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The Relationship Between Social Participation and Mental Health in Elderly Cancer Patients: The Mediating of Social Adaptation

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Abstract: Psychological health issues among elderly cancer patients are becoming increasingly prominent, yet the mechanisms through which social participation influences elderly cancer patients and the group differences in these effects remain poorly understood. This study focuses on the association between social participation and psychological health among elderly cancer patients and delves into the mediating effects of social adaptation and its heterogeneous characteristics. Using data from three waves of the China Longitudinal Study of Aging (CLASS) conducted in 2016, 2018, and 2020, we analyzed 369 elderly cancer patients. Through baseline regression, quartile regression, Bootstrap mediation tests, and multivariable logistic subgroup analysis, we found that social participation significantly reduced depression ($b = -1.299$, $P < 0.001$), indicating that social participation significantly improves the mental health of elderly cancer patients. Mediating analysis revealed that social adaptation partially mediated this effect (indirect effect = -0.444 , 95% CI: -0.649 to -0.239); quartile regression showed that the protective effect of social participation on depression increased gradually with the severity of depression; Subgroup analysis indicated that the effect was not statistically significant in the elderly (aged >70 years), those with activities of daily living (ADL) impairment, and those with primary school education or below ($P > 0.05$). This study revealed the relationship between social participation and mental health in elderly cancer patients and validated the mediating effect of social adaptation between the two, providing empirical support for precision social participation interventions for elderly cancer patients.

Keywords: social participation; elderly cancer patients; mental health; depression; social adaptation

1. Introduction

Against the backdrop of accelerating population aging and advancements in medical technology, the population of elderly cancer patients is expanding significantly ^[1]. As a severe chronic disease, cancer not only causes sustained damage to the physiological functions of elderly patients but also tends to trigger significant fluctuations in their psychological well-being. Mental health issues

have thus become a core challenge threatening the quality of life of elderly cancer patients ^[2]. Negative emotions such as depression ^[3] and anxiety ^[4] are significantly more prevalent among elderly cancer patients than in the general elderly population. Prolonged psychological imbalance can further exacerbate immune function decline, delay disease recovery, and even increase suicide risk, posing a direct threat to patients' lives ^[5]. The mental health of elderly cancer patients not only affects their individual well-being but also places a heavy burden on family care ^[6], and poses a severe challenge to the allocation of medical resources and the chronic disease management system in China. Therefore, exploring effective pathways to improve the mental health of elderly cancer patients has become an important issue that needs to be addressed in the fields of geriatric medicine and health psychology.

Social participation, as an important means of actively coping with the trauma of disease and reconstructing the meaning of life, has a unique impact on the mental health of elderly cancer patients. A cancer diagnosis often leads to the disruption of patients' social roles and the shrinkage of their social networks, while active social participation can help them rebuild social connections and regain a sense of self-worth. In recent years, the state has successively introduced a number of policies focusing on the social integration of special elderly groups. Since 2021, the Chinese government has issued a series of documents to further implement the national strategy for responding to population aging, aiming to promote the social participation of older adults. For example, the "Opinions on Strengthening Aging Work in the New Era" pointed out that efforts should be made to expand the supply of educational resources for older adults, improve the quality of cultural and sports services for older adults, and encourage older adults to continue to play an active role. These policies provide institutional support for exploring the role of social participation in the mental health of elderly cancer patients. It is worth noting that social adaptation may play a key mediating role in the process from social participation to psychological well-being improvement among elderly cancer patients ^[10]. As a dynamic process in which individuals adjust their state to achieve harmonious interaction in a changing social environment ^[11], social adaptation can help elderly cancer patients reconstruct their cognitive patterns and optimize their coping strategies in the dual context of disease and social participation. However, existing studies have mostly focused on the direct impact of social participation on the mental health of ordinary elderly people ^[12-14]. There is still insufficient research on the internal mechanism through which social participation affects mental health via social adaptation in the special group of elderly cancer patients.

Based on this, in response to the gap in existing research, which mostly focuses on ordinary elderly people and pays insufficient attention to the special group of elderly cancer patients, and has not yet deeply analyzed the internal mechanism through which social participation affects mental health via social adaptation, this study aims to utilize national longitudinal survey data on elderly

cancer patients to empirically examine the impact of social participation on the mental health of elderly cancer patients and systematically reveal the mediating role of social adaptation in this process. The study seeks to provide theoretical support for the development of precise mental health intervention programs and contribute to the effective implementation of the Healthy China strategy among elderly cancer patients.

