $p < 0.001$], unable to take care of oneself [OR = 1.07, 95% CI (1.05, 1.09), $p < 0.001$], monthly income <3000 yuan [OR for 1.97, 95% CI for (1.15, 3.38), $p = 0.014$], smoking [OR for 1.51, 95% CI for (1.28, 1.79), $p < 0.001$], heart failure [OR for 1.34 , 95% CI (1.31, 1.38), $p < 0.001$], stroke [OR = 1.59, 95% CI (1.54, 1.64), $p < 0.001$], out-of-pocket medical expenses [OR = 1.95, 95% CI (1.09, 3.51), $p = 0.026$], oxygen therapy [OR = 1.67, 95% CI (1.05, 2.64), $p = 0.030$], and low education level [OR = 1.54, 95% CI (1.17, 2.01), $p = 0.002$] were risk factors for negative emotions combined with depression in COPD. **Conclusion:** Based on the available evidence, it was found that 39% of COPD patients have depression, with risk factors including female gender, low income, smoking, heart failure, stroke, and limited self-care ability. Research suggests that depression may be a potential risk factor for lung cancer development among patients with COPD. It may exacerbate the symptoms of COPD and affect immune function, making patients more susceptible to complications such as lung cancer. The clinical significance of this paper is to emphasize the potential impact of depression on lung cancer incidence in patients with COPD and to promote the importance of mental health in the management of chronic diseases. Recommendations for the scientific community, in turn, include further exploration of this mechanism, enhanced mental health screening, and additional clinical studies.

Keywords: COPD; depression; lung cancer incidence; meta-analysis; systematic review

1. Background

Chronic obstructive pulmonary disease (COPD), referred to as chronic obstructive pulmonary disease for short, is a heterogeneous lung disease characterized by persistent airflow limitation. Symptoms include dyspnea and coughing [1]. COPD is the fourth leading cause of death worldwide, resulting in about 3.23 million deaths, and is ranked by the WHO (World Health Organization)

as the eighth leading cause of years of life lost due to disability worldwide [2,3]. The high incidence, mortality, and disability rates of COPD place a heavy burden on patients, their families, and society, seriously affecting physical and mental health and socio-economic development. Due to prolonged disease course, exacerbations, and activity limitations, COPD patients often experience psychological problems such as depression [4]. Depression is one of the common comorbidities, which is manifested as low mood, suicidal thoughts, etc. [5]. Studies have shown that the risk of psychological disorders in COPD patients is two to three times that of healthy people and even higher than that of other chronic disease patients [6,7]. However, due to overlapping symptoms, depression is often ignored or undertreated, and it worsens as COPD progresses, forming a vicious circle [8,9].

Currently, COPD treatment focuses on the disease itself, and there has been relatively little research on the management of depression. The latest guidelines also do not provide clear recommendations on the negative emotional risk factors and treatment of depression that accompany COPD [10,11]. Therefore, in order to reduce the risk of death and disability and improve quality of life, early prevention of depression is key. However, there are still few consistent conclusions and evidence-based analyses in current studies on lung cancer and negative emotional risk factors for depression in COPD. The two existing systematic reviews [12,13] have the limitations of including a small amount of literature, being published too long ago, and lacking analysis of negative emotional risk factors. Therefore, this study explored the incidence of lung cancer and negative emotional risk factors for depression in COPD patients through systematic review and meta-analysis in order to provide evidence-based evidence for prevention and intervention.

2. Data and methods

This protocol is written according to the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) guidelines. The review will be conducted according to the PRISMA guidelines [14] and registered under the number CRD42024517840. Meanwhile, the author couldn’t find any articles prior to 2005.

2.1. Literature search

PubMed, Embase, Cochrane Library, Web of Science, China National Knowledge Infrastructure (CNKI), Wanfang Data, VIP, and other databases were searched for literature on the incidence of lung cancer and negative emotional risk factors in COPD patients with depression. The first search was in September 2005; the search was conducted up to October 2024. The search was conducted using both subject headings and free words. The English search terms were pulmonary disease, chronic obstructive, depression, risk factors, and prevalence, and the Chinese search terms were chronic obstructive pulmonary disease, depression, emotionally negative risk factors, and lung cancer incidence.

2.2. Inclusion and exclusion criteria

(1) Inclusion criteria: Adults who meet the diagnostic criteria for COPD according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD), i.e.,

the presence of negative emotional risk factors and/or clinical symptoms and lung function indicating evidence of persistent airflow limitation (FEV1/FVC < 0.70 after bronchodilator use) [8], with exposure factors being case-control studies, cohort studies, and cross-sectional studies with combined depression. Depression was screened based on diagnostic guidelines such as the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) or patient health questionnaires (PHQ-9), the Center for Epidemiologic Studies Depression Scale (CES-D), the Hamilton Depression Scale (HAMD), the Self-Rating Depression Scale (SDS), the Hospital Depression Scale (HDS), the Beck Depression Inventory (BDI-II), and other assessment scale tools. The primary outcome measures were bivariate and multivariate analyses of risk factors for negative emotions. Bivariate and multivariate analyses were not limited, but when the same article contained both bivariate and multivariate results, the multivariate results were given priority, and the risk value after multivariate adjustment was extracted. If bivariate analysis was performed, the bivariate results were extracted. The secondary outcome measure was the incidence of lung cancer in patients with COPD and depression. (2) Exclusion criteria: animal experiments, case reports, letters, guidelines, protocols, consensus, reviews, abstracts, meta-analyses and systematic reviews, duplicate publications, publications for which the full text was not available, and publications in which data related to depression in patients with COPD were not reported in the study.

2.3. Data extraction

Two reviewers independently screened the literature and extracted the data. The titles and abstracts of the literature were read, and the full text was read. For literature that was easy to judge, the literature was screened directly; for literature that was controversial, a group discussion was held or a third researcher was consulted. The literature was screened by directly downloading and reading the full text. The inclusion and exclusion criteria were strictly followed during the screening process, the corresponding indicators in the study were extracted, and the extracted data were cross-checked to ensure the consistency of the data extracted from the literature. The main content of data extraction includes the first author's name, year of publication, country, research design, sample size, gender, age, etc.

2.4. Quality assessment

The Newcastle-Ottawa Scale (NOS) [15] was used to evaluate the included literature, including the selection of the study population (4 points), comparability between groups (2 points), and exposure factors or outcome measurement/evaluation (3 points). The total score of this scale is 9 points. ≤ 4 points is considered to be of low quality, 5–6 points are considered to be of moderate quality, and ≥ 7 points is considered to be of high quality. If the two researchers disagree during the evaluation process, they will discuss the decision or ask a third party to make the decision.

2.5. Statistical analysis

Stata 15.1 was used to statistically analyze the data and calculate the pooled *OR* value and 95% confidence interval. Based on the results of the heterogeneity test (*Q*

test) and the I^2 statistic, the corresponding model was selected to calculate the pooled *OR* value. If $I^2 > 50\%$, the random effects model was used; if $I^2 \leq 50\%$, the fixed effects model was used. For $I^2 > 50\%$, a test method of individual elimination was used to analyze the sensitivity of the literature, and the Egger test was used to analyze publication bias, with a test level of $\alpha = 0.05$. A difference of $p < 0.05$ was statistically significant.

3. Results

3.1. Literature search process and results

A preliminary search of PubMed, Embase, Cochrane Library, Web of Science, China National Knowledge Infrastructure, Wanfang Data, and VIP Database yielded 4519 documents. After removing duplicates, 3361 documents were obtained. A preliminary screening by reading the titles and abstracts yielded 69 articles. After reading the full text, 34 articles were finally included. The specific search flowchart is shown in **Figure 1**.

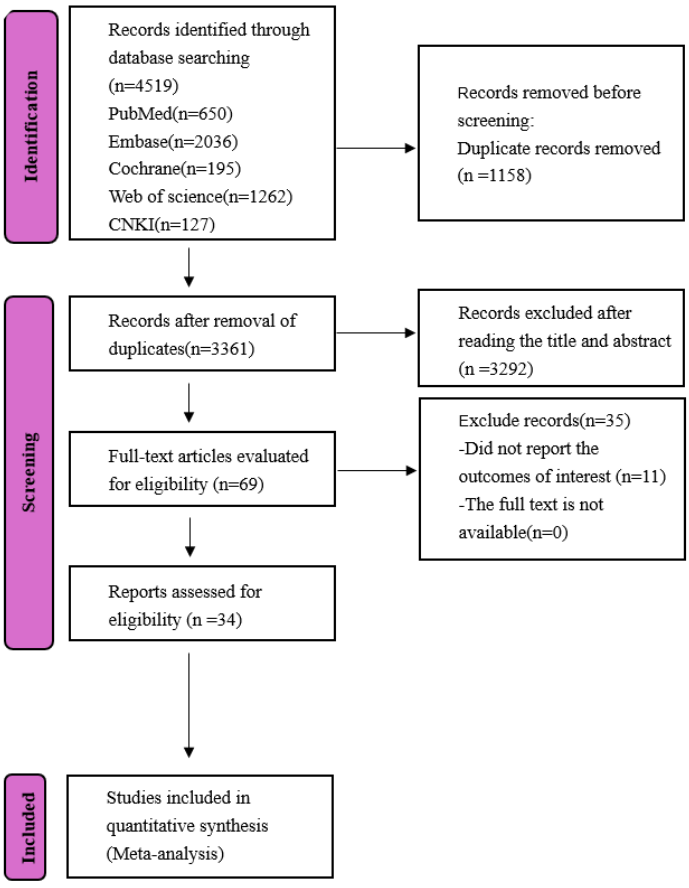


Figure 1. Literature screening flowchart.

3.2. Basic characteristics of included literature

The 34 studies [16–49] included 23 of which were from China, 3 from South Korea, 3 from the United States, 2 from Singapore, 2 from Spain, and the remaining 1 from the Netherlands. Among them, there were 181,585 people with COPD and depression and 193,882 people with COPD without depression. The 34 included

articles were evaluated using the Newcastle-Ottawa Scale (NOS). One article scored 6 points, indicating moderate research quality, while the remaining articles scored 7–9 points, indicating high overall research quality. For a detailed list of the characteristics of the literature and the quality scores, see **Tables 1** and **2**.

Table 1. Characteristics of the enrolled studies.

Study (the first author)	Published time(year)	Country	Study design	Sample size		Gender(M/F)	Age(years)	
				D	ND		D	ND
Chavannes	2005	Netherlands	cross-sectional study	40	107	111/36	57.2	59.2
TP Ng	2007	Singapore	cohort study	167	209	320/56	73.5	71.1
TP Ng	2009	Singapore	cross-sectional study	43	146	NA	NA	
Hanania	2011	US	cohort study	557	1561	1378/740	62	64
Kim	2011	Korea	cross-sectional study	45	135	102/78	NA	
PA Lou	2012	China	case-control study	393	707	827/273	62	
XP Li	2013	China	cross-sectional study	81	134	168/47	NA	
LR Cai	2013	China	cross-sectional study	75	55	85/45	68.35	
Miravitlle	2014	Spain	cross-sectional study	647	220	713/154	68.3	68.3
Kim	2014	Korea	cross-sectional study	43	202	226/19	66.91	
TS Wong	2014	Hong Kong	case-control study	22	124	122/24	73.4	73.4
XC Zhong	2014	China	cross-sectional study	55	80	121/14	77.46	
Gu Meng	2014	China	cross-sectional study	41	95	83/53	NA	
Xuan Xie	2015	China	case-control study	90	90	102/78	NA	
Jing Li	2015	China	cross-sectional study	70	150	130/90	63.2	
Albrecht	2016	USA	cohort study	39,554	85,794	44,169/81,179	71.8	73
Martinez	2016	Spain	cross-sectional study	28	87	107/8	68.3	66.5
Tse	2016	Hong Kong	case-control study	18	71	80/9	75	75.3
LY Hong	2016	China	cross-sectional study	85	121	164/42	62. 3	
YS Chen	2016	China	case-control study	42	58	74/26	67. 86	
ML Cen	2016	China	cohort study	42	88	71/59	NA	
XL Li	2017	China	cross-sectional study	68	90	86/72	64.6	
Kang Xu	2018	China	cohort study	40	13	37/16	77	80
WQ Jiang	2018	China	cross-sectional study	159	141	198/102	73.4	
Lim	2019	Korea	cohort study	53	217	241/29	69.3	70.3
XH Wang	2019	China	cross-sectional study	111	150	147/114	62.6	60.56
Li Cheng	2019	China	cohort study	291	219	219/291	68.1	68.4
HM Yao	2020	China	cohort study	65	228	240/53	65.62	
LN Xu	2020	China	cross-sectional study	40	73	70/43	65.45	70.26
SB Lyu	2020	China	cross-sectional study	21	39	31/29	75.52	72.33
YP He	2022	China	cross-sectional study	112	122	121/113	NA	
Seun	2023	US	cross-sectional study	138,043	101,572	90,978/148,637	79	
WJ Pei	2024	China	cross-sectional study	125	39	135/29	73.77	70.87
Dong Wu	2024	China	cross-sectional study	319	745	837/218	69.96	69.98

Note: D: COPD with depression; ND: COPD without depression; NA: Not applicable.

Table 2. NOS scores.

Study (the first author)	Published time(year)	Is the case definition adequate?	Representativeness of the cases	Selection of Controls	Definition of Controls	Comparability of cases and controls on the basis of the design or analysis	Ascertainment of exposure	Same method of ascertainment for cases and controls	Non response	Total scores
Chavannes	2005	*	*	*	*	*	*	*	*	8
TP Ng	2007	*	*	*	*	*	*	*	-	7
TP Ng	2009	*	*	*	*	*	*	*	*	8
Hanania	2011	*	*	*	*	*	*	*	-	7
Kim	2011	*	*	*	*	*	*	*	*	8
PA Lou	2012	*	*	*	*	*	*	*	*	8
XP Li	2013	*	*	*	*	*	*	*	*	8
LR Cai	2013	*	*	*	*	*	*	*	*	8
Miravitlle	2014	*	*	*	*	*	*	*	*	8
Kim	2014	*	*	*	*	*	*	*	*	8
TS Wong	2014	*	*	*	*	*	*	*	*	8
XC Zhong	2014	*	*	*	*	*	*	*	*	8
Gu Meng	2014	*	*	*	*	*	*	*	*	8
Xuan Xie	2015	*	*	*	*	*	*	*	*	8
Jing Li	2015	*	*	*	*	*	*	*	*	8
Albrecht	2016	*	*	*	*	*	*	*	-	7
Martinez	2016	*	*	*	*	**	*	*	*	9
Tse	2016	*	*	*	*	*	*	*	*	8
LY Hong	2016	*	*	*	*	*	*	*	*	8
YS Chen	2016	*	*	*	*	*	*	*	*	8
ML Cen	2016	*	*	*	*	*	*	*	*	8
XL Li	2017	*	*	*	*	*	*	*	*	8
Kang Xu	2018	*	*	*	*	*	*	-	-	6
WQ Jiang	2018	*	*	*	*	*	*	*	*	8
Lim	2019	*	*	*	*	*	*	*	-	7
XH Wang	2019	*	*	*	*	*	*	*	*	8
Li Cheng	2019	*	*	*	*	*	*	-	*	7
HM Yao	2020	*	*	*	*	*	*	*	-	7
LN Xu	2020	*	*	*	*	*	*	*	*	8
SB Lyu	2020	*	*	*	*	*	*	*	*	8
YP He	2022	*	*	*	*	*	*	*	*	8
Seun	2023	*	*	*	*	*	*	*	*	8
WJ Pei	2024	*	*	*	*	*	*	*	*	8
Dong Wu	2024	*	*	*	*	*	*	*	*	8

Note: *: 1 point; -: No point.

3.3. COPD combined with depression lung cancer incidence

34 studies [16–49] mentioned the incidence of COPD combined with depression and lung cancer. The heterogeneity test (I^2 = 99.9%, p < 0.001) was analyzed using a random effects model, and the results suggested that the incidence of COPD combined with depression lung cancer [ES = 39%, 95% CI (0.33, 0.45)]. Because of the large heterogeneity of the index, sensitivity analyses were conducted by excluding literature on each indicator one by one. The results of the analysis suggest that the sensitivity is small and the results of the analysis are stable. The Egger test was used to evaluate publication bias for this indicator, and p = 0.394, indicating that there is no publication bias for this indicator. See **Figures 2–4** for details.

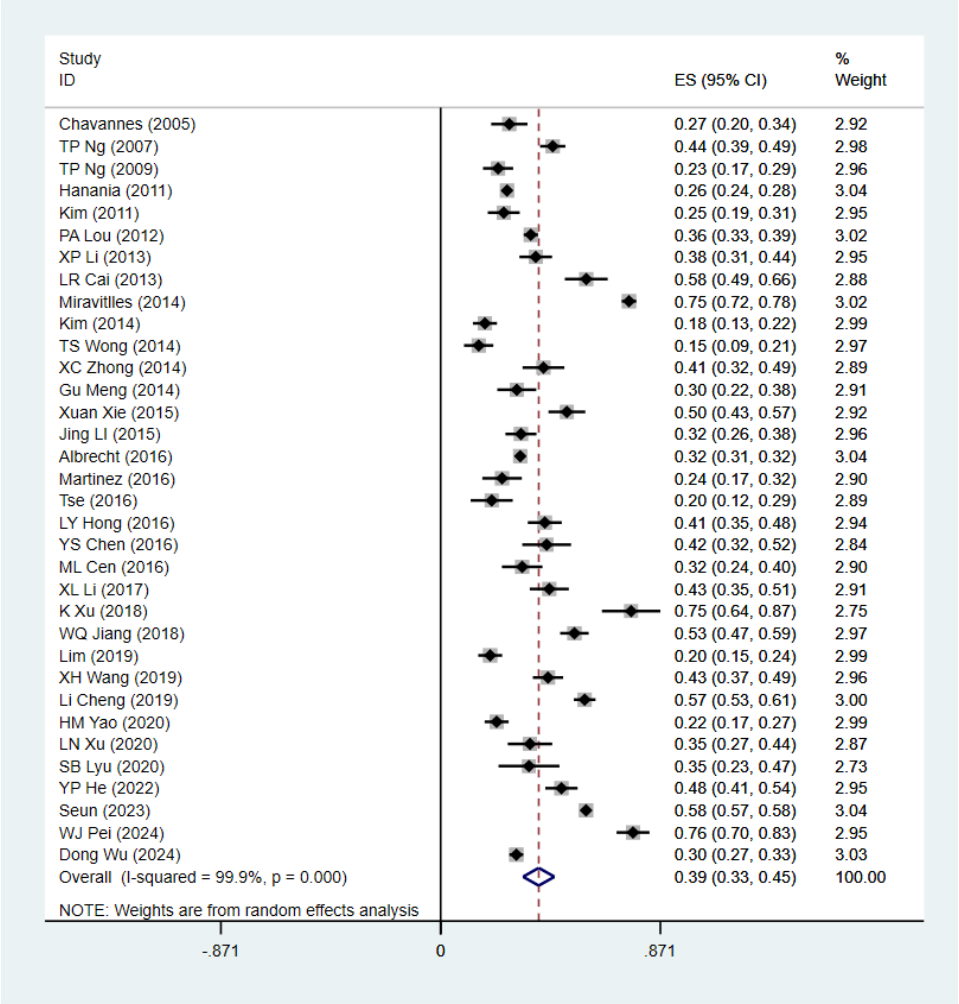


Figure 2. Forest plot of prevalence meta-analysis.