2. Literature review and research hypotheses

Older cancer patients face the stress pile-up effect, which is the combined impact of multiple stressors ^[15]. At the biomedical level, tumor progression and the side effects of chemotherapy and radiotherapy lead to physical decline ^[16], at the psychological level, age-related declines in cognitive flexibility and multiple losses (such as social role loss and the perception of impending death) exacerbate anxiety and depression [17,18]; At the sociocultural level, disease stigmatization and social withdrawal form a negative feedback loop ^[19]. When these composite stressors are constructed by individuals as existential threats through primary cognitive appraisal, they significantly activate the hypothalamic-pituitary-adrenal (HPA) axis stress response, ultimately manifesting as psychological pathologies such as depression and post-traumatic stress disorder ^[20,21]. Epidemiological studies have shown that the prevalence of major depressive disorder among elderly cancer patients is higher than that among healthy people of the same age ^[22], and there is an urgent need to construct intervention pathways based on a social ecological perspective.

Lazarus and Folkman (1984) developed the stress-coping theory, which provides a meta-theoretical framework for deconstructing the psychological benefits of social participation. This theory emphasizes that psychological adaptation arises from the appraisal-coping cycle of continuous interaction between individuals and their environment: when cancer is appraised as a high-threat event (primary appraisal), individuals determine the intensity of their stress response (secondary appraisal) by assessing available coping resources. Among these, social participation, as a key exogenous resource, exerts a protective effect through two pathways. On the one hand, it directly replenishes psychological capital reserves by providing emotional support (alleviating loneliness and fear), instrumental support (overcoming barriers to medical care), informational support (enhancing disease control), and confirmation of belonging (counteracting stigma). On the other hand, when faced with acute stress such as chemotherapy side effects, the immediate response of social networks can regulate cortisol peaks and prevent the perception of stress from turning into chronic psychological exhaustion.

The psychological benefits of social participation need to be deeply internalized through social adaptation. In the context of cancer, social adaptation is conceptualized as a dynamic process of rebuilding social connections, adjusting role functions, and integrating disease experiences ^[23], with the following core

dimensions: first, role reconstruction, from a passive patient identity to an active role, such as patient supporter or rehabilitation advocate; Second, relational resilience, which involves maintaining the reciprocity of intimate relationships despite changes in physical appearance. Third, meaning reconstruction, which involves integrating disease narratives into the life course to achieve post-traumatic growth. The three-stage transformation mechanism of social participation promoting social adaptation is also reflected in three aspects. First, at the behavioral activation level. Community rehabilitation programs (such as prosthetic breast fitting workshops) provide a role-playing arena, reducing behavioral inhibition in returning to society ^[24]; second, the emotional integration level: patient groups promote collective meaning generation through narrative sharing, alleviating existential loneliness; third, the cognitive schema level: intergenerational activities stimulate alternative learning, expanding the cognitive possibilities for role transformation.

At the same time, the psychosocial benefits of social participation exhibit significant context dependency ^[25]. Differences in individual cognitive evaluation abilities moderate the efficiency of resource conversion—individuals with higher educational attainment are better at analyzing the adaptive value of social participation and, through cognitive reappraisal, transform ordinary social interactions into growth opportunities ^[26]; however, individuals with mild cognitive impairment (MMSE score < 24) experience difficulties in decoding participation information ^[27]. The urban-rural gap in medical resources leads to differences in the coverage of community support programs, with rural patients often falling into a “participation desert” ^[28]. Based on this, the following hypotheses are proposed:

Hypothesis 1: Social participation promotes the mental health of elderly cancer patients.

Hypothesis 2: The impact of social participation on the mental health of elderly cancer patients varies across groups.

Hypothesis 3: Social adaptation mediates the relationship between social participation and the mental health of elderly cancer patients.

3. Materials and methods

3.1. Data sources

The data in this paper are derived from the national survey data of the China Longitudinal Aging Social Survey (CLASS), implemented by the China Survey and Data Center at Renmin University of China. The CLASS project employs a stratified multistage probability sampling method, with the survey sample distributed across 28 provinces (autonomous regions and municipalities), 134 counties (districts), and 462 villages/communities ^[29]. Given the limited sample size of elderly cancer patients in a single year of the China Longitudinal Aging Social Survey (CLASS), which may not meet the basic requirements for sample size in statistical analysis and potentially affect the robustness of the results, this study

integrated data from the 2016, 2018, and 2020 CLASS surveys. During data cleaning, to ensure the robustness and reliability of the analysis results, the sample was restricted to elderly individuals with cancer, and missing and outlier values related to mental health, social networks, and social adaptation were excluded. The final sample included in the analysis comprised 369 elderly individuals.