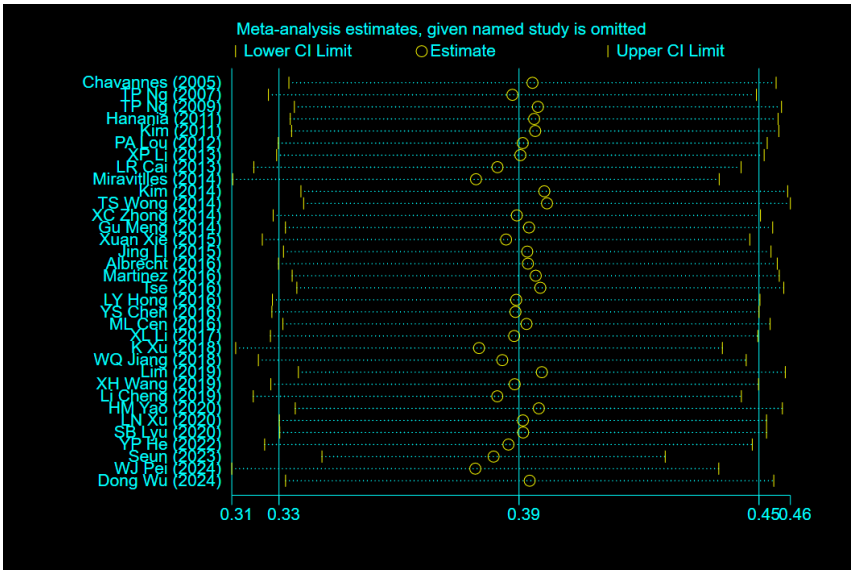


Figure 3. Prevalence sensitivity analysis.

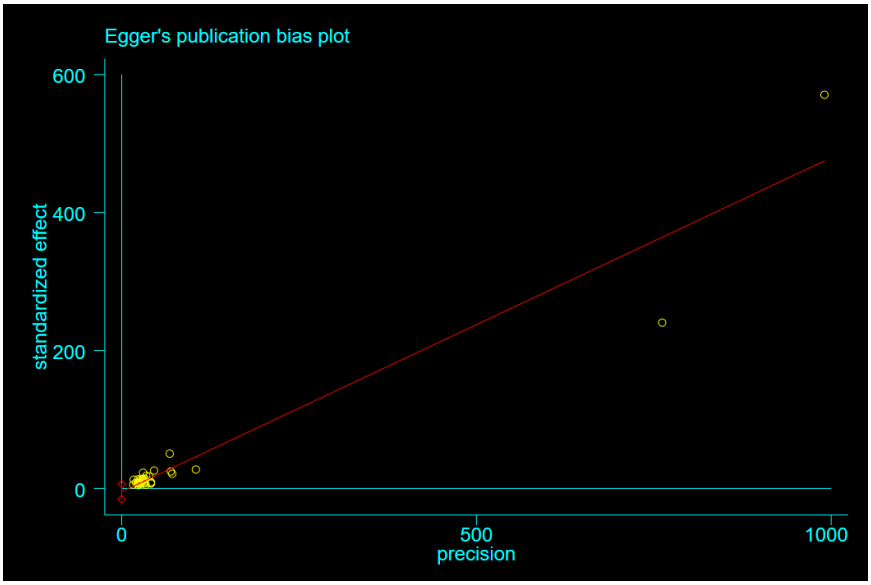


Figure 4. Prevalence Egger test chart—Egger = 0.394.

3.4. Results of meta-analysis

3.4.1. Female

33 studies [16–40,42–49] mentioned females. The heterogeneity test ($I^2 = 91.2\%$, $p < 0.001$) was used to analyze the data using a random effects model. The results of the analysis suggested that female gender is a negative emotional risk factor for the coexistence of COPD and depression, and the difference is statistically significant [*OR* = 1.40, 95% CI (1.24, 1.58), $p < 0.001$]. Because $I^2 > 50\%$, a sensitivity analysis of the literature was performed, and the results showed that the sensitivity was small and the results of the analysis were stable. For details, see **Figures 5** and **6** and **Table 3**.

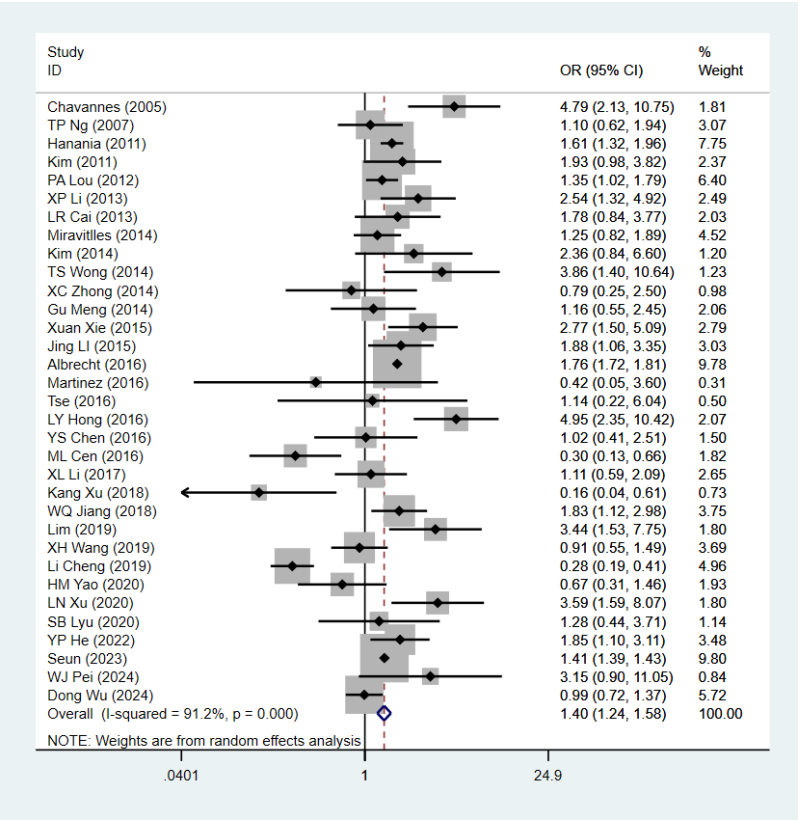


Figure 5. Forest plot of meta-analysis for females.

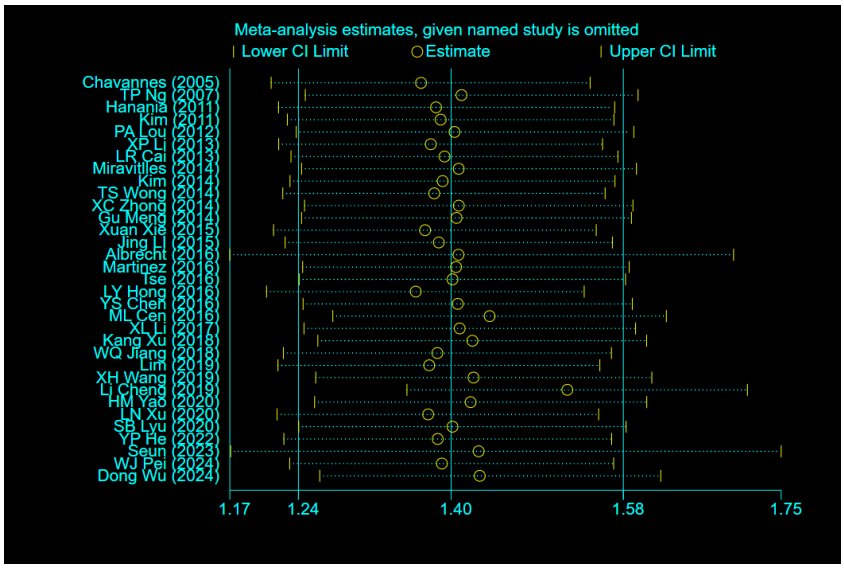


Figure 6. Sensitivity analysis plot for females.

3.4.2. No spouse

12 studies [17,21–24,27,32,33,35–37,42] mentioned no spouse. The heterogeneity test ($I^2 = 55.0\%$, $p = 0.011$) was analyzed using a random effects model. The results suggested that not being married was a negative emotional risk factor for the coexistence of COPD and depression, and the difference was statistically significant [$OR = 1.89$, 95% CI (1.41, 2.52), $p < 0.001$]. Because $I^2 > 50\%$, a sensitivity analysis of the literature was performed, and the results showed that the sensitivity

was small and the results of the analysis were stable. See **Figures 7** and **8** and **Table 3** for details.

Table 3. Meta-analysis results.

Risk factors	No of study	heterogeneity		OR (95% CI)	*P*	Egger
		I^2 (%)	*P*			
Age < 60	18	96.4	< 0.001	0.94 (0.78, 1.15)	0.563	0.297
Age ≥ 60	18	96.4	< 0.001	1.06 (0.87, 1.28)	0.563	0.297
Gender (female/male)	33	91.2	< 0.001	1.40 (1.24, 1.58)	< 0.001	0.836
Low education level (primary school and below)	10	65.0	0.002	1.54 (1.17, 2.01)	0.002	0.010
Mateless	12	55.0	0.011	1.89 (1.41, 2.52)	< 0.001	0.785
Living alone	7	54.6	0.040	1.65 (0.97, 2.81)	0.063	0.817
No self-care ability	6	41.7	0.127	1.07 (1.05, 1.09)	< 0.001	0.437
Monthly income is < 3000	3	57.5	0.095	1.97 (1.15, 3.38)	0.014	0.439
Duration of COPD ≥ 10 years	4	55.0	0.083	1.61 (0.99, 2.62)	0.056	0.253
Smoking	24	66.2	< 0.001	1.51 (1.28, 1.79)	< 0.001	0.001
Diabetes	6	71.8	0.003	1.07 (0.75, 1.53)	0.719	0.481
Asthma	4	71.7	0.014	0.94 (0.71, 1.24)	0.646	0.328
Heart failure	3	35.4	0.213	1.34 (1.31, 1.38)	< 0.001	0.605
Ischemic heart disease	3	63.1	0.066	2.11 (0.86, 5.18)	0.102	0.006
Stroke	3	0.00	0.557	1.59 (1.54, 1.64)	< 0.001	0.914
Hypertension	3	0.00	0.483	1.07 (0.77, 1.49)	0.676	0.111
Medical expenses at their own expense	8	80.3	< 0.001	1.95 (1.09, 3.51)	0.026	0.663
Oxygen therapy	8	88.3	< 0.001	1.67 (1.05, 2.64)	0.030	0.211

Note: NA: Not applicable.

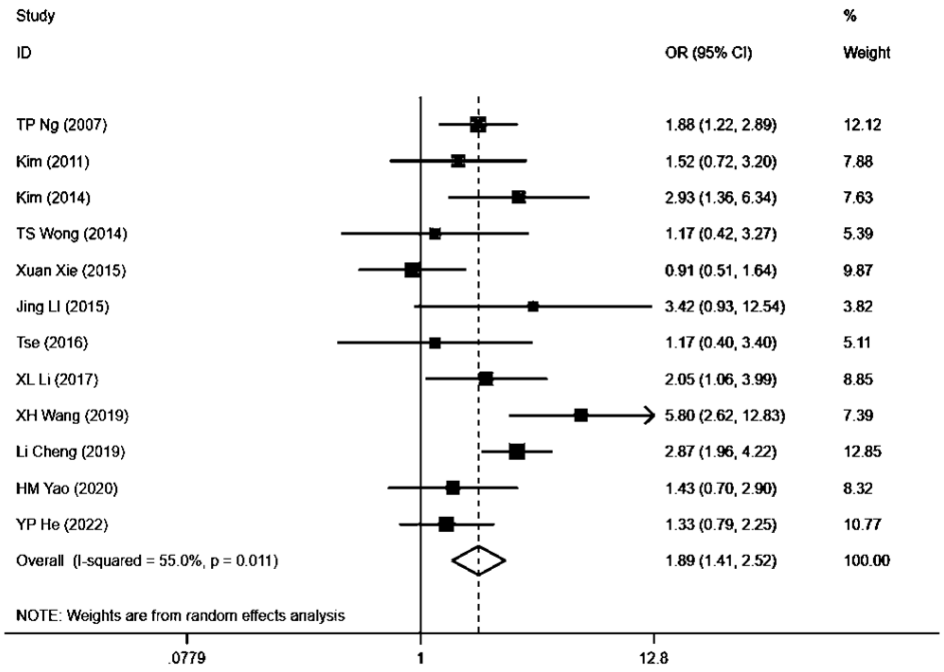


Figure 7. Forest plot of meta-analysis of no spouse.

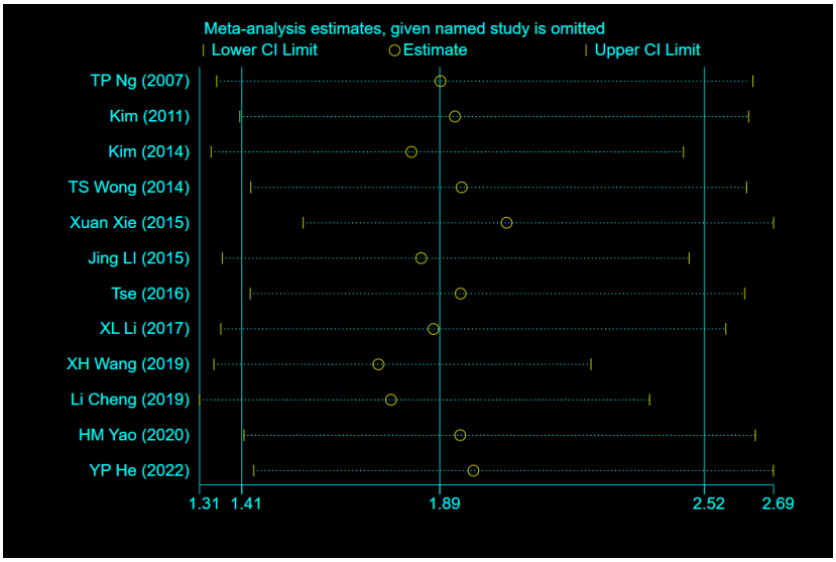


Figure 8. Sensitivity analysis for individuals without a spouse.

3.4.3. Dependence

6 studies [16,17,21,25,30,48] did not mention spouses. Heterogeneity test using a fixed-effect model (I^2 = 41.7%, p = 0.127). The results showed that lack of self-care ability was a negative emotional risk factor for the coexistence of COPD and depression, and the difference was statistically significant [OR = 1.07, 95% CI (1.05, 1.09), p < 0.001]. See **Figure 9** and **Table 3** for details.

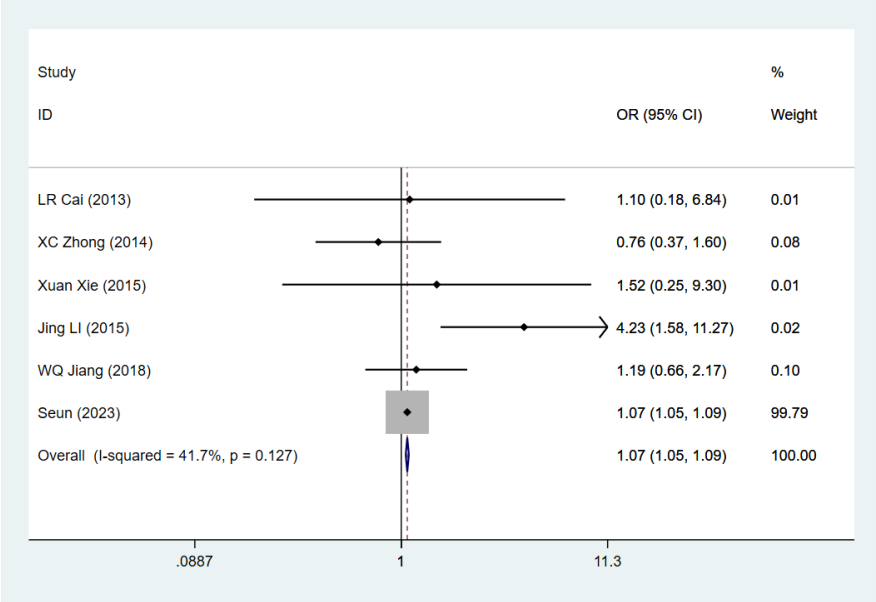


Figure 9. Forest plot of meta-analysis for individuals without self-care ability.

3.4.4. Monthly income < 3000 yuan

Three studies [24,25,46] mentioned not having a spouse. The heterogeneity test (I^2 = 57.5%, p = 0.095) used a random effects model. The results of the analysis suggest that a monthly income of < 3000 yuan is a risk factor for negative emotions in patients with COPD and depression, and the difference is statistically significant [OR = 1.97, 95% CI (1.15, 3.38), p = 0.014]. Because I^2 > 50%, a sensitivity analysis of the

literature was performed, and the results showed that the sensitivity was small and the analysis results were stable. See **Figures 10** and **11** and **Table 3** for details.

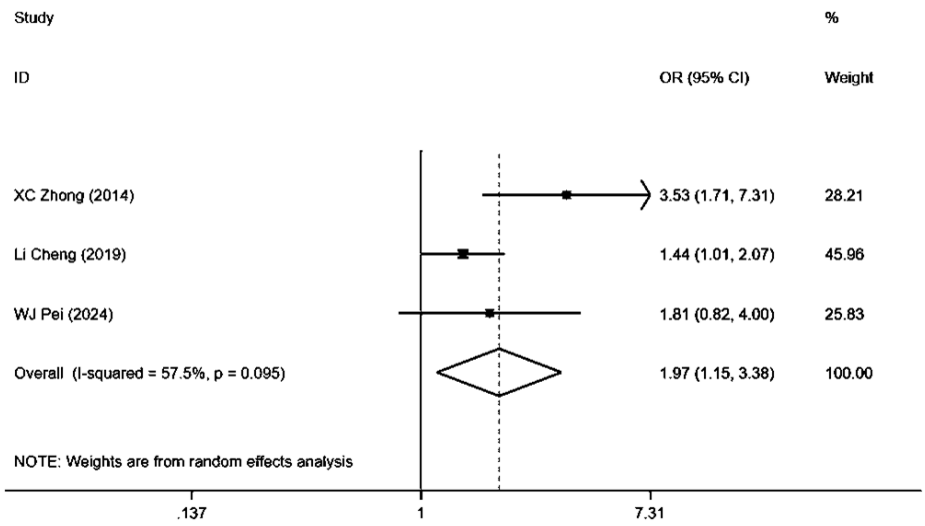


Figure 10. Forest plot of meta-analysis for individuals with monthly income less than 3000.

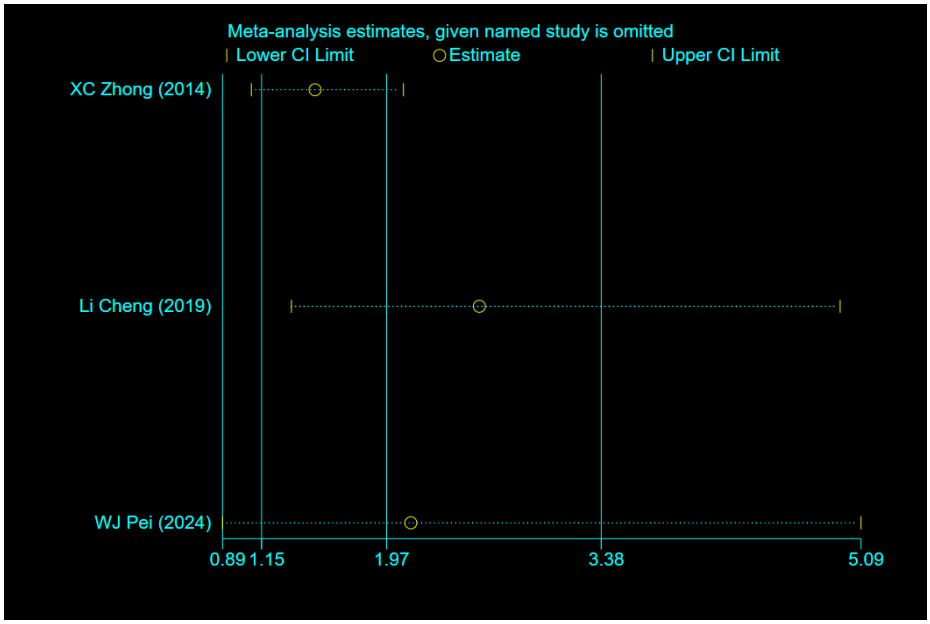


Figure 11. Sensitivity analysis plot for individuals with monthly income less than 3000.

3.4.5. Smoking

24 studies [16–18,20,23,25,26,28–30,32–34,36–39,41–45,47,48] mentioned smoking. The heterogeneity test (I^2 = 66.2%, p < 0.001) was analyzed using a random effects model. The results suggest that smoking is a negative emotional risk factor for COPD combined with depression, and the difference is statistically significant [*OR* = 1.51, 95% CI (1.28, 1.79), p < 0.001]. Because I^2 > 50%, a sensitivity analysis of the literature was performed, which showed that the sensitivity was small and the results of the analysis were stable. See **Figures 12** and **13** and **Table 3** for details.

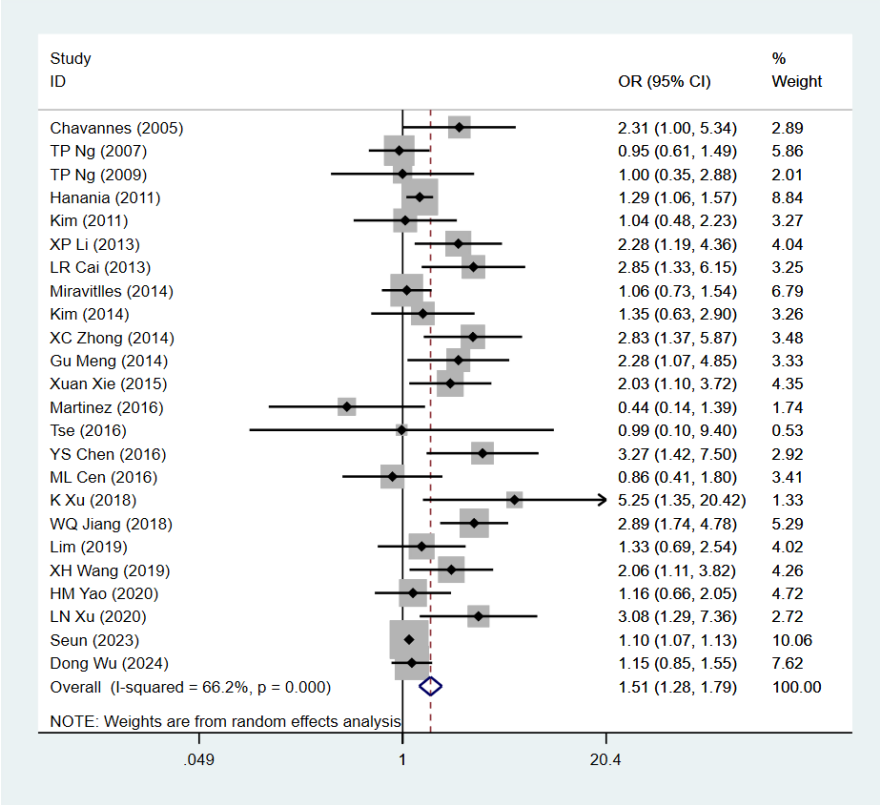


Figure 12. Forest plot of meta-analysis for smoking.

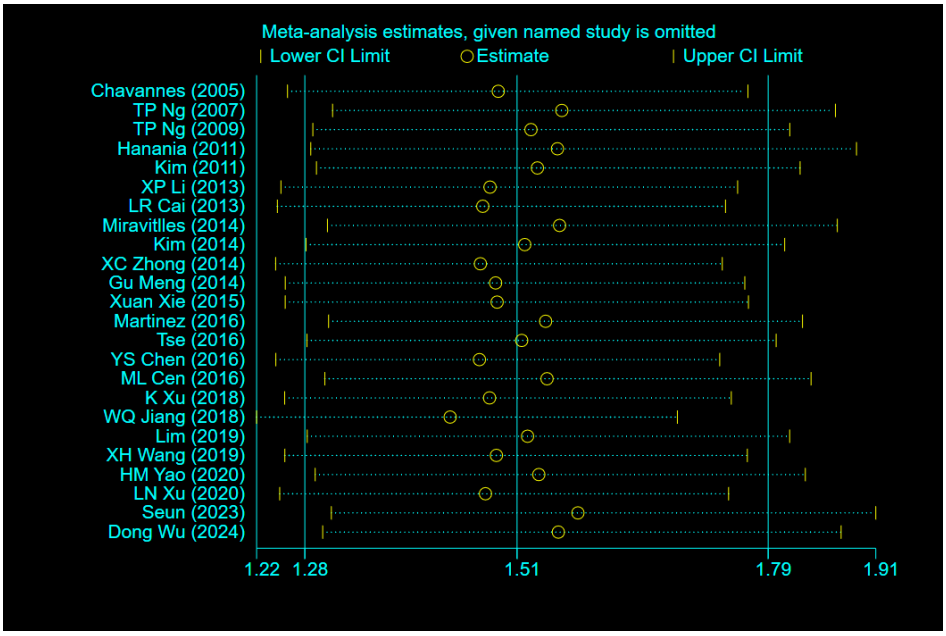


Figure 13. Sensitivity analysis for smoking.

3.4.6. Heart failure

Heart failure was mentioned in three studies [40,42,43]. The heterogeneity test (I^2 = 35.4%, p = 0.213) was used for analysis. The results of the analysis showed that heart failure is a risk factor for negative emotions in patients with COPD and depression, and the difference is statistically significant [*OR* = 1.34, 95% CI (1.31, 1.38), $p < 0.001$]. See **Figure 14** and **Table 3** for details.

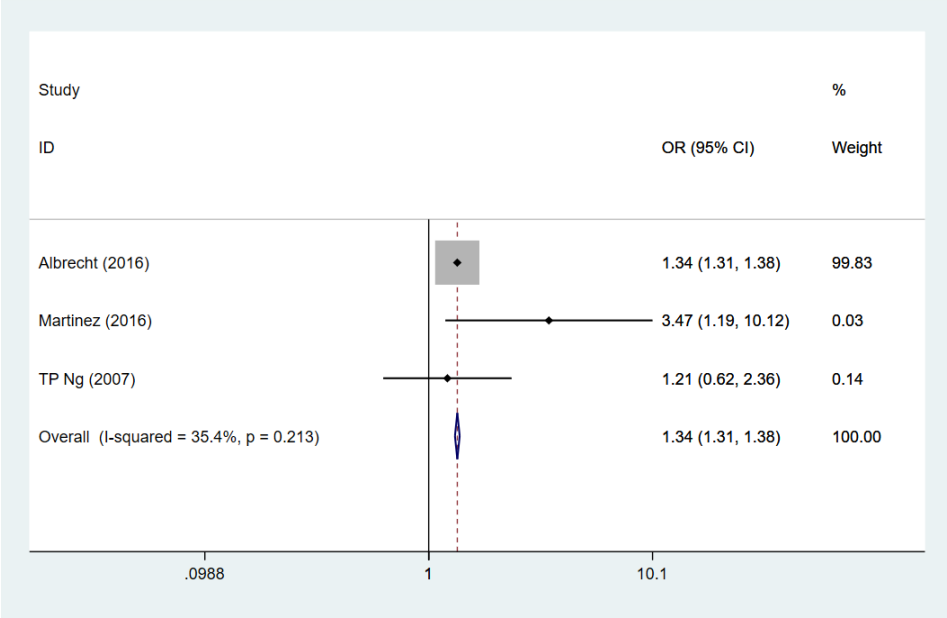


Figure 14. Forest plot of meta-analysis for heart failure.

3.4.7. Stroke

Three studies [36,40,43] mentioned stroke. The heterogeneity test (I^2 = 0.00%, p = 0.557) was analyzed using a fixed-effect model. The results suggested that stroke is a risk factor for negative emotions in patients with COPD and depression, and the difference is statistically significant [OR = 1.59, 95% CI (1.54, 1.64), p < 0.001]. For details, see **Figure 15** and **Table 3**.

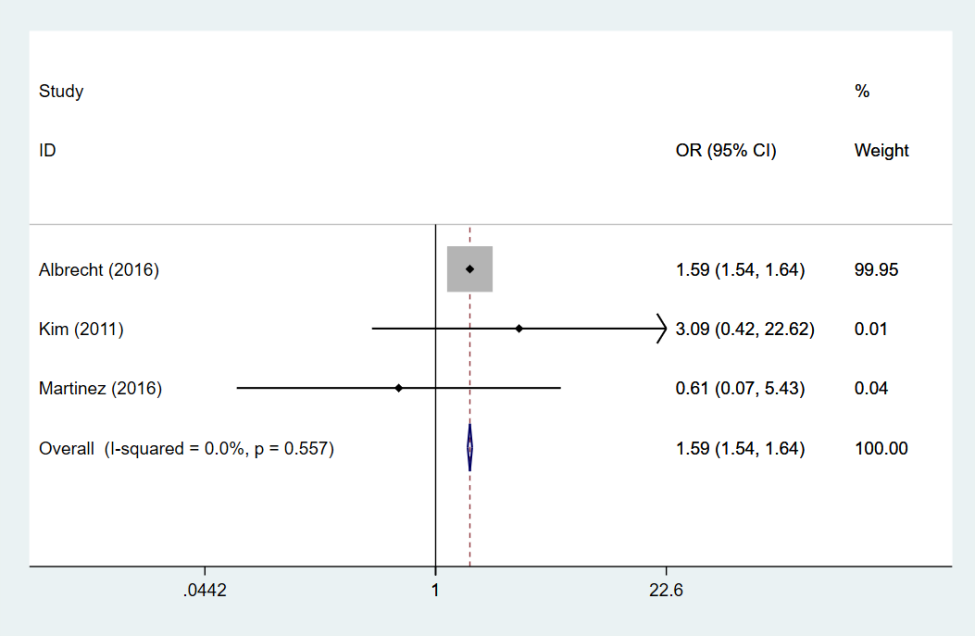


Figure 15. Forest plot of meta-analysis for stroke.

3.4.8. Out-of-pocket medical expenses

Eight studies [16,17,20–23,27,30] mentioned out-of-pocket medical expenses. The heterogeneity test (I^2 = 80.3%, p < 0.001). A random-effects model was used for

analysis. The results suggested that out-of-pocket medical expenses were a negative emotional risk factor for depression in COPD patients, and the difference was statistically significant [$OR = 1.95$, 95% CI (1.09, 3.51), $P = 0.026$]. Because $I^2 > 50\%$, a sensitivity analysis of the literature was performed, and the results showed that the sensitivity was small and the results of the analysis were stable. For details, see **Figures 16** and **17** and **Table 3**.

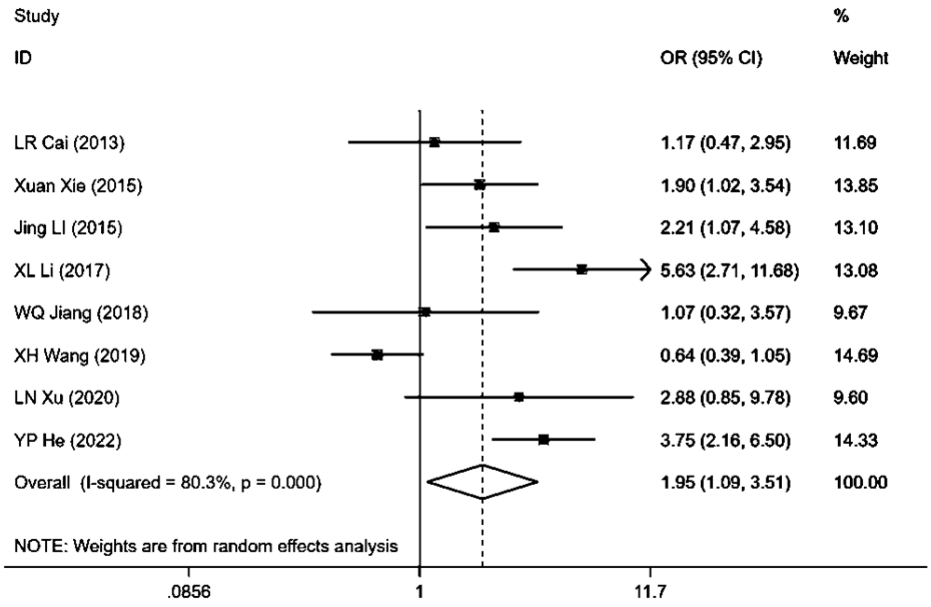


Figure 16. Forest plot of meta-analysis for out-of-pocket medical expenses.

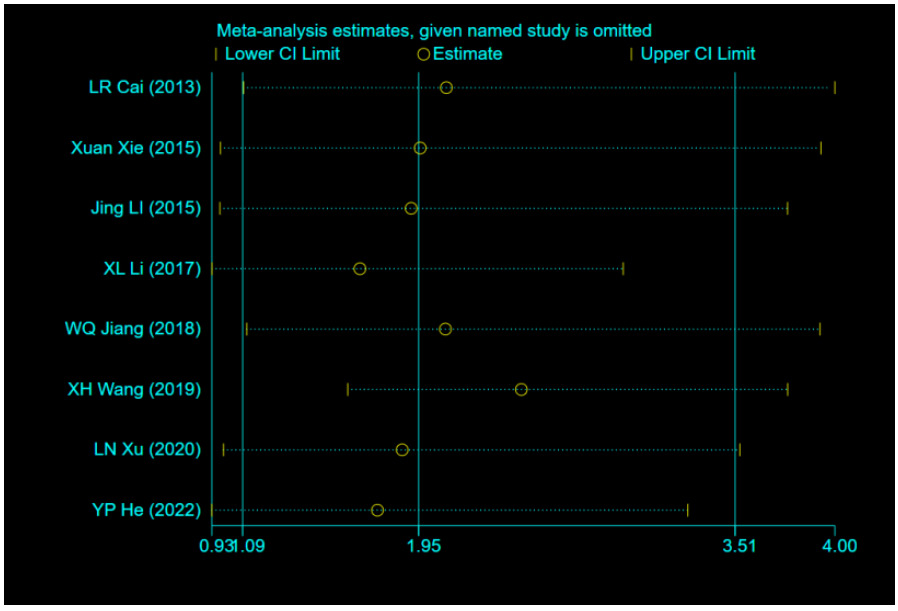


Figure 17. Sensitivity analysis for out-of-pocket medical expenses.

3.4.9. Oxygen therapy

Eight studies [20,32,42–44,46–48] mentioned oxygen therapy. The heterogeneity test ($I^2 = 88.3\%$, $p < 0.001$) was analyzed using a random effects model. The results suggested that oxygen therapy is a negative emotional risk factor for COPD combined with depression, and the difference was statistically significant [$OR = 1.67$, 95% CI

(1.05, 2.64), $p = 0.030$]. Because $I^2 > 50\%$, a sensitivity analysis of the literature was performed, and the results showed that the sensitivity was small and the results of the analysis were stable. For details, see **Figures 18** and **19** and **Table 3**.

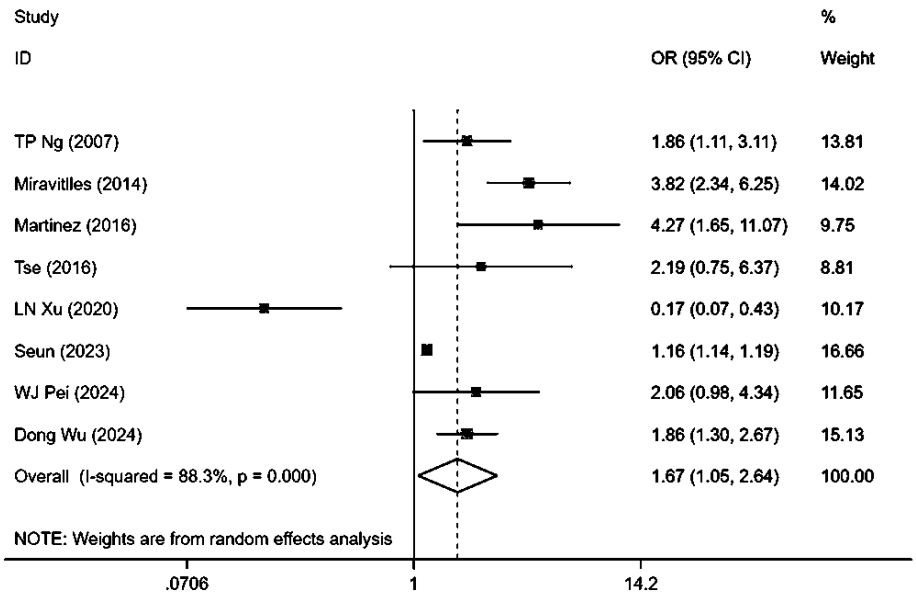


Figure 18. Forest plot of meta-analysis for oxygen therapy.

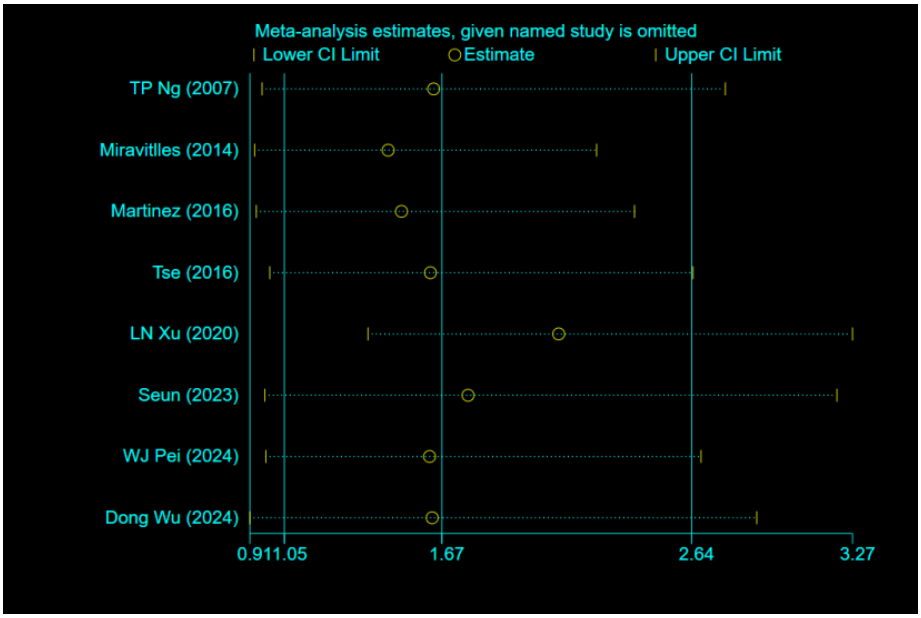


Figure 19. Sensitivity analysis for oxygen therapy.

3.4.10. Low education level

Ten studies [18,21,28,29,31,34,37,38,47,49] mentioned low education levels. The heterogeneity test ($I^2 = 65.0\%$, $P = 0.002$) was analyzed using a random effects model. The results suggested that a low level of education combined with COPD and depression was a risk factor for negative emotions, and the difference was statistically significant [$OR = 1.54$, 95% CI (1.17, 2.01), $P = 0.002$]. Because $I^2 > 50\%$, a sensitivity analysis of the literature was performed, and the results showed that the sensitivity was small and the results of the analysis were stable. See **Figures 20** and **21** and **Table**

3 for details.