3.2. Variable Selection

3.2.1. Dependent variable: Mental health

The dependent variable in this study is the mental health of elderly cancer patients. Depression levels were used to measure this variable. The CLASS questionnaire was adapted from the Center for Epidemiologic Studies Depression (CES-D) scale developed by the U.S. Centers for Disease Control and Prevention and the Chinese version of the CES-D scale compiled by the Key Laboratory of Mental Health, Chinese Academy of Sciences. It consists of 12 items to assess depression levels in the elderly ^[29]. The scale ranges from 12 to 36 points, with a reliability coefficient of $\alpha = 0.89$, which effectively reflects the depression levels of the elderly. Higher scores indicate a greater risk of depression.

3.2.2. Independent variable: social participation

The core independent variable in this study is the social participation of the elderly. The social participation module of the CLASS questionnaire was used to measure the levels of volunteer-type and personal-type social participation among the elderly. Volunteer-type social participation includes “community patrols, caring for other elderly people and children, environmental hygiene protection, mediating neighborhood disputes, accompanying others for conversation, providing volunteer services requiring specialized skills, and caring about the education of the next generation”; individual-oriented social participation includes “attending senior university or training courses, playing mahjong/chess/cards, and square dancing.” Each activity is assigned a value of 1 point, with a score range of 0–10 points ^[30]. Volunteer-oriented social participation has a score range of 0–7 points, while individual-oriented social participation has a score range of 0–3 points.

3.2.3. Mediating variable: social adaptation

This study utilized the Social Adaptation Scale from the CLASS questionnaire to measure two dimensions of social development adaptation and spiritual and cultural adaptation among the elderly ^[31]. Specifically, social development adaptation was assessed based on the following items from the questionnaire: “If given the opportunity, I would be willing to participate in certain activities organized by the village or community committee”; “I often think about doing something more for society”; and “I currently enjoy learning new things.” I currently enjoy learning; I feel that I am still a useful member of society“ in the questionnaire. Respondents selected “completely disagree“ = 1, “somewhat disagree“ =

2, 'neutral' = 3, "somewhat agree" = 4, and "completely agree" = 5. Spiritual and cultural adaptation was measured using the following set of items from the questionnaire: "Social changes are happening too quickly for me to adapt; increasingly, many viewpoints are difficult for me to accept; the growing number of new social policies today are difficult for me to accept;The current social changes are increasingly unfavorable for the elderly.» Scores were then reversed: completely disagree = 5, somewhat disagree = 4, neutral = 3, somewhat agree = 2, completely agree = 1. The scores for all questions were summed, with a score range of 8–40

3.2.4. Control variables

Based on a review of previous literature ^[32], this study controlled for demographic characteristics, physical health, and socioeconomic status. In addition, considering individual-level social participation, including recreational activities, this study controlled for the availability of recreational facilities in the community (Table 1).

Table 1. Demographic Characteristics (N=369).

Variable	Definition	N	Percentage
Gender	Male	178	48.24%
	Female	191	51.76%
Age	≤70	198	53.66%
	>70	171	46.34%
Educational attainment	Elementary school or below	95	25.75%
	Junior high school	123	33.33%
	High school/vocational school	82	22.22%
	College or above	69	18.70%
Marital status	Unmarried	88	23.85%
	Married	281	76.15%
Household registration	Rural	170	46.07%
	Urban	199	53.93%
Living arrangements	Not living alone	249	67.48%
	Living	120	32.52%
Activities of daily living	Normal	299	81.03%
	Disabled	70	18.97%
Community facilities	No	150	40.65%
	Yes	219	59.35%
Personal annual income	Continuous variable	3.40	1.11

3.3. Method

This study utilized SPSS 26.0 for data analysis. Descriptive statistics were first employed to present the demographic characteristics of the sample and the distribution of variables. Pearson correlation analysis was conducted to examine the direction and strength of the association between social participation and psychological health among elderly cancer patients. Harman's single-factor test was used to control for common method bias. Cronbach's α coefficient and confirm-

atory factor analysis were employed to ensure the reliability and validity of the scales. A multiple linear regression model was constructed to test the direct effect of social participation on the mental health of elderly cancer patients. The mediating role of social adaptation was validated using the Bootstrap method (5,000 repeated samples), and robustness tests were conducted using quartile regression and subsample analysis.