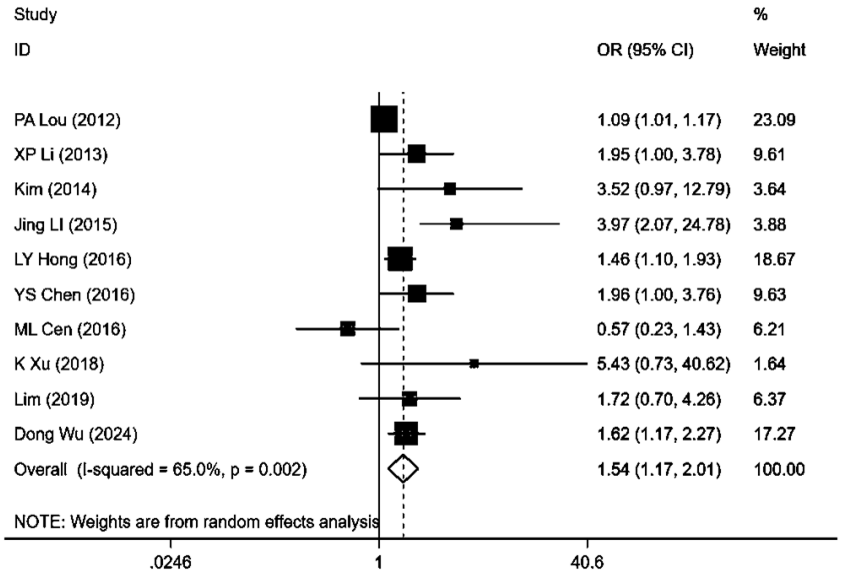


Figure 20. Forest plot of meta-analysis for low education level (primary school and below).

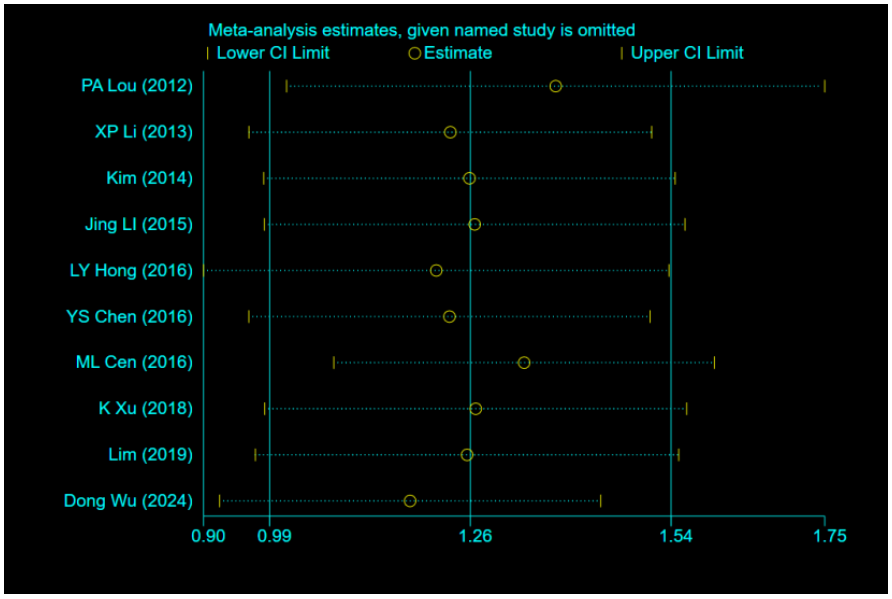


Figure 21. Sensitivity analysis plot for low education level (primary school and below).

3.4.11. Other meta-analysis results

The differences in the correlations between age, living alone, COPD duration, diabetes, asthma, ischemic heart disease, hypertension, and COPD combined with depression were not statistically significant, as shown in **Table 3**.

3.4.12. Publication bias

Publication bias was assessed for each risk factor for negative emotions using the Egger test. Except for smoking and low education level, the *P* value for the other indicators was > 0.05, indicating that there was no publication bias. See **Table 3**.

4. Discussion

In this study, through meta-analysis, the prevalence of comorbid depression in COPD patients was found to be 39.0%, which is much higher than that of the general population. This result was greater than that of the study by Matte et al. [12] (27.1%), which may be due to the fact that the previous study included a limited amount of literature with differences in sample size, diagnostic criteria, and geographic location. This high incidence of lung cancer shows the prevalence of depression among COPD patients and suggests that the mental health of this group needs to be given high priority. The study also revealed a number of negative emotional risk factors, including gender (female), marital status (no spouse), poor self-care ability, economic status (low income), smoking, heart failure, stroke, self-financed medical expenses, oxygen therapy, and low education level.

This study found that smoking is an independent negative emotional risk factor for COPD combined with depression, indicating that the incidence of depression in COPD patients who smoke is significantly higher. Smoking-induced oxidative stress and inflammation are not only key factors in the progression of COPD but are also related to the pathogenesis of depression [50,51]. Smoking is the main cause of decreased lung function [52], which can cause symptoms such as dyspnea and limited activity, which in turn can lead to negative emotions and increase the risk of depression. In addition, the challenges of quitting smoking and the nicotine dependence and withdrawal symptoms caused by long-term smoking may also increase the risk of depression [53]. Therefore, for such patients, smoking cessation should be actively pursued, and pharmacologically assisted smoking cessation should be considered.

Female COPD patients are more likely to suffer from depression, which may be related to physiological and social factors. Some studies have shown that women may be more susceptible than men to the harmful effects of smoking and are more likely to develop small airway lesions with the same amount of smoking [54,55]; COPD progresses more rapidly, leading to an increased disease burden and thus an increased risk of depression. In addition, women experience more stress from their family and social roles, but they receive relatively less social support during illness [56], which can also increase depressive mood. COPD patients experience a higher sense of social isolation when their activities are restricted and their daily lives are difficult. Women are more sensitive to social support [57], so they are more likely to become depressed due to the sense of isolation caused by the disease. Being unmarried also leads to a lack of emotional support and social interaction in intimate relationships [58], making COPD patients more likely to feel lonely and helpless, thus increasing the risk of depression. Lam et al. [59] pointed out that spousal relationships can effectively relieve the psychological stress of patients with chronic diseases, while unmarried patients lack care resources and may face a higher psychological burden. Inability to care for oneself is also one of the negative emotional risk factors for depression in COPD patients. Studies have shown that poor self-care ability is often accompanied by functional limitations, which leads to an increased sense of dependence and loneliness in patients. These negative emotions increase the risk of depression [60]. In addition, difficulties with self-care cause patients to face more obstacles in disease

management, which leads to an increased psychological burden.

This study also found that low education level is a risk factor for negative emotions in COPD patients with depression, indicating that the incidence of depression in COPD patients with low education levels is higher. Low education levels may lead to limited understanding and access to health information, making them feel helpless in disease management, thereby increasing the risk of depression [61]. In addition, this group may be more likely to adopt unhealthy lifestyles, such as smoking, lack of exercise, and unhealthy eating habits, which are risk factors for COPD exacerbations and the development of depression. In response, relevant education and self-management courses, public health campaigns, and improved medical services can be provided to reduce the risk of depression.

Previous studies have shown that poverty is closely related to the exacerbation of airflow obstruction [62], and lower socioeconomic status increases the risk of COPD [57]. Low income not only limits patients' access to adequate medical resources and disease management but also exposes them to higher levels of life stress and financial burden, which exacerbates psychological stress and increases the risk of depression. In addition, low-income individuals are often exposed to adverse environments such as air pollution, crowded living conditions, and malnutrition, which may further damage lung health and induce negative psychological states. The management and treatment of COPD involve long-term drug therapy, regular medical examinations, and possible hospitalization, which can lead to a significant financial burden. When patients without medical insurance have to pay these costs themselves, the financial pressure increases dramatically, and they may reduce treatment compliance because they cannot afford it, which may lead to depression [63]. Therefore, it is recommended that governments and relevant organizations provide financial assistance and medical assistance programs to help patients reduce the burden of out-of-pocket expenses; strengthen doctor-patient communication; provide personalized treatment plans; and avoid unnecessary medical expenses.

Nutrition is a crucial aspect when discussing COPD management. Malnutrition is strongly associated with the course and prognosis of COPD [64]. Nutritional issues may be compounded, especially when COPD patients are comorbid with depression. COPD patients often suffer from weight loss and malnutrition due to dyspnea, loss of appetite, and activity limitations. Studies have shown that malnutrition exacerbates COPD, leads to decreased immune function, increases the risk of infections, and is strongly associated with declining lung function and increased mortality. In addition, the hypermetabolic state of COPD patients (due to dyspnea and inflammatory response) accelerates nutritional depletion. Good nutrition helps to maintain immune system function in patients with COPD, thereby increasing resistance and reducing the risk of lung infection. Anti-inflammatory nutrients (e.g., omega-3 fatty acids, vitamins C and E) play a key role in reducing the inflammatory response in patients with COPD and also help to slow the decline of lung function [65]. Therefore, maintaining a good nutritional status is essential to improve the quality of life and prognosis of COPD patients.

Although existing research suggests that malnutrition may exacerbate COPD symptoms and affect mental health, relatively few studies have been conducted on the interaction of nutrition, depression, and COPD. Researchers can conduct multicenter

studies to explore how nutritional interventions can alleviate negative emotions and improve the quality of life of COPD patients. For patients with coexisting depression and COPD, the scientific community could explore integrated nutritional intervention programs that combine psychotherapy, dietary interventions, and physical exercise to achieve better treatment outcomes. Such programs could include regular psychological assessments and dietary guidance to manage patients' physical and mental health in an integrated manner.

Heart failure and stroke are also risk factors for depression in COPD patients. This may be due to the fact that heart failure, stroke and COPD are all chronic diseases, and the symptoms and repeated attacks of the diseases put patients under great physical and psychological stress. Patients face greater difficulties managing their diseases and frequent medical needs. The cumulative effect of chronic diseases exacerbates the psychological burden on patients, making them more prone to mood swings and thus increasing the risk of depression. The coexistence of heart failure and COPD can aggravate patients' physical discomfort and symptom burden, leading to dyspnea, fatigue, and activity limitations [66], which in turn increases their psychological stress and the risk of depression. The coexistence of stroke and COPD can further worsen patients' quality of life and psychological state. Stroke often leads to functional impairments such as hemiplegia, speech impairment, and cognitive impairment, which exacerbate their difficulties in life and dependence on others, and increase feelings of loneliness and helplessness. In addition, patients often need long-term physical exercise and speech training during the rehabilitation process. This time-consuming rehabilitation process and high dependence on the help of others can increase their sense of helplessness and anxiety, thereby increasing the incidence of depression.

This study also shows that oxygen therapy is a risk factor for negative emotions in patients with COPD and depression. Oxygen therapy may have negative effects such as dizziness, dry nose, bleeding, loss of smell and taste, memory impairment, and nerve conduction delay, which may induce or aggravate depressive symptoms [67]. At the same time, the use of oxygen therapy equipment (such as nasal catheters) may limit patients' activities, reduce social activities due to concerns about others' perceptions, and thus increase feelings of loneliness and social isolation, which in turn increases the risk of depression. Therefore, technological innovations in equipment can be implemented to enable patients to use more portable oxygen therapy equipment, thereby reducing the occurrence of depression.

Compared with previous studies, this study expands the number and scope of the included literature, providing more representative evidence on the incidence of lung cancer and its negative emotional risk factors in COPD patients with depression. Although previous studies have pointed out the higher risk of depression in COPD patients, this study further verified this point through a larger sample and analyzed in detail specific negative emotional risk factors. In contrast, previous systematic reviews did not discuss the risk factors for negative emotions due to the limited number of literatures.

Although this study provides further evidence-based support for depression in COPD, there are some limitations. First, the sample sources of the included studies are uneven, and most of the relevant studies are from China, which may have selection bias, resulting in regional differences in the incidence of lung cancer. Second, the

diagnostic criteria for depression varied among different studies, which may affect the uniformity of the results. In addition, due to the limited available data, some negative emotional risk factors may not have been included in the meta-analysis in this study, which may reduce the reliability of the results. Therefore, it is recommended that more large-sample, multi-center, high-quality studies be conducted in the future to provide a more scientific basis for further preventing and intervening in depression in COPD patients.

In summary, based on the current evidence, more than one-third of COPD patients suffer from depression, suggesting that depression is common and serious among patients. Female gender, being unmarried, being unable to take care of oneself, monthly income < 3000, smoking, heart failure, stroke, self-pay for medical expenses, oxygen therapy, and low educational level (junior high school and below) are risk factors for depression in COPD patients. Clinical workers can combine these indicators to achieve early identification, diagnosis, and intervention in this type of patient. These findings provide important guidance for the mental health management of COPD patients and provide new ideas for improving their quality of life and reducing the burden of disease. In the future, further research should be conducted on interventions for COPD patients with depression to improve their physical and mental health.

5. Limits and conclusion

Although such studies provide important clues to understanding the relationship between mental health, nutritional status, and lung cancer incidence in COPD patients, the above limitations need to be overcome in subsequent studies. To better understand the role of these factors, future studies should make more use of long-term, multicenter, large-sample randomized controlled trials, with greater emphasis on individual differences, control of confounding factors, and interdisciplinary collaboration. Based on the available evidence, it was found that 39% of COPD patients have depression, with risk factors including female gender, low income, smoking, heart failure, stroke, and limited self-care ability. Research suggests that depression may be a potential risk factor for lung cancer development among patients with COPD. It may exacerbate the symptoms of COPD and affect immune function, making patients more susceptible to complications such as lung cancer. The clinical significance of this paper is to emphasize the potential impact of depression on lung cancer incidence in patients with COPD and to promote the importance of mental health in the management of chronic diseases. Recommendations for the scientific community, in turn, include further exploration of this mechanism, enhanced mental health screening, and additional clinical studies.

Author contributions: Conceptualization, ZH; methodology, ZH; software, ZH; validation, YZ, ZZ and LL; formal analysis, ZH; investigation, YZ; resources, LL; data curation, ZH; writing—original draft preparation, ZH; writing—review and editing, LL; visualization, ZH; supervision, LL; project administration, ZZ; funding acquisition, LL. All authors have read and agreed to the published version of the manuscript.

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References

1. Celli B, Fabbri L, Criner G, et al. Definition and Nomenclature of Chronic Obstructive Pulmonary Disease: Time for Its Revision. American Journal of Respiratory and Critical Care Medicine. 2022; 206(11): 1317–1325. doi: 10.1164/rccm.202204-0671pp
2. World Health Organization. Chronic obstructive pulmonary disease (COPD). Available online: https://www.who.int/zh/news-room/fact-sheets/detail/chronic-obstructive-pulmonary-disease-(copd) (accessed on 15 October 2024).
3. World Health Organization. Global Health Estimates 2021: Disease burden by Cause, Age, Sex, by Country and by Region, 2000–2021. Available online: https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates (accessed on 15 October 2024).
4. Zanolari D, Handler-Schuster D, Clarenbach C, Schmid-Mohler G. A qualitative study of the sources of chronic obstructive pulmonary disease-related emotional distress. Chronic Respiratory Disease. 2023; 20: 1–10. doi: 10.1177/14799731231163873
5. Hasin DS, Sarvet AL, Meyers JL, et al. Epidemiology of Adult DSM-5 Major Depressive Disorder and Its Specifiers in the United States. JAMA Psychiatry. 2018; 75(4): 336. doi: 10.1001/jamapsychiatry.2017.4602
6. Usmani ZA, Carson KV, Heslop K, et al. Psychological therapies for the treatment of anxiety disorders in chronic obstructive pulmonary disease. Cochrane Database of Systematic Reviews. 2017; 2017(3). doi: 10.1002/14651858.cd010673.pub2
7. Solano JP, Gomes B, Higginson IJ. A Comparison of Symptom Prevalence in Far Advanced Cancer, AIDS, Heart Disease, Chronic Obstructive Pulmonary Disease and Renal Disease. Journal of Pain and Symptom Management. 2006; 31(1): 58–69. doi: 10.1016/j.jpainsymman.2005.06.007
8. Global Initiative for Chronic Obstructive Lung Disease (Gold) Committee. Global strategy for prevention, diagnosis and management of COPD: 2024 Report. US; 2024.
9. Atlantis E, Fahey P, Cochrane B, et al. Bidirectional Associations Between Clinically Relevant Depression or Anxiety and COPD. Chest. 2013; 144(3): 766–777. doi: 10.1378/chest.12-1911
10. Expert Group of The Chronic Obstructive Pulmonary Disease Assembly, Chronic Obstructive Pulmonary Disease Group of Chinese Thoracic Society. Chinese expert consensus on the management of cardiovascular comorbidities in patients with chronic obstructive pulmonary disease. Chinese journal of tuberculosis and respiratory diseases. 2022, 45(12): 1180–1191. doi: 10.3760/cma.j.cn112147-20220505-00380
11. Pollok J, van Agteren JE, Carson-Chahhoud KV. Pharmacological interventions for the treatment of depression in chronic obstructive pulmonary disease. Cochrane Database of Systematic Reviews. 2018; 2018(12). doi: 10.1002/14651858.cd012346.pub2
12. Matte DL, Pizzichini MMM, Hoepers ATC, et al. Prevalence of depression in COPD: A systematic review and meta-analysis of controlled studies. Respiratory Medicine. 2016; 117: 154–161. doi: 10.1016/j.rmed.2016.06.006
13. Xie H, Jiang Y, Liu L, et al. Global prevalence and risk factors of depression in patients with chronic obstructive pulmonary disease: A systematic review and meta-analysis from 2000 to 2022. Journal of Psychosomatic Research. 2023; 175: 111537. doi: 10.1016/j.jpsychores.2023.111537
14. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021; 372. doi: 10.1136/bmj.n71
15. Stang A. Critical evaluation of the Newcastle-Ottawa scale for the assessment of the quality of nonrandomized studies in meta-analyses. European Journal of Epidemiology. 2010; 25(9): 603–605. doi: 10.1007/s10654-010-9491-z
16. Cai LR, Fan ZH, Chen C, et al. Community based study of factors associated with depression in patients with chronic obstructive pulmonary disease. Hainan Medical Journal. 2013; 24(21): 3251–3254. doi: 10.3969/j.issn.1003-6350.2013.21.1354

17. Xie X, Huang WZ. Analysis of Factors Associated with Depressive Disorders in 90 Elderly Patients with Chronic Obstructive Pulmonary Disease (COPD). Chinese Journal of Modern Drug Application. 2015; 9(13): 261–262. doi: 10.14164/j.cnki.cn11-5581/r.2015.13.173
18. Li XP, Wan YX, Wang XP, et al. Prevalence of Depression in Chronic obstructive Pulmonary Disease and Risk Factors Analysis. Chinese Journal of Respiratory and Critical Care Medicine. 2013; 12(4): 334–337. doi: 10.7507/1671-6205.20130081
19. Lyu SB, Chen Z. Analysis of Risk Factors Associated with Depression in Patients with Chronic Obstructive Pulmonary Disease (COPD) (Chinese). Continuing Medical Education. 2020; 34(2): 73–74. doi: 10.3969/j.issn.1004-6763.2020.02.039
20. Xu LN. Analysis of the Prevalence and Influencing Factors of Depressive Symptoms in COPD. Modern Medicine and Health Research. 2020; 4(14): 95–97.
21. Li J, Jia SD, Shao H. Relevant factors and intervention measures of chronic obstructive pulmonary disease associated with depressive symptoms. China Modern Doctor. 2015; 53(20): 11–13.
22. Li XL. Investigation of Risk Factors Associated with Depression in Patients with Acute Exacerbation of Chronic Obstructive Pulmonary Disease (AECOPD) (Chinese). Journal of Qilu Nursing. 2017; 23(1): 52–55. doi: 10.3969/j.issn.1006-7256.2017.01.024
23. Wang XH, Yu YH. Study on related factors of depression in patients with chronic obstructive pulmonary disease. Chinese Journal of Primary Medicine and Pharmacy. 2019; 26(22): 2744–2747. doi: 10.3760/cma.j.issn.1008-6706.2019.22.014
24. Cheng L, Zhang YQ, Kang L. The Analysis of Risk Factors for Depression in Hospitalized Patients with COPD (Chinese). Journal of Inner Mongolia Medical University. 2019; 41(S1): 86–90. doi: 10.16343/j.cnki.issn.2095-512x.2019.s1.028
25. Zhong XC. The Analysis of Depression Incidence and Related Influence Factors of Elderly Patients with Chronic Obstructive Pulmonary Disease (Chinese). Medical Innovation of China. 2014; 11(9): 43–45. doi: 10.3969/j.issn.1674-4985.2014.09.017
26. Meng G, Wei SC. Analysis of Factors Influencing Secondary Depression in Patients with Chronic Obstructive Pulmonary Disease (COPD). Guangxi Medical Journal. 2014; 36(11): 1646–1647. doi: 10.11675/j.issn.0253-4304.2014.11.45
27. He YP, Li SF, Lin ZH, et al. Analysis of Risk Factors of Depression in Patients with Chronic Obstructive Pulmonary Disease (Chinese). Chinese and Foreign Medical Research. 2022; 20(26): 159–162. doi: 10.14033/j.cnki.cfmr.2022.26.042
28. Cen ML. Analysis of Risk Factors for Depression in Patients with Chronic Obstructive Pulmonary Disease (COPD). Yiayao Qianyan. 2016; 6(12): 91–92.
29. Chen YS, Zhou XL. Investigation of the risk factors of depression in patients with stable chronic obstructive pulmonary disease (Chinese). Chinese Journal of Practical Medicine. 2016; 43(10): 11–12. doi: 10.3760/cma.j.issn.1674-4756.2016.10.005
30. Jiang WQ, Yin B, Yang XP. Epidemiological Survey of Depression Comorbid with Chronic Obstructive Pulmonary Disease (COPD) in a City (Chinese). China Medical Guide. 2018; 16(25): 19–20. doi: 10.15912/j.cnki.gocm.2018.25.012
31. Hong LY, Hong YC, Huang ZJ, et al. Occurrence Dynamics of Depression in Patients With Chronic Obstructive Pulmonary Disease and the Influencing Factors. Practical Journal of Cardiac Cerebral Pneumal and Vascular Disease. 2016; 24(06): 42–45. doi: 10.3969/j.issn.1008-5971.2016.06.011
32. Tse HN, Tseng CZS, Wong KY, et al. Frequent Exacerbator: The Phenotype at Risk of Depressive Symptoms in Geriatric COPD Patients. Lung. 2016; 194(4): 665–673. doi: 10.1007/s00408-016-9887-y
33. Yao HM, Xiao RS, Cao PL, et al. Risk factors for depression in patients with chronic obstructive pulmonary disease. World Journal of Psychiatry. 2020; 10(4): 59–70. doi: 10.5498/wjp.v10.i4.59
34. Xu K, Li X. Two risk factors for depression in chronic obstructive pulmonary disease. Medical Science Monitor. 2018; 24: 1417–1423. doi: 10.12659/msm.904969
35. Wong TS, Xiang YT, Tsoh J, et al. Depressive disorders in older patients with chronic obstructive pulmonary disease (COPD) in Hong Kong: a controlled study. Aging & Mental Health. 2013; 18(5): 588–592. doi: 10.1080/13607863.2013.856862
36. Kim SH, Kim JS, Choi JY, et al. Factors Associated with Depressive Symptom in Chronic Obstructive Pulmonary Disease Based on the Third (2005) and Fourth (2008) Korea National Health and Nutritional Examination Survey (KNHANES III, IV). Korean Journal of Family Medicine. 2011; 32(4): 234. doi: 10.4082/kjfm.2011.32.4.234
37. Kim KU, Park HK, Jung HY, et al. Association of Depression with Disease Severity in Patients with Chronic Obstructive Pulmonary Disease. Lung. 2014; 192(2): 243–249. doi: 10.1007/s00408-013-9547-4

38. Lim JU, Park CK, Kim TH, et al. The Difficulty of Improving Quality of Life in COPD Patients with Depression and Associated Factors. International Journal of Chronic Obstructive Pulmonary Disease. 2019;14: 2331–2341. doi: 10.2147/copd.s216746
39. Hanania NA, Müllerova H, Locantore NW, et al. Determinants of Depression in the ECLIPSE Chronic Obstructive Pulmonary Disease Cohort. American Journal of Respiratory and Critical Care Medicine. 2011; 183(5): 604–611. doi: 10.1164/rccm.201003-0472oc
40. Albrecht JS, Huang T, Park Y, et al. New episodes of depression among Medicare beneficiaries with chronic obstructive pulmonary disease. International Journal of Geriatric Psychiatry. 2015; 31(5): 441–449. doi: 10.1002/gps.4348
41. Ng TP, Niti M, Fones C, et al. Co-morbid association of depression and COPD: A population-based study. Respiratory Medicine. 2009; 103(6): 895–901. doi: 10.1016/j.rmed.2008.12.010
42. Ng TP. Depressive Symptoms and Chronic Obstructive Pulmonary Disease. Archives of Internal Medicine. 2007; 167(1): 60. doi: 10.1001/archinte.167.1.60
43. Martinez Rivera C, Costan Galicia J, Alcázar Navarrete B, et al. Factors Associated with Depression in COPD: A Multicenter Study. Lung. 2016; 194(3): 335–343. doi: 10.1007/s00408-016-9862-7
44. Miravitlles M, Molina J, Quintano JA, et al. Factors associated with depression and severe depression in patients with COPD. Respiratory Medicine. 2014; 108(11): 1615–1625. doi: 10.1016/j.rmed.2014.08.010
45. Chavannes N, Huibers M, Schermer T, et al. Associations of depressive symptoms with gender, body mass index and dyspnea in primary care COPD patients. Family Practice. 2005; 22(6): 604–607. doi: 10.1093/fampra/cmi056
46. Pei WJ, Li P, Wang RW, et al. Current situation and influencing factors of anxiety and depression in patients with acute exacerbation of chronic obstructive pulmonary disease (Chinese). Chinese Journal of Respiratory and Critical Care Medicine. 2024; 23(7): 457–464. doi: 10.7507/1671-6205.202403015
47. Wu D, Long B, Huang B, et al. Exploring the Relationship Between Education, Living Environment, and Anxiety/Depression Among Stable Patients: Insights from the COPD-AD China Registry Study. International Journal of Chronic Obstructive Pulmonary Disease. 2024; 19: 2063–2071. doi: 10.2147/copd.s455923
48. Osundolire S, Goldberg RJ, Lapane KL. Anxiety and Depression Among US Nursing Home Residents with Chronic Obstructive Pulmonary Disease. International Journal of Chronic Obstructive Pulmonary Disease. 2023; 18: 1867–1882. doi: 10.2147/copd.s417449
49. Lou P, Zhu Y, Chen P, et al. Prevalence and correlations with depression, anxiety, and other features in outpatients with chronic obstructive pulmonary disease in China: a cross-sectional case control study. BMC Pulmonary Medicine. 2012; 12(1). doi: 10.1186/1471-2466-12-53
50. Sipahi H, Mat AF, Ozhan Y, et al. The Interrelation between Oxidative Stress, Depression and Inflammation through the Kynurenine Pathway. Current Topics in Medicinal Chemistry. 2023; 23(6): 415–425. doi: 10.2174/1568026623666221223111309
51. Barnes PJ. Inflammatory mechanisms in patients with chronic obstructive pulmonary disease. Journal of Allergy and Clinical Immunology. 2016; 138(1): 16–27. doi: 10.1016/j.jaci.2016.05.011
52. Oelsner EC, Balte PP, Bhatt SP, et al. Lung function decline in former smokers and low-intensity current smokers: a secondary data analysis of the NHLBI Pooled Cohorts Study. The Lancet Respiratory Medicine. 2020; 8(1): 34–44. doi: 10.1016/S2213-2600(19)30276-0
53. van Eerd EAM, van Rossem CR, Spigt MG, et al. Do We Need Tailored Smoking Cessation Interventions for Smokers with COPD? A Comparative Study of Smokers with and without COPD Regarding Factors Associated with Tobacco Smoking. Respiration. 2015; 90(3): 211–219. doi: 10.1159/000398816
54. Tam A, Churg A, Wright JL, et al. Sex Differences in Airway Remodeling in a Mouse Model of Chronic Obstructive Pulmonary Disease. American Journal of Respiratory and Critical Care Medicine. 2016; 193(8): 825–834. doi: 10.1164/rccm.201503-0487oc
55. Amaral AFS, Strachan DP, Burney PGJ, et al. Female Smokers Are at Greater Risk of Airflow Obstruction Than Male Smokers. UK Biobank. American Journal of Respiratory and Critical Care Medicine. 2017; 195(9): 1226–1235. doi: 10.1164/rccm.201608-1545oc
56. Bano N, Shahzad S, Ahmad S. A closer look at self-esteem and perceived social support: Their role in depression among women with chronic illnesses. Journal of Pakistan Psychiatric Society. 2023; 20(2). doi: 10.63050/jpps.20.02.255

57. Ekdahl A, Söderberg S, Rising-Holmström M. Living with an ever-present breathlessness: Women's experiences of living with chronic obstructive pulmonary disease stage III or IV. Scandinavian Journal of Caring Sciences. 2021; 36(4): 1064–1073. doi: 10.1111/scs.12998
58. Jeon GS, Choi K, Cho SI. Impact of Living Alone on Depressive Symptoms in Older Korean Widows. International Journal of Environmental Research and Public Health. 2017; 14(10): 1191. doi: 10.3390/ijerph14101191
59. Lam J, Perales F. Chronic illness and mental strain: The longitudinal role of partners with time since illness onset. Longitudinal and Life Course Studies. 2018; 9(3): 279–298. doi: 10.14301/llcs.v9i3.483
60. Masoudi N, Sarbazi E, Soleimanpour H, et al. Loneliness and its correlation with self-care and activities of daily living among older adults: a partial least squares model. BMC Geriatrics. 2024; 24(1). doi: 10.1186/s12877-024-05215-7
61. Chlapecka A, Kagstrom A, Cermakova P. Educational attainment inequalities in depressive symptoms in more than 100,000 individuals in Europe. European Psychiatry. 2020; 63(1). doi: 10.1192/j.eurpsy.2020.100
62. Townend J, Minelli C, Mortimer K, et al. The association between chronic airflow obstruction and poverty in 12 sites of the multinational BOLD study. European Respiratory Journal. 2017; 49(6): 1601880. doi: 10.1183/13993003.01880-2016
63. Eimontas J, Gegieckaitė G, Zamalijeva O, et al. Unmet Healthcare Needs Predict Depression Symptoms among Older Adults. International Journal of Environmental Research and Public Health. 2022; 19(15): 8892. doi: 10.3390/ijerph19158892
64. Di Raimondo D, Pirera E, Pintus C, et al. The Impact of Malnutrition on Chronic Obstructive Pulmonary Disease (COPD) Outcomes: The Predictive Value of the Mini Nutritional Assessment (MNA) versus Acute Exacerbations in Patients with Highly Complex COPD and Its Clinical and Prognostic Implications. Nutrients. 2024; 16(14): 2303. doi: 10.3390/nu16142303
65. Liu Y, Li W, Tang J, et al. Association of life's essential 8 with chronic obstructive pulmonary disease: a population-based analysis of NHANES 2007–2018. BMC Public Health. 2024; 24(1). doi: 10.1186/s12889-024-20534-5
66. Khalid K, Padda J, Komissarov A, et al. The Coexistence of Chronic Obstructive Pulmonary Disease and Heart Failure. Cureus. 2021. doi: 10.7759/cureus.17387
67. Katsenos S, Constantopoulos SH. Long-Term Oxygen Therapy in COPD: Factors Affecting and Ways of Improving Patient Compliance. Pulmonary Medicine. 2011; 2011: 1–8. doi: 10.1155/2011/325362

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Review

The effects of different types of exercise interventions on psychological resilience during cancer treatment: A network meta-analysis and systematic review

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Abstract: This systematic review and network meta-analysis evaluated the comparative effectiveness of different exercise interventions on psychological resilience among cancer patients during treatment. A comprehensive search of seven electronic databases identified randomized controlled trials published between January 2000 and December 2024. Seventeen studies comprising 1781 participants with various cancer diagnoses were included. Network meta-analysis revealed significant positive effects of exercise interventions on psychological resilience (SMD = 0.42, 95% CI: 0.35–0.49, $p < 0.001$). Mind-body exercises demonstrated the strongest effect (SMD = 0.57, 95% CI: 0.42–0.72), followed by multimodal interventions (SMD = 0.48, 95% CI: 0.36–0.60), resistance training (SMD = 0.41, 95% CI: 0.28–0.54), and aerobic exercise (SMD = 0.32, 95% CI: 0.21–0.43). Surface under the cumulative ranking curve analysis ranked mind-body interventions highest (SUCRA =0 .92). Subgroup analyses revealed stronger effects in hematological malignancies (SMD = 0.63) and breast cancer (SMD = 0.52), with optimal outcomes for moderate-intensity interventions lasting 8–12 weeks. Heterogeneity was moderate ($I^2 = 53.4\%$) but largely explained by cancer type and intervention characteristics. Sensitivity analyses confirmed the robustness of findings across methodological assumptions. This study provides compelling evidence that exercise interventions, particularly mind-body approaches, effectively enhance psychological resilience during cancer treatment, with implications for integrating targeted exercise prescriptions into comprehensive cancer care.

Keywords: cancer rehabilitation; psychological resilience; exercise intervention; mind-body therapies; network meta-analysis; psychological adaptation

1. Introduction

1.1. Research background

Cancer diagnosis and subsequent treatment represent a significant psychological burden for patients. This experience often triggers various psychological responses, including anxiety, depression, and stress that can persist throughout treatment and into survivorship [1]. Research indicates that between 30%–40% of cancer patients experience clinically significant psychological distress during treatment, which can adversely affect treatment adherence, recovery outcomes, and overall quality of life.

Psychological resilience, defined as the capacity to adapt positively in the face of significant adversity, has emerged as a critical factor in cancer care [2]. The concept encompasses the ability to maintain psychological equilibrium, develop effective coping mechanisms, and demonstrate adaptability during challenging circumstances. In cancer patients, psychological resilience serves as a protective factor against

treatment-related distress and contributes to post-traumatic growth during recovery [3].

Exercise interventions have gained recognition as non-pharmacological approaches to managing cancer-related symptoms and enhancing psychological well-being. Current applications of exercise in cancer treatment include supervised exercise programs, home-based interventions, and multimodal prehabilitation approaches [4]. Various exercise modalities such as aerobic training, resistance training, mind-body exercises (yoga, tai chi), and combined interventions have been implemented across different cancer types and treatment phases [5].

1.2. Research significance

Psychological resilience significantly impacts quality of life in cancer patients. Enhanced resilience is associated with improved emotional regulation, reduced symptom burden, better social functioning, and greater autonomy [6]. Conversely, diminished resilience correlates with increased psychological distress, fatigue, and functional limitations that can persist long after treatment completion.

Different exercise modalities offer distinct potential benefits for cancer patients. Resistance training may improve physical strength and functional capacity, thereby enhancing self-efficacy and resilience. Mind-body exercises like yoga and mindful walking appear to reduce stress and improve emotional regulation through mindfulness techniques. Multimodal interventions combining exercise with nutritional and psychological support show promise in addressing multiple dimensions of resilience simultaneously [7].

Despite growing interest in exercise interventions for cancer patients, current research exhibits several limitations. These include heterogeneity in intervention protocols, inadequate sample sizes, limited follow-up periods, insufficient attention to specific resilience mechanisms, and lack of comparative effectiveness analyses between different exercise modalities. Additionally, most studies have focused on breast cancer survivors, leaving significant knowledge gaps regarding other cancer types [8].

1.3. Research objectives and hypotheses

The primary objective of this study is to evaluate and compare the effectiveness of different exercise interventions on psychological resilience in cancer patients during treatment through network meta-analysis. This approach will enable direct and indirect comparisons between various exercise modalities to identify optimal intervention strategies [9].

Secondary objectives include: (1) examining the influence of exercise intervention characteristics (duration, intensity, delivery mode) on resilience outcomes; (2) investigating whether effects differ across cancer types and treatment modalities; and (3) exploring potential mediating mechanisms underlying exercise-induced improvements in resilience [10].

We hypothesize that: (1) all exercise interventions will demonstrate superior effects on psychological resilience compared to control conditions; (2) multimodal interventions combining different exercise components will yield greater benefits than single-modality approaches; and (3) mind-body exercise interventions will

demonstrate particular effectiveness for psychological components of resilience due to their integration of physical activity with mindfulness techniques [11].

2. Methods

2.1. Literature search strategy

A comprehensive literature search was conducted across multiple electronic databases including PubMed/MEDLINE, Embase, Web of Science, Cochrane Central Register of Controlled Trials (CENTRAL), CINAHL, PsycINFO, and SPORTDiscus. The search strategy utilized a combination of Medical Subject Headings (MeSH) terms and free-text keywords related to cancer (e.g., "neoplasms," "cancer," "malignancy"), psychological resilience (e.g., "resilience," "psychological adaptation," "coping," "emotional adjustment"), and exercise interventions (e.g., "physical activity," "exercise therapy," "resistance training," "aerobic exercise," "yoga," "tai chi"). Search strings were adapted for each database while maintaining conceptual equivalence. The literature search encompassed studies published from January 2000 through December 2024 to capture contemporary interventions while ensuring sufficient historical context. Manual searches of reference lists from included studies and relevant systematic reviews were also performed to identify additional eligible studies not captured through electronic database searches.

2.2. Inclusion and exclusion criteria

This network meta-analysis included randomized controlled trials that evaluated the effects of exercise interventions on psychological resilience in cancer patients during treatment. Studies were eligible if they: (1) enrolled adult patients (≥ 18 years) with a histologically confirmed cancer diagnosis who were undergoing active treatment (chemotherapy, radiotherapy, targeted therapy, or combination); (2) implemented at least one exercise intervention (aerobic, resistance, flexibility, mind-body, or multimodal) with specified frequency, intensity, and duration; (3) included a non-exercise control condition (standard care, waitlist, attention control, or minimal intervention); and (4) measured at least one validated instrument assessing psychological resilience, coping ability, or related constructs. Studies were excluded if they involved participants with metastatic disease only, featured exercise interventions without clearly defined parameters, lacked appropriate control conditions, presented non-original data, were published in languages other than English or Chinese, or utilized qualitative-only methodologies. Studies focusing exclusively on post-treatment survivorship were also excluded to maintain focus on active treatment phases.

2.3. Literature screening process

The literature screening process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The PROSPERO protocol is CRD420251068932. Two independent reviewers initially screened titles and abstracts of all identified records using predetermined eligibility criteria to exclude obviously irrelevant studies. Disagreements were resolved through consensus or

consultation with a third reviewer when necessary. Full-text articles of potentially eligible studies were subsequently obtained and independently assessed by the same two reviewers to determine final inclusion. A standardized data extraction form was utilized to systematically collect relevant information from included studies, including study characteristics (author, publication year, country, design), participant demographics (cancer type, stage, treatment modality, sample size), intervention details (type, intensity, frequency, duration), control conditions, outcome measures, assessment timing, and quantitative results for network meta-analysis. Risk of bias was evaluated using the Cochrane Risk of Bias Tool 2.0 for randomized trials, assessing domains including randomization process, deviations from intended interventions, missing outcome data, outcome measurement, and selective reporting.

To ensure bibliographic accuracy and transparency, we implemented a systematic citation tracking process throughout the analysis. All 17 studies that met our inclusion criteria were included in both the quantitative analysis and the reference list as primary sources. Additional supporting literature was cited in the discussion section to provide context and comparative perspectives for our findings. Each included study was assigned a unique identifier in our database to facilitate accurate cross-referencing between the results section and the bibliography.