4. Results

4.1. Common Method Bias Test

The Harman single-factor test was used to examine common method bias^[33]. All items related to social participation, social adaptation, and mental health were grouped together for exploratory factor analysis. The results showed that the first factor explained 27.49% of the variance, which was less than the critical threshold of 40%. This indicates that there was no serious common method bias in this study.

4.2. Correlation analysis

Descriptive statistics and correlation analysis results indicate that social participation ($r = -0.319$, $P < 0.01$), volunteer-type social participation ($r = -0.279$, $P < 0.01$), and individual-type social participation ($r = -0.239$, $P < 0.05$) are significantly negatively correlated with the mental health of elderly cancer patients. Social participation ($r = 0.379$, $P < 0.001$), voluntary social participation ($r = 0.339$, $P < 0.001$), and individual social participation ($r = 0.189$, $P < 0.05$) were significantly positively correlated with social adaptation among elderly cancer patients; Social adaptation is significantly negatively correlated with mental health in elderly cancer patients ($r = -0.289$, $P < 0.01$). See **Table 2**.

Table 2. Descriptive statistics and correlation analysis of variables.

	M	SD	Social participation	Voluntary social participation	Individual social participation	Mental health	Social adaptation
Social participation	3.417	1.178	1.000	-	-	-	-
Voluntary social participation	2.758	1.447	0.829***	1.000	-	-	-
Individual social participation	1.169	0.829	0.678**	0.228*	1.000	-	-
Mental health	21.887	4.759	-0.319**	-0.279**	-0.239*	1.000	
Social adaptation	24.916	5.867	0.379***	0.339***	0.189*	-0.289**	1.000

4.3. Basic regression analysis

The results of the baseline regression analysis indicate that social participation significantly enhances the mental health of elderly cancer patients, specifically by significantly reducing the risk of depression among elderly cancer patients ($b = -1.299$, $P < 0.001$). Among these, volunteer-type social participation ($b = -0.918$, $P < 0.001$) and individual-type social participation ($b = -1.372$, $P < 0.05$)

also significantly reduced the risk of depression among elderly cancer patients. These results indicate that different dimensions of social participation can effectively reduce the risk of depression among elderly cancer patients. See **Table 3**.

Table 3. Basic regression analysis.

Independent variable	b	SE	t	95%CI	P	R2
Social participation	-1.299	0.325	-3.997	(-1.936,-0.663)	<0.001	0.102
Voluntary social participation	-0.918	0.270	-3.400	(-1.447,-0.389)	<0.001	0.078
Individual social participation	-1.372	0.572	-2.400	(-2.493,-0.251)	<0.05	0.057

4.4. Robustness Test

To validate the robustness of the research findings, this study employed quantile regression analysis to examine the relationship between social participation, volunteer-based social participation, individual volunteer participation, and mental health among elderly cancer patients. The results indicate that in the impact of social participation on depression among elderly cancer patients, the effect is extremely significant in the high depression group (Q4) ($b = -0.891$, $p < 0.001$), suggesting that the more severe the depression, the stronger the protective effect of social participation. Patients with severe depression achieve a more pronounced effect in rebuilding their social roles and countering feelings of uselessness through participation. Volunteer-based social participation is more critical for severely depressed elderly cancer patients, as helping others enables patients to reconstruct their self-worth and counteract the sense of helplessness caused by cancer. Therefore, a strong effect is only observed in Q4 ($b = -0.668$, $p < 0.01$). The effects of individual-based social participation were not significant across Q2–Q4 ($p > 0.05$), though trend tests showed marginal significance (P for trend = 0.073). Individual-oriented social participation falls under recreational social activities, which depend on patients' social willingness and physical strength. Moderate-to-severe depression patients often exhibit social withdrawal and reduced energy, leading to insufficient motivation or effectiveness in participation, resulting in weak quartile differences.

Table 4. Quartile regression analysis.