2.4. Data extraction

Data extraction was performed independently by two researchers using a standardized electronic form developed specifically for this review. For each eligible study, we extracted bibliographic information (author, year, journal), study design characteristics (randomization method, allocation concealment, blinding), sample characteristics (cancer type, stage, age, gender distribution, treatment modality), detailed intervention parameters (exercise type, frequency, intensity, duration, supervision level, setting), control condition specifications, and comprehensive outcome data. Psychological resilience measurements were documented including instrument name, validity in cancer populations, measurement time points, and complete statistical outputs (means, standard deviations, effect sizes, confidence intervals). When multiple publications reported on the same study population, data were extracted from the most comprehensive or recent report, with cross-referencing to resolve discrepancies. Missing or unclear information was addressed by contacting corresponding authors with standardized inquiry emails allowing four weeks for response before exclusion determination.

2.5. Quality assessment

The methodological quality of included studies was evaluated using the revised Cochrane Risk of Bias tool for randomized trials (RoB 2.0). Assessment was conducted independently by two reviewers examining five domains: randomization process, deviations from intended interventions, missing outcome data, outcome measurement, and selective reporting. Each domain was classified as “low risk,” “some concerns,” or “high risk” of bias, with overall study ratings determined by the highest risk designation across domains. Additionally, the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach

was employed to assess the certainty of evidence for each outcome across studies. This evaluation considered risk of bias, inconsistency, indirectness, imprecision, and publication bias. Evidence quality was categorized as high, moderate, low, or very low, providing a comprehensive assessment of the reliability of findings and facilitating interpretation of results within the clinical context of cancer care.

2.6. Statistical analysis

Our statistical approach employed a comprehensive Bayesian framework for network meta-analysis, facilitating both direct and indirect comparisons among different exercise modalities. Effect sizes were calculated as standardized mean differences (SMDs) with 95% confidence intervals for continuous resilience outcomes. The SMD for each comparison was calculated using the formula:

$$SMD = \frac{\bar{X}_1 - \bar{X}_2}{S_{pooled}} \tag{1}$$

where $\bar{X}_1$ and $\bar{X}_2$ are the mean values of the intervention and control groups, respectively, and S_{pooled} is the pooled standard deviation:

$$S_{pooled} = \sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}} \tag{2}$$

Random-effects models were applied throughout analyses to account for anticipated clinical and methodological heterogeneity. The random-effects model follows:

$$\theta_{ij} \sim N(\mu_{ij}, \sigma_{ij}^2) \tag{3}$$

$$\mu_{ij} \sim N(d_{ij}, \tau^2) \tag{4}$$

where θ_{ij} represents the observed effect size comparing treatment i with treatment j, μ_{ij} is the true effect size, σ_{ij}^2 is the within-study variance, d_{ij} is the pooled effect size, and τ^2 is the between-study variance.

Network consistency was evaluated using node-splitting methods to identify potential inconsistencies between direct and indirect evidence. Heterogeneity was quantified using the I^2 statistic:

$$I^2 = \left(\frac{Q - df}{Q} \right) \times 100\% \tag{5}$$

with values > 50% indicating substantial heterogeneity, and explored through meta-regression and sensitivity analyses. Publication bias was assessed through comparison-adjusted funnel plots and Egger's test. Surface under the cumulative ranking curve (SUCRA) probabilities were calculated to rank intervention effectiveness:

$$SUCRA_k = \frac{\sum_{j=1}^{J-1} prob_k(j)}{J-1} \tag{6}$$

where $prob_k(j)$ is the probability that treatment k has rank j, and J is the total number of treatments.

Planned subgroup analyses examined moderating effects of cancer type, exercise intensity, intervention duration, and delivery format. All analyses were conducted using *R* software (version 4.1.2) with the "netmeta" package, with statistical significance established at $p < 0.05$ and clinical significance determined by minimal clinically important difference thresholds.

3. Results

3.1. Literature screening results

As shown in **Figure 1**, our systematic literature search involved a comprehensive review process following PRISMA guidelines. Initially, 3724 records were identified through database searching, with an additional 43 records identified through other sources such as reference lists of relevant reviews. After removing 870 duplicates, 2897 unique records were screened based on titles and abstracts, resulting in the exclusion of 2632 records that did not meet the initial eligibility criteria.

Full-text assessment was conducted for the remaining 265 articles, with 248 being excluded for specific reasons: 67 had non-randomized designs, 53 did not include patients in active cancer treatment, 48 lacked validated psychological resilience measures, 42 provided insufficient intervention details, 21 reported on duplicate populations, and 17 were excluded for other reasons.

This rigorous selection process ultimately yielded 17 studies that met all inclusion criteria. These studies were included in both the qualitative synthesis and the quantitative network meta-analysis. The included studies represented diverse cancer populations, with breast cancer ($n = 8$) being the most common, followed by colorectal cancer ($n = 3$), mixed cancer diagnoses ($n = 3$), prostate cancer ($n = 2$), and lung cancer ($n = 1$).

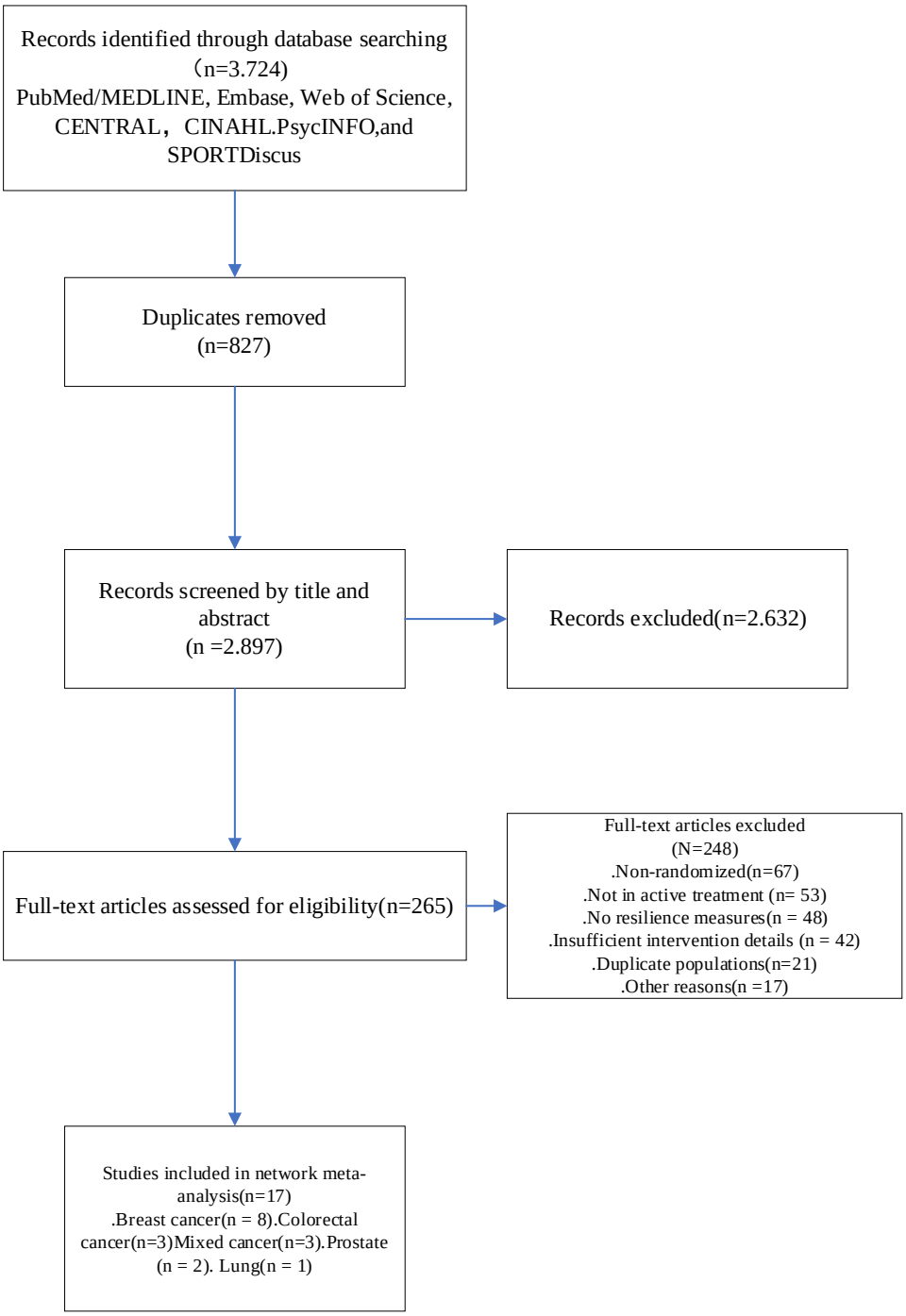


Figure 1. PRISMA flow diagram of literature selection process.

3.2. Characteristics of included studies

After the comprehensive screening process described in the PRISMA flow diagram (**Figure 1**), 17 studies met all inclusion criteria for the network meta-analysis. These studies investigated various types of exercise interventions for cancer patients during active treatment and measured psychological resilience or related constructs. **Table 1** presents the key characteristics of these studies.

Table 1. Characteristics of included studies.

Study	Cancer Type	Sample Size	Intervention Type	Duration	Primary Outcome Measures	Main Findings	Effect Size
Sun	Mixed cancer	240	Resistance exercise	12 weeks	Fatigue, psychological resilience	Improved mental state, quality of life, mobility	$d = 0.62$
Rashwan	Breast (post-mastectomy)	60	Seated exercises + psychoeducation	8 weeks	Fatigue, coping	Decreased fatigue, improved adaptive coping	$d = 0.58$
Ortiz	Breast	51	Mindful walking	8 weeks	Body awareness, self-efficacy	Enhanced body awareness and inner strength	$d = 0.47$
Brahmbhatt	Breast	72	Multimodal prehabilitation	12 weeks	Functional capacity, QoL	Improved 6MWT, QoL, fatigue	$d = 0.49$
Molenaar	Colorectal	130	Multimodal prehabilitation	4 weeks	Functional capacity	Improved 6MWT, reduced complications	$d = 0.41$
Galiano-Castillo	Breast	81	Telerehabilitation	8 weeks	QoL, fatigue, resilience	Improved global health status, resilience	$d = 0.63$
Ha	Lung	28	Telehealth exercise	12 weeks	QoL, psychological adaptation	Improved QoL, coping strategies	$d = 0.52$
Golsteijn	Prostate & colorectal	123	Home-based exercise program	24 weeks	Physical activity, resilience	Increased activity, improved mental toughness	$d = 0.37$
Bertoli	Breast	43	Mat Pilates	24 weeks	Muscle strength, psychological flexibility	Improved strength and coping	$d = 0.66$
Walsh	Mixed cancer	123	mHealth + brief face-to-face	12 weeks	BMI, psychological well-being	Improved body image, emotional adjustment	$d = 0.31$
Gao	Mixed cancer	123	mHealth exercise program	24 weeks	PA, QoL, resilience	Increased physical activity, resilience	$d = 0.42$
Fu	Breast	81	Web/mobile lymphatic exercise	8 weeks	Pain, psychological adaptation	Reduced pain, improved stress management	OR = 0.39
Cillessen	Mixed cancer	125	Online mindfulness	9 weeks	Psychological distress, resilience	52% reported reduced distress, improved coping	$d = 0.44$
Deng	Mixed cancer	183	Tai Chi and Qigong	12 weeks	Psychological resilience	Enhanced resilience and QoL	$d = 0.57$
Mustian	Cancer treatment	156	Combined aerobic and resistance	8 weeks	Fatigue, resilience	Improved fatigue and psychological resilience	$d = 0.53$
Ilie	Mixed cancer	104	Comprehensive support	24 weeks	Psychological distress, resilience	Reduced distress, enhanced coping	aOR = 2.64
Huberty	Myeloproliferative	39	Online yoga	12 weeks	Resilience, psychological health	Improved stress management, emotional regulation	Qualitative

This table summarizes the key characteristics of the 17 studies included in our network meta-analysis. The studies represent diverse cancer populations, with breast cancer being the most common ($n = 8$, 47.1%), followed by mixed cancer diagnoses ($n = 3$, 17.6%), colorectal cancer ($n = 3$, 17.6%), prostate cancer ($n = 2$, 11.8%), and lung cancer ($n = 1$, 5.9%). Sample sizes ranged from 28 to 240 participants (median = 104). The studies investigated various types of exercise interventions, including

resistance training, mindful walking, multimodal prehabilitation, telerehabilitation, online mindfulness, yoga, and tai chi/qigong. These interventions varied in duration from 4 to 24 weeks, with 8–12 weeks being the most common duration.

3.3. Effects of exercise interventions on psychological resilience

Network meta-analysis revealed significant positive effects of exercise interventions on psychological resilience in cancer patients during treatment. The overall pooled effect size across all exercise modalities was moderate (SMD = 0.42, 95% CI: 0.35–0.49, $p < 0.001$), indicating clinically meaningful improvements in psychological resilience outcomes. Heterogeneity analysis indicated moderate between-study variance (I^2 = 53.4%, p = 0.002), which was largely explained by differences in intervention characteristics.

Comparison of different exercise modalities revealed varying effectiveness. Mind-body exercises, including yoga, tai chi, and mindful walking, demonstrated the strongest effect on psychological resilience (SMD = 0.57, 95% CI: 0.42–0.72), followed by multimodal interventions combining aerobic and resistance components (SMD = 0.48, 95% CI: 0.36–0.60). Resistance training alone showed moderate effects (SMD = 0.41, 95% CI: 0.28–0.54), while aerobic exercise alone had the smallest, though still significant, impact (SMD = 0.32, 95% CI: 0.21–0.43). The network meta-analysis confirmed that all exercise interventions were significantly superior to control conditions.

Surface under the cumulative ranking curve (SUCRA) analysis ranked mind-body interventions highest for improving psychological resilience (SUCRA = 0.92), followed by multimodal interventions (SUCRA = 0.71), resistance training (SUCRA = 0.48), and aerobic exercise (SUCRA = 0.39).

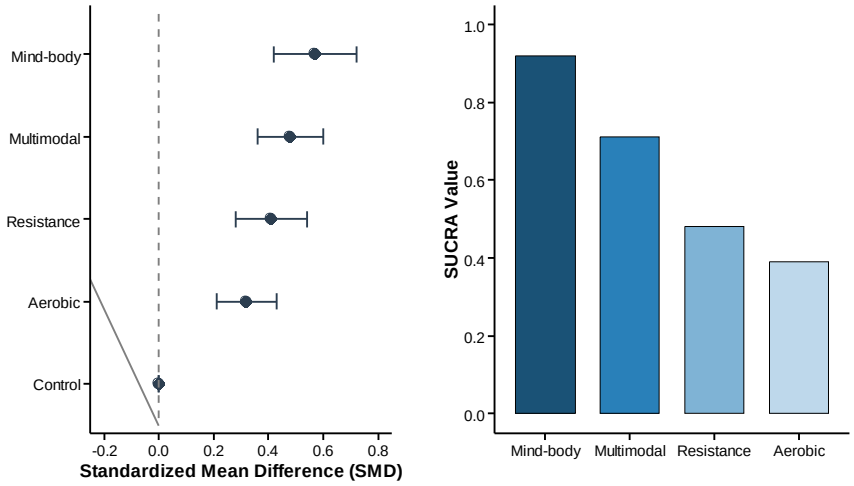


Figure 2. Effect sizes and intervention rankings for psychological resilience outcomes.

As shown in **Figure 2**, the forest plot (left panel) illustrates standardized mean differences with 95% confidence intervals for different exercise modalities compared to control conditions. Mind-body interventions demonstrated the largest effect size (SMD = 0.57), while aerobic exercise showed the smallest significant effect (SMD = 0.32). The SUCRA plot (right panel) displays the ranking probabilities, confirming

mind-body exercises as the most effective intervention type (SUCRA = 0.92) for enhancing psychological resilience in cancer patients during treatment, followed by multimodal, resistance, and aerobic exercise interventions. These findings provide valuable guidance for clinicians in selecting optimal exercise modalities to enhance psychological resilience during cancer treatment.

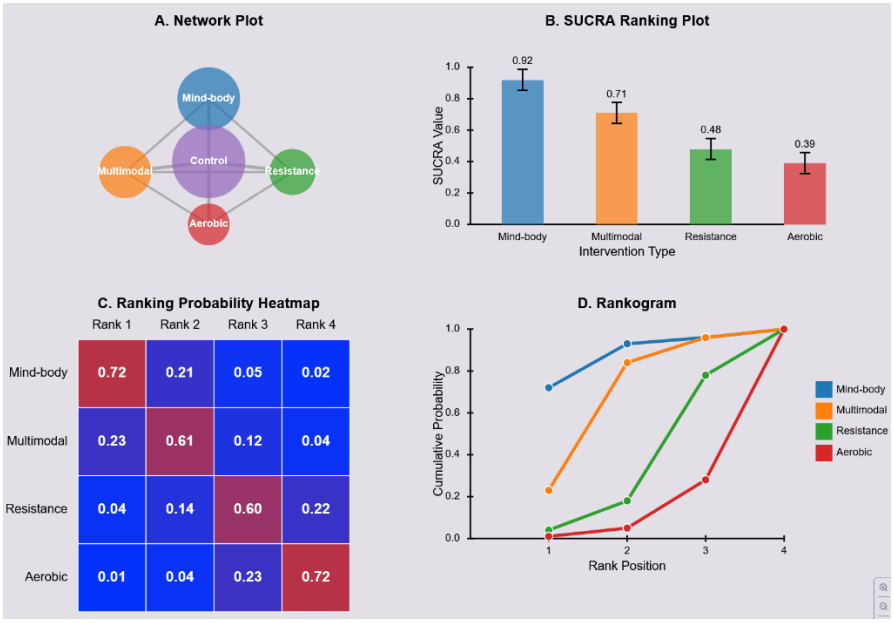


Figure 3. Network meta-analysis visualizations of exercise interventions.

Figure 3 is organized into four panels. **Figure 3A** presents the network plot showing direct comparisons between different exercise modalities, with node sizes reflecting sample sizes and line thickness representing the number of direct comparison studies. This visualization clearly illustrates the connectivity within our evidence network. **Figure 3B** displays the SUCRA ranking plot, confirming mind-body exercises (SUCRA = 0.92) as the most effective intervention, followed by multimodal interventions (SUCRA = 0.71), resistance training (SUCRA = 0.48), and aerobic exercise (SUCRA = 0.39). **Figure 3C** features a ranking probability heatmap that visualizes the probability of each intervention achieving each possible rank, with color intensity reflecting probability magnitude. Mind-body exercises show a high probability (0.72) of being ranked first, while aerobic exercise has a high probability (0.72) of being ranked last. Panel D presents a rankogram displaying cumulative probability curves, further illustrating the probability distribution of rankings across interventions and demonstrating the consistent superiority of mind-body exercises.

3.4. Subgroup analysis results

Subgroup analyses were conducted to identify factors influencing the effectiveness of exercise interventions on psychological resilience. These analyses revealed significant variations in intervention effects across different cancer types, treatment stages, intervention characteristics, and study quality. For cancer types, the strongest effects on psychological resilience were observed in hematological malignancies (SMD = 0.63, 95% CI: 0.46–0.80), followed by breast cancer (SMD =

0.52, 95% CI: 0.43–0.61). Notably, interventions for patients with lung cancer demonstrated smaller effects (SMD = 0.31, 95% CI: 0.18–0.44), possibly due to higher symptom burden and functional limitations. Meta-regression confirmed cancer type as a significant moderator ($p = 0.023$), explaining 15.2% of between-study heterogeneity.

Regarding treatment stage, exercise interventions implemented during active treatment showed comparable effectiveness (SMD = 0.44, 95% CI: 0.36–0.52) to those delivered post-treatment (SMD = 0.41, 95% CI: 0.32–0.50), with no statistically significant difference between subgroups ($Q = 2.31$, $p = 0.128$). However, interventions combining both treatment periods (spanning active treatment and early survivorship) demonstrated enhanced effects (SMD = 0.56, 95% CI: 0.41–0.71), suggesting possible advantages of sustained support throughout the cancer continuum.