Independent variable	Dependent variable	b	SE	t	95%CI	P	P for trend
Social participation	Q1	-	-	-	-	-	<0.001
	Q2	-0.358	0.291	-1.230	(-0.929,0.213)	0.219	
	Q3	-0.627	0.276	-2.272	(-1.166,-0.088)	0.025	
	Q4	-0.891	0.263	-3.388	(-1.407,-0.375)	<0.001	
Voluntary social participation	Q1	-	-	-	-	-	<0.001
	Q2	-0.249	0.248	-1.004	(-0.737,0.239)	0.316	
	Q3	-0.436	0.233	-1.871	(-0.894,0.022)	0.062	
	Q4	-0.668	0.219	-3.050	(-1.098,-0.238)	<0.01	
Individual social participation	Q1	-	-	-	-	-	0.073
	Q2	-0.456	0.417	-1.094	(-1.278,0.366)	0.275	
	Q3	-0.588	0.394	-1.492	(-1.363,0.187)	0.136	
	Q4	-0.267	0.380	-0.703	(-1.014,0.048)	0.482	

4.5. Subgroup analysis

To investigate the differences in the impact of social participation on depression among elderly cancer patients across different groups, this study first converted depression scores into a binary variable, categorizing participants into depressed and non-depressed groups. The cutoff point was set at a depression score greater than 10 points for depression and otherwise non-depressed. Subsequently, a multivariate logistic regression subgroup analysis was conducted. The results showed no significant differences in gender, marital status, place of residence, or living arrangements. However, among patients aged over 70 years, those with disabilities, and those with primary school education or below, the effect of social participation on reducing the risk of depression did not reach a significant level. Older patients and those with disabilities, due to physiological decline, had reduced feasibility and recovery capacity for participating in physical or social activities, thereby weakening the emotional improvement effects of social participation. Patients with low educational attainment faced cognitive barriers (difficulty understanding activity rules, communication difficulties) and limited access to appropriate community activities, which restricted the effectiveness of social participation.

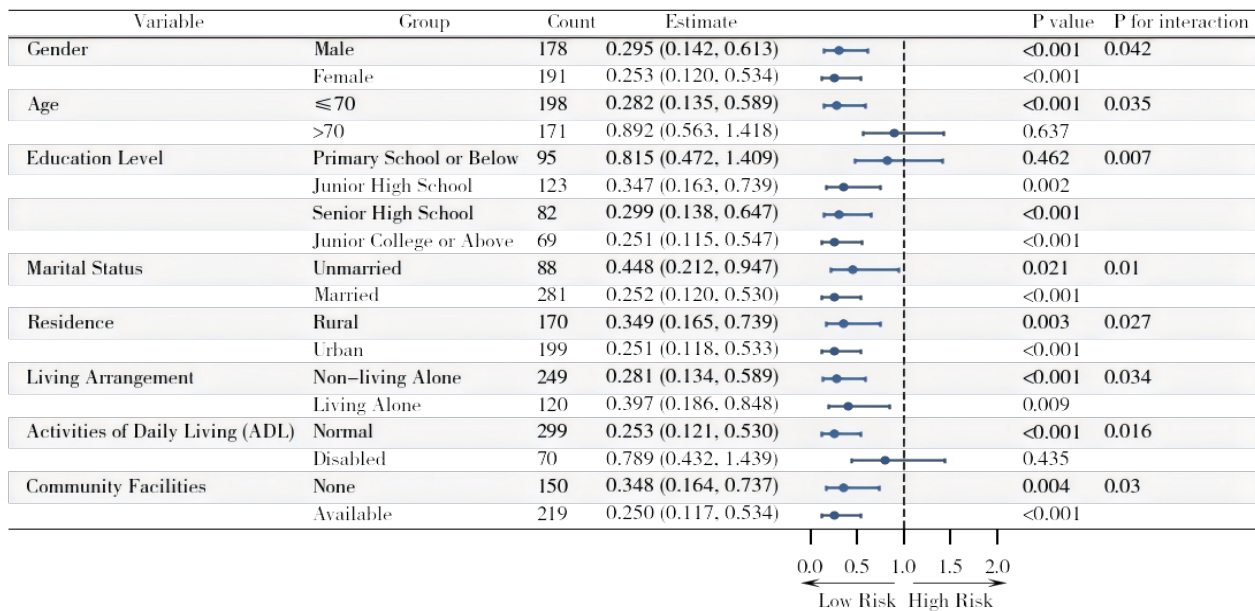