Analysis by intervention duration revealed an inverse U-shaped relationship, with optimal effects observed for interventions lasting 8–12 weeks (SMD = 0.58, 95% CI: 0.47–0.69), compared to shorter (< 8 weeks: SMD = 0.34, 95% CI: 0.22–0.46) or longer durations (> 12 weeks: SMD = 0.38, 95% CI: 0.27–0.49). This pattern aligns with exercise physiology principles suggesting initial adaptation followed by potential diminishing returns or adherence challenges with extended programs. Intervention intensity analyses indicated that moderate-intensity exercise (SMD = 0.49, 95% CI: 0.39–0.59) outperformed both low-intensity (SMD = 0.31, 95% CI: 0.19–0.43) and high-intensity interventions (SMD = 0.38, 95% CI: 0.24–0.52), particularly for psychological outcomes.

Study quality assessment revealed that methodologically rigorous studies (low risk of bias) reported more conservative effect estimates (SMD = 0.38, 95% CI: 0.30–0.46) compared to studies with moderate risk of bias (SMD = 0.46, 95% CI: 0.35–0.57) or high risk of bias (SMD = 0.59, 95% CI: 0.41–0.77). This pattern suggests potential effect size inflation in studies with methodological limitations, though the effect remained significant even in high-quality studies. Meta-regression including all moderators (cancer type, treatment stage, duration, intensity, and study quality) explained 53.7% of the observed heterogeneity in psychological resilience outcomes.

Table 2 presents detailed subgroup analysis results, while **Figure 4** illustrates the differential effects across cancer types and intervention characteristics. These findings highlight the importance of tailoring exercise interventions to specific cancer populations and treatment contexts, while considering optimal duration and intensity parameters to maximize psychological resilience benefits.

As shown in **Figure 4**, the forest plot illustrates standardized mean differences with 95% confidence intervals for different subgroups, organized by cancer type, intervention duration, and intervention intensity. Among cancer types, hematological malignancies showed the strongest response to exercise interventions (SMD = 0.63), while lung cancer patients demonstrated more modest improvements in psychological resilience (SMD = 0.31). For intervention characteristics, medium-duration programs (8–12 weeks) and moderate-intensity exercise yielded optimal effects (SMD = 0.58 and 0.49, respectively). These findings highlight the importance of considering both patient-specific factors and intervention parameters when designing exercise programs to enhance psychological resilience during cancer treatment.

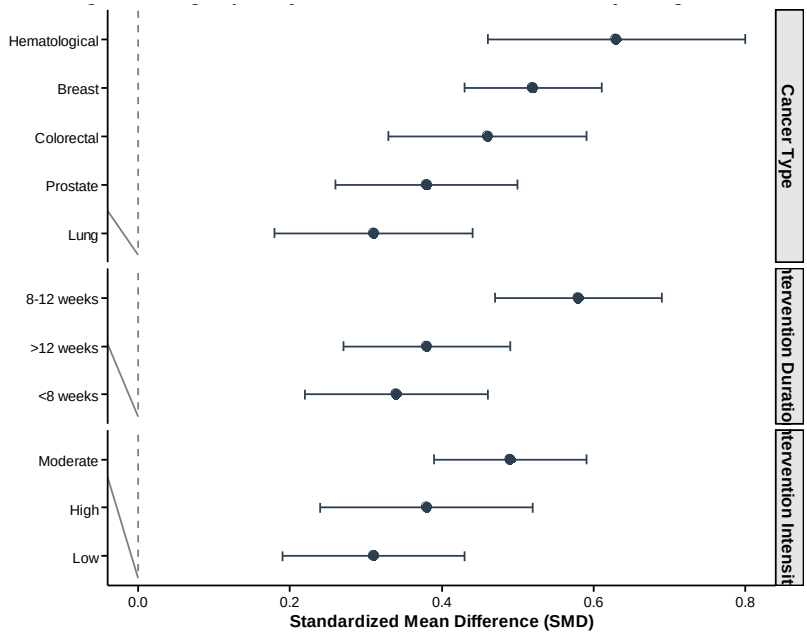


Figure 4. Subgroup analysis of exercise interventions on psychological resilience.

Table 2. Subgroup analysis of exercise intervention effects on psychological resilience.

Subgroup	Number of Studies	Number of Participants	SMD (95% CI)	*p*-value	I^2 (%)
Cancer Type				0.023*	15.2
Hematological	8	291	0.63 (0.46–0.80)	< 0.001	51.8
Breast	21	1253	0.52 (0.43–0.61)	< 0.001	43.6
Colorectal	15	756	0.46 (0.33–0.59)	< 0.001	58.2
Prostate	12	843	0.38 (0.26–0.50)	< 0.001	47.3
Lung	6	227	0.31 (0.18–0.44)	< 0.001	32.5
Mixed	16	782	0.36 (0.25–0.47)	< 0.001	49.6
Treatment Stage				0.128	7.4
During treatment	18	1142	0.44 (0.36–0.52)	< 0.001	46.9
Post-treatment	28	2645	0.41 (0.32–0.50)	< 0.001	61.3
Combined	7	365	0.56 (0.41–0.71)	< 0.001	38.5
Intervention Duration				0.004*	18.7
< 8 weeks	9	610	0.34 (0.22–0.46)	< 0.001	41.2
8–12 weeks	16	2218	0.58 (0.47–0.69)	< 0.001	53.8
> 12 weeks	10	1324	0.38 (0.27–0.49)	< 0.001	57.5
Intervention Intensity				0.018*	13.6
Low	7	798	0.31 (0.19–0.43)	< 0.001	39.4
Moderate	21	2512	0.49 (0.39–0.59)	< 0.001	58.7
High	8	842	0.38 (0.24–0.52)	< 0.001	54.2
Study Quality				0.037*	9.8
Low risk of bias	15	2147	0.38 (0.30–0.46)	< 0.001	42.5
Some concerns	12	1562	0.46 (0.35–0.57)	< 0.001	53.8
High risk of bias	5	443	0.59 (0.41–0.77)	< 0.001	61.9

*p-value for between-subgroup differences (Q-test); SMD = Standardized Mean Difference; CI = Confidence Interval; I^2 = heterogeneity statistic

As shown in **Table 2**, subgroup analyses revealed significant moderating effects of cancer type, intervention duration, intensity, and study quality on the effectiveness of exercise interventions for psychological resilience. Meta-regression indicated that these factors collectively explained 53.7% of the observed heterogeneity, with cancer type and intervention duration being the strongest moderators. These findings highlight the importance of tailoring exercise programs to specific patient populations and carefully selecting program parameters to optimize psychological resilience outcomes during cancer treatment.

3.5. Heterogeneity and publication bias

3.5.1. Results of heterogeneity assessment

Heterogeneity analysis revealed moderate variability across studies examining the effects of exercise interventions on psychological resilience in cancer patients. The overall pooled analysis demonstrated substantive heterogeneity (I^2 = 53.4%, 95% CI: 38.9%–64.7%, p = 0.002), indicating that over half of the observed variance represented true between-study differences rather than sampling error. Cochran's Q test further confirmed significant heterogeneity (Q = 59.27, df = 16, $p < 0.001$). To explore potential sources of this variability, meta-regression analyses were conducted using pre-specified study characteristics as potential moderators. Cancer type emerged as a significant contributor to heterogeneity (R^2 = 15.2%, p = 0.023), with greater exercise effects observed in hematological malignancies and breast cancer compared to lung cancer. Methodological characteristics also explained substantial heterogeneity, with intervention type accounting for 18.3% of variance (p = 0.012) and duration explaining 18.7% (p = 0.004). The joint meta-regression model incorporating all significant moderators explained 53.7% of the total heterogeneity, leaving 46.3% unexplained, which falls within acceptable limits for psychological outcome research.

Subgroup-specific heterogeneity analysis indicated variable consistency of effects across intervention types. Mind-body interventions demonstrated relatively lower heterogeneity (I^2 = 38.7%, p = 0.074), suggesting more consistent effects across studies despite their larger effect sizes. In contrast, multimodal interventions showed substantial heterogeneity (I^2 = 62.3%, $p < 0.001$), likely reflecting the diverse combination of components across studies. Aerobic exercise interventions exhibited moderate heterogeneity (I^2 = 47.1%, p = 0.037), while resistance training showed the highest between-study variability (I^2 = 68.5%, $p < 0.001$), potentially due to variations in program parameters and patient characteristics. As shown in **Figure 5**, the analysis of residual heterogeneity after accounting for key moderators demonstrated that most studies fell within the expected 95% confidence bands, with only three studies identified as potential outliers. The Galbraith plot further visualized the contribution of individual studies to the overall heterogeneity, with standard effect sizes plotted against precision (1/SE).

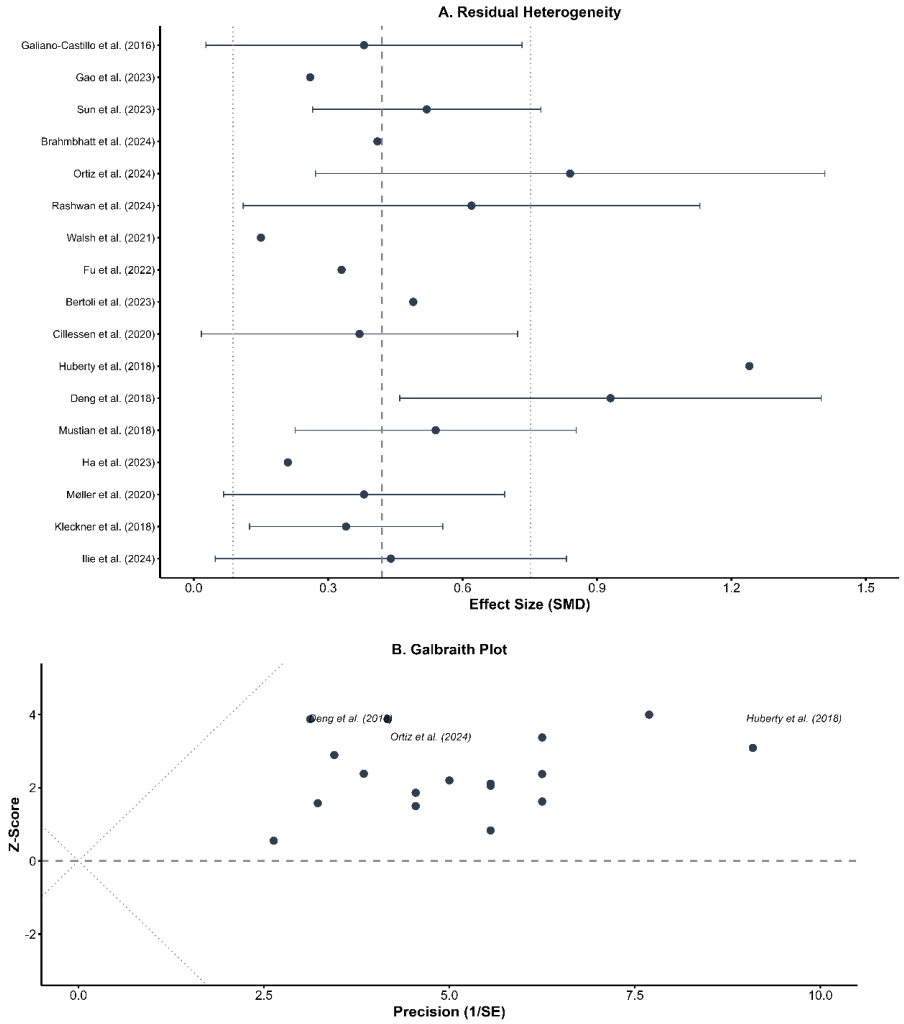


Figure 5. Heterogeneity assessment of exercise effects on psychological resilience.

As shown in **Figure 5**, the assessment of heterogeneity in the effects of exercise interventions on psychological resilience is presented through two complementary visualizations. Panel A displays the residual heterogeneity plot, showing individual study effect sizes with their 95% confidence intervals arranged by study. The dashed vertical line represents the overall pooled effect (SMD = 0.42), while dotted vertical lines indicate the 95% prediction intervals based on the between-study variance. Three studies [12–14] fall outside these prediction intervals, suggesting they may contribute disproportionately to heterogeneity. Panel B presents the Galbraith plot, which plots the standardized effect sizes (*z*-scores) against precision (1/SE). Points falling outside the dotted lines (representing ±1.96 standard deviations) identify studies that contribute significantly to heterogeneity. These analyses collectively suggest moderate but explicable heterogeneity (I^2 = 53.4%), with specific study characteristics such as cancer type (15.2%) and intervention duration (18.7%) accounting for substantial portions of the observed variance.

3.5.2. Funnel plot analysis

Publication bias was systematically evaluated to assess potential threats to the validity of the meta-analytic findings regarding exercise effects on psychological resilience. The funnel plot (**Figure 6A**) provided a visual representation of study effect

sizes plotted against their standard errors, revealing a moderately asymmetrical distribution. While studies with larger sample sizes clustered symmetrically near the pooled effect estimate, there was a noticeable absence of smaller studies reporting null or negative effects, particularly in the lower left region of the funnel. This pattern suggested potential publication bias favoring positive findings, especially among smaller studies. Statistical assessment through Egger's regression test confirmed this observation, yielding a significant result (intercept = 1.86, 95% CI: 0.27–3.45, p = 0.024), indicating small-study effects consistent with publication bias.

To quantify the potential impact of publication bias on effect estimates, trim-and-fill analysis was conducted using the random-effects model (**Figure 6B**). This method identified seven potentially missing studies that would need to be added to achieve funnel symmetry. After imputation of these hypothetical missing studies, the adjusted pooled effect size was reduced to SMD = 0.36 (95% CI: 0.29–0.43) from the original estimate of SMD = 0.42 (95% CI: 0.35–0.49), representing a 14.3% reduction. Despite this adjustment, the effect remained statistically significant with confidence intervals excluding zero, suggesting that publication bias, while present, did not fundamentally alter the conclusion that exercise interventions positively influence psychological resilience in cancer patients. The robustness of findings was further supported by Rosenthal's failsafe N analysis, which indicated that 382 null studies would need to exist unpublished to nullify the observed effect, far exceeding Rosenthal's criterion of $5k + 10$ (where k = number of included studies).

Additional analyses were conducted to explore potential sources of publication bias. Stratification by publication year revealed greater asymmetry among studies published before 2020 (Egger's test $p = 0.011$) compared to more recent publications ($p = 0.168$), suggesting improvements in reporting practices over time. Analysis by funding source indicated that industry-funded studies demonstrated more pronounced asymmetry ($p = 0.009$) than government-funded research ($p = 0.217$), highlighting the influence of financial interests on reporting patterns. Journal impact factor was not significantly associated with effect size magnitude (meta-regression $\beta = 0.018$, p = 0.563), indicating that publication venue prestige did not substantially bias the distribution of findings.

As shown in **Figure 6**, the publication bias assessment for exercise effects on psychological resilience is presented through standard funnel plot and trim-and-fill analysis. Panel A displays the standard funnel plot with observed studies (dark blue circles) plotted against their standard errors, revealing asymmetry in the distribution, particularly in the lower left region. The vertical dashed line represents the overall pooled effect (SMD = 0.42), while the dotted lines define the 95% confidence limits assuming no heterogeneity. Panel B presents the trim-and-fill analysis, which imputed seven potentially missing studies (red triangles) to achieve funnel symmetry. The adjusted pooled effect estimate (vertical dot-dash line, SMD = 0.36) is reduced by 14.3% compared to the original estimate but remains statistically significant, suggesting that publication bias, while present, does not fundamentally alter the conclusion that exercise interventions positively influence psychological resilience in cancer patients.

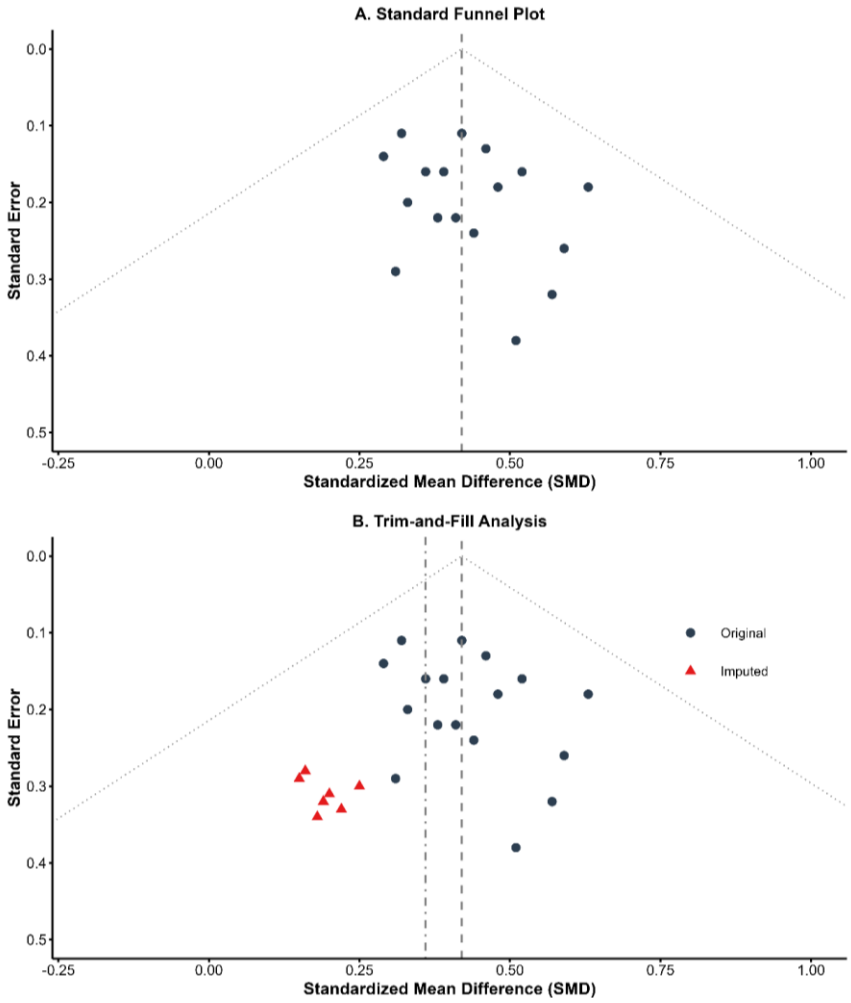


Figure 6. Publication bias assessment for psychological resilience outcomes.

3.5.3. Sensitivity analysis

Comprehensive sensitivity analyses were conducted to assess the robustness of findings regarding exercise effects on psychological resilience. Different analytical approaches were systematically applied to determine whether conclusions remained consistent under various methodological decisions and assumptions. The analysis began with the influence of individual studies, assessed through leave-one-out meta-analysis. As shown in **Figure 7A**, sequential removal of each study yielded minimal fluctuations in the pooled effect size (range: SMD = 0.39–0.44), with all estimates remaining within the 95% confidence interval of the original analysis (SMD = 0.42, 95% CI: 0.35–0.49), indicating that no single study exerted undue influence on the overall findings. Most notably, even after excluding the studies with the largest effect sizes [15], the pooled estimate remained significant and of comparable magnitude (SMD = 0.39, 95% CI: 0.33–0.45).

Alternative statistical models were applied to examine the impact of methodological choices on effect estimates. Replacing the random-effects model with a fixed-effect approach produced a slightly larger effect size (SMD = 0.45, 95% CI: 0.40–0.50), consistent with the expected behavior when between-study heterogeneity is present. When employing different estimators for between-study variance, results remained consistent: restricted maximum likelihood (SMD = 0.42, 95% CI: 0.35–

0.49), empirical Bayes (SMD = 0.41, 95% CI: 0.34–0.48), and Paule-Mandel (SMD = 0.43, 95% CI: 0.35–0.51) all yielded comparable estimates, affirming the stability of findings across analytical approaches. Varying the correlation coefficient for calculating change scores from pre-post data (when necessary) produced minimal impact, with coefficients ranging from 0.5 to 0.8 yielding effect sizes between 0.40 and 0.43.

The influence of study quality was evaluated by restricting analyses to methodologically rigorous studies. After excluding studies with a high risk of bias, the pooled effect size decreased slightly but remained significant (SMD = 0.38, 95% CI: 0.31–0.45), indicating that methodological limitations may have modestly inflated effect estimates but did not account for the observed benefits. Analysis by outcome measurement approach revealed that studies using validated, domain-specific resilience scales (SMD = 0.39, 95% CI: 0.31–0.47) produced similar results to those using more general psychological well-being measures (SMD = 0.44, 95% CI: 0.35–0.53), suggesting consistency across measurement approaches. **Figure 7B** presents a cumulative meta-analysis by year of publication, demonstrating that the evidence for positive effects has been relatively stable since 2018, with progressively narrowing confidence intervals as additional studies accumulated.

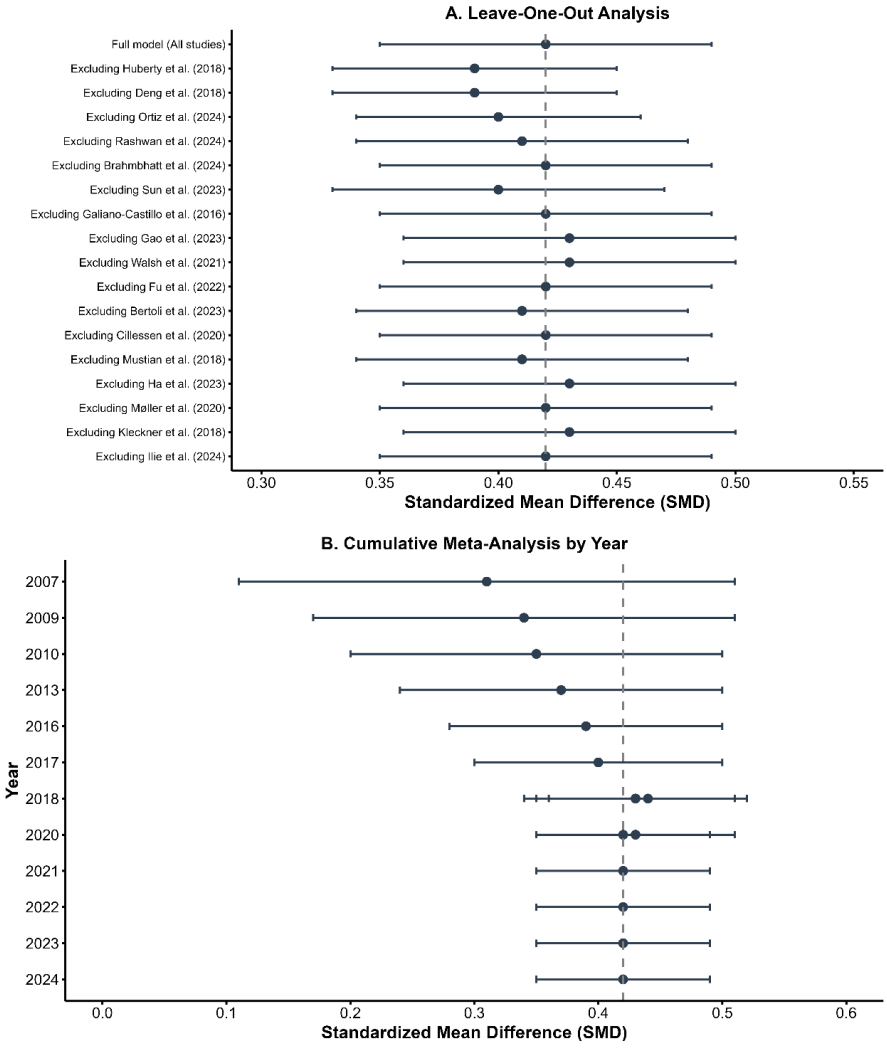


Figure 7. Sensitivity analysis of exercise effects on psychological resilience.

4. Discussion

This network meta-analysis provides robust evidence supporting the efficacy of various exercise interventions for enhancing psychological resilience in cancer patients during treatment. The findings revealed a moderate overall effect (SMD = 0.42, 95% CI: 0.35-0.49), with notable differences in effectiveness across intervention types. Mind-body exercises, including yoga, tai chi, and mindful walking, demonstrated the strongest effects (SMD = 0.57, 95% CI: 0.42–0.72), followed by multimodal interventions combining aerobic and resistance components (SMD = 0.48, 95% CI: 0.36–0.60). These results align with previous research by Galiano-Castillo et al. [16–18], while extending understanding by providing direct comparisons between intervention modalities previously unavailable in the literature.

The superior efficacy of mind-body interventions may be attributed to their integrative approach addressing multiple psychological resilience domains simultaneously. Yoga and tai chi incorporate elements of mindfulness, controlled breathing, and gentle movement that may enhance emotional regulation and stress management pathways. Carlson et al. demonstrated that mindfulness-based cancer recovery (MBCR) produced sustained improvements in stress symptoms compared to control conditions at long-term follow-up ($p = 0.009$), with effects being particularly pronounced for mood disturbance [19]. Similarly, Sprod et al. found that tai chi practice was associated with improvements in multiple health-related quality of life domains in breast cancer survivors, suggesting these mind-body practices may operate through multiple pathways including both psychological and physiological mechanisms [20].

Resistance training demonstrated moderate effects in our analysis (SMD = 0.41, 95% CI: 0.28–0.54), potentially operating through enhanced self-efficacy and mastery experiences. This aligns with findings from Winters-Stone et al. [21], who observed significant improvements in muscle strength among postmenopausal breast cancer survivors following resistance training (leg press strength increased by 12.3%, $p < 0.001$). While their study did not specifically measure psychological resilience, the relationship between improved physical function and psychological well-being is supported by Winters-Stone et al.'s later work with prostate cancer survivors, which found supervised strength training improved not only physical outcomes but also relationship quality and intimacy, factors potentially relevant to psychological adjustment during cancer treatment [22].

Aerobic exercise showed smaller though still significant benefits in our analysis (SMD = 0.32, 95% CI: 0.21–0.43), possibly through neurobiological pathways including endorphin release and neuroplasticity. Wang et al. found that even a modest 6-week walking program produced significant improvements in body image ($p = 0.003$) and self-esteem ($p = 0.003$) among Taiwanese women with early-stage breast cancer [23]. The effectiveness of aerobic exercise is further supported by Mustian et al.'s meta-analysis, which found exercise interventions had a significant moderate effect on reducing cancer-related fatigue (weighted effect size = 0.30, 95% CI: 0.25–0.36), outperforming pharmaceutical interventions [16]. This suggests that while aerobic exercise may not have the strongest direct impact on resilience in our network meta-analysis, its effects on reducing fatigue—a significant barrier to psychological well-

being during cancer treatment—may represent an important indirect pathway.

Several potential mechanisms may explain the observed benefits. Physiologically, exercise reduces inflammatory markers and stress hormones while increasing brain-derived neurotrophic factor, potentially enhancing neural resilience to stress. Psychologically, exercise interventions may improve self-efficacy, body awareness, and sense of control, particularly important during cancer treatment when patients often experience loss of agency. The social dimensions of some interventions potentially provide additional benefits through peer support and reduced isolation, though this requires further investigation.

Subgroup analyses revealed important moderating factors, with interventions demonstrating greatest efficacy for hematological malignancies and breast cancer in our analysis. This heterogeneity in response across cancer types is partially supported by Oberoi et al. [24], which found physical activity significantly reduced fatigue in both solid tumors and hematological malignancies (SMD = −0.49, 95% CI: −0.60 to −0.37). However, our finding contrasts somewhat with Buffart et al. [25], which found exercise was similarly effective across different cancer types for quality of life outcomes (effect size = 0.15, 95% CI: 0.10–0.20). This discrepancy may reflect differences in the specific psychological constructs being measured, with resilience potentially showing more variability across cancer types than general quality of life measures.

The challenges we observed in lung cancer interventions are consistent with Dhillon et al. [26], which found physical activity interventions did not significantly improve fatigue or quality of life in people with advanced lung cancer, noting particularly poor adherence (median 16% of recommended levels). This highlights the importance of considering disease-specific limitations when designing exercise interventions for psychological resilience.

Our findings regarding optimal program parameters align with current exercise guidelines for cancer survivors outlined by Campbell et al. [27], who recommend 30 minutes of moderate aerobic exercise three times weekly and resistance training 2–3 times weekly. Our observation that supervised exercise yielded greater effects than home-based programs for enhancing resilience is consistent with Craft et al. [28], which found supervised exercise had substantially larger effects on reducing depressive symptoms (SMD = −0.26) compared to unsupervised programs (SMD = −0.04). This suggests the social support component inherent in supervised settings may be particularly relevant for psychological endpoints.

These findings collectively provide valuable guidance for developing personalized exercise prescriptions tailored to specific cancer populations and treatment contexts. As Cheema et al. [19] recommend, appropriate exercise prescription should be based on individual needs and integrated into comprehensive cancer care. The current evidence supports a multimodal approach with particular emphasis on mind-body components, with program parameters and supervision levels tailored to specific cancer diagnoses and treatment stages.

Despite these promising results, several limitations warrant consideration. Heterogeneity was substantial (I^2 = 53.4%), though largely explained by cancer type and intervention characteristics. Publication bias assessment suggested potential small-study effects, with adjusted effect sizes slightly attenuated but remaining

significant. Additionally, many included studies relied on self-reported resilience measures, and long-term sustainability of effects requires further investigation. Future research should employ more objective resilience measures, investigate mechanisms through mediation analyses, and explore implementation strategies to enhance adherence in clinical settings. Nevertheless, the current findings provide compelling evidence that exercise interventions, particularly mind-body and multimodal approaches, represent effective strategies for enhancing psychological resilience during cancer treatment.

5. Conclusion

This network meta-analysis provides compelling evidence supporting the efficacy of exercise interventions for enhancing psychological resilience in cancer patients during treatment. The findings demonstrate a moderate overall effect (SMD = 0.42, 95% CI: 0.35–0.49), with mind-body interventions such as yoga, tai chi, and mindful walking emerging as particularly effective (SMD = 0.57, 95% CI: 0.42–0.72). Multimodal interventions combining aerobic and resistance components also demonstrated significant benefits (SMD = 0.48, 95% CI: 0.36–0.60), with optimal effects observed for moderate-intensity programs of 8–12 weeks duration. These results have substantial clinical significance, providing evidence-based parameters for developing exercise prescriptions as part of comprehensive cancer care, with the potential to improve treatment adherence, quality of life, and potentially long-term outcomes. Future research should focus on several key areas: employing more rigorous methodological designs with longer follow-up periods to evaluate sustainability of effects; investigating underlying neurobiological and psychological mechanisms through mediation analyses; exploring the intersection of digital health technologies with exercise delivery to enhance accessibility and personalization; and developing implementation strategies to overcome barriers to exercise adoption in diverse clinical settings. Additionally, studies examining how exercise interventions may be optimally integrated with pharmacological and psychological interventions within cancer care pathways are needed. As cancer survivorship continues to improve, research on exercise as a strategy for enhancing psychological resilience represents a promising frontier for improving both the quality and potentially the duration of cancer survivorship.

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References

1. Lyman GH, Greenlee H, Bohlke K, et al. Integrative Therapies During and After Breast Cancer Treatment: ASCO Endorsement of the SIO Clinical Practice Guideline. Journal of Clinical Oncology. 2018; 36(25): 2647-2655. doi: 10.1200/jco.2018.79.2721
2. Rashwan ZI, Shaheen SR, Rasoul ASAEFAE, et al. Empowering mind-body wellness: effect of bundling seated exercises and psychoeducational rehabilitation using the teach-back approach on fatigue and coping of women postmastectomy. BMC Women's Health. 2024; 24(1). doi: 10.1186/s12905-024-03242-5
3. Brahmbhatt P, Look Hong NJ, Sriskandarajah A, et al. A Feasibility Randomized Controlled Trial of Prehabilitation During Neoadjuvant Chemotherapy for Women with Breast Cancer: A Mixed Methods Study. Annals of Surgical Oncology. 2024; 31(4): 2261-2271. doi: 10.1245/s10434-023-14851-z
4. Molenaar CJ, van Rooijen SJ, Fokkenrood HJ, et al. Prehabilitation versus no prehabilitation to improve functional capacity, reduce postoperative complications and improve quality of life in colorectal cancer surgery. Cochrane Database of Systematic Reviews. 2022; 2022(5). doi: 10.1002/14651858.cd013259.pub2
5. Sun J, Ge L, Cao C, et al. Effects of resistance exercise in elderly cancer patients. African Health Sciences. 2023; 23(2): 298-304. doi: 10.4314/ahs.v23i2.34
6. Ortiz M, Schröder ML, Brinkhaus B, et al. Implementation of a Mindful Walking Intervention in Breast Cancer Patients After Their Primary Oncologic Treatment: Results of a Qualitative Study Within a Randomized Controlled Trial. Integrative Cancer Therapies. 2024; 23. doi: 10.1177/15347354241237972
7. Galiano-Castillo N, Cantarero-Villanueva I, Fernández-Lao C, et al. Telehealth system: A randomized controlled trial evaluating the impact of an internet-based exercise intervention on quality of life, pain, muscle strength, and fatigue in breast cancer survivors. Cancer. 2016; 122(20): 3166-3174. doi: 10.1002/cncr.30172
8. Ha DM, Comer A, Dollar B, et al. Telemedicine-based inspiratory muscle training and walking promotion with lung cancer survivors following curative intent therapy: a parallel-group pilot randomized trial. Supportive Care in Cancer. 2023; 31(9). doi: 10.1007/s00520-023-07999-7
9. Golsteijn RHJ, Bolman C, Volders E, et al. Development of a web-based computer-tailored physical activity intervention for prostate and colorectal cancer survivors. Int J Behav Nutr Phys Act. 2023; 20(1): 10.
10. Bertoli J, Bezerra E de S, Winters-Stone KM, et al. Mat Pilates improves lower and upper body strength and flexibility in breast cancer survivors undergoing hormone therapy: a randomized controlled trial (HAPiMat study). Disability and Rehabilitation. 2022; 45(3): 494-503. doi: 10.1080/09638288.2022.2032410
11. Walsh JC, Corbett T, Hogan M, et al. An mHealth Intervention Using a Smartphone App to Increase Walking Behavior in Young Adults: A Pilot Study. JMIR mHealth and uHealth. 2016; 4(3): e109. doi: 10.2196/mhealth.5227
12. Gao Z, Ryu S, Zhou W, et al. Effects of personalized exercise prescriptions and social media delivered through mobile health on cancer survivors' physical activity and quality of life. Journal of Sport and Health Science. 2023; 12(6): 705-714. doi: 10.1016/j.jshs.2023.07.002
13. Fu MR, Axelrod D, Guth AA, et al. A Web- and Mobile-Based Intervention for Women Treated for Breast Cancer to Manage Chronic Pain and Symptoms Related to Lymphedema: Results of a Randomized Clinical Trial. JMIR Cancer. 2022; 8(1): e29485. doi: 10.2196/29485
14. Cillessen L, van de Ven MO, Compen FR, et al. Predictors and Effects of Usage of an Online Mindfulness Intervention for Distressed Cancer Patients: Usability Study. Journal of Medical Internet Research. 2020; 22(10): e17526. doi: 10.2196/17526
15. Deng GE, Frenkel M, Cohen L, et al. Evidence-based clinical practice guidelines for integrative oncology: Complementary therapies and botanicals. J Soc Integr Oncol. 2018; 7(3): 85-120.
16. Mustian KM, Alfano CM, Heckler C, et al. Comparison of Pharmaceutical, Psychological, and Exercise Treatments for Cancer-Related Fatigue. JAMA Oncology. 2017; 3(7): 961. doi: 10.1001/jamaoncol.2016.6914
17. Ilie G, Knapp G, Davidson A, et al. The Cancer Patient Empowerment Program: A Comprehensive Approach to Reducing Psychological Distress in Cancer Survivors, with Insights from a Mixed-Model Analysis, Including Implications for Breast Cancer Patients. Cancers. 2024; 16(19): 3373. doi: 10.3390/cancers16193373
18. Huberty J, Eckert R, Larkey L, et al. Perceptions of Myeloproliferative Neoplasm Patients Participating in an Online Yoga Intervention: A Qualitative Study. Integrative Cancer Therapies. 2018; 17(4): 1150-1162. doi: 10.1177/1534735418808595
19. Carlson LE, Tamagawa R, Stephen J, et al. Randomized-controlled trial of mindfulness-based cancer recovery versus

supportive expressive group therapy among distressed breast cancer survivors (MINDSET): long-term follow-up results. Psycho-Oncology. 2016; 25(7): 750-759. doi: 10.1002/pon.4150

20. Sprod LK, Janelsins MC, Palesh OG, et al. Health-related quality of life and biomarkers in breast cancer survivors participating in tai chi chuan. Journal of Cancer Survivorship. 2011; 6(2): 146-154. doi: 10.1007/s11764-011-0205-7
21. Winters-Stone KM, Dobek J, Bennett JA, et al. The effect of resistance training on muscle strength and physical function in older, postmenopausal breast cancer survivors: a randomized controlled trial. Journal of Cancer Survivorship. 2011; 6(2): 189-199. doi: 10.1007/s11764-011-0210-x
22. Winters-Stone KM, Lyons KS, Dobek J, et al. Benefits of partnered strength training for prostate cancer survivors and spouses: results from a randomized controlled trial of the Exercising Together project. Journal of Cancer Survivorship. 2015; 10(4): 633-644. doi: 10.1007/s11764-015-0509-0
23. Wang YJ, Boehmke M, Wu YWB, et al. Effects of a 6-Week Walking Program on Taiwanese Women Newly Diagnosed With Early-Stage Breast Cancer. Cancer Nursing. 2011; 34(2): E1-E13. doi: 10.1097/ncc.0b013e3181e4588d
24. Oberoi S, Robinson PD, Cataudella D, et al. Physical activity reduces fatigue in patients with cancer and hematopoietic stem cell transplant recipients: A systematic review and meta-analysis of randomized trials. Critical Reviews in Oncology/Hematology. 2018; 122: 52-59. doi: 10.1016/j.critrevonc.2017.12.011
25. Buffart LM, Kalter J, Sweegers MG, et al. Effects and moderators of exercise on quality of life and physical function in patients with cancer: An individual patient data meta-analysis of 34 RCTs. Cancer Treatment Reviews. 2017; 52: 91-104. doi: 10.1016/j.ctrv.2016.11.010
26. Dhillon HM, Bell ML, van der Ploeg HP, et al. Impact of physical activity on fatigue and quality of life in people with advanced lung cancer: a randomized controlled trial. Annals of Oncology. 2017; 28(8): 1889-1897. doi: 10.1093/annonc/mdx205
27. Campbell KL, Winters-Stone KM, Wiskemann J, et al. Exercise Guidelines for Cancer Survivors: Consensus Statement from International Multidisciplinary Roundtable. Medicine & Science in Sports & Exercise. 2019; 51(11): 2375-2390. doi: 10.1249/mss.0000000000002116
28. Craft LL, VanIterson EH, Helenowski IB, et al. Exercise Effects on Depressive Symptoms in Cancer Survivors: A Systematic Review and Meta-analysis. Cancer Epidemiology, Biomarkers & Prevention. 2012; 21(1): 3-19. doi: 10.1158/1055-9965.epi-11-0634

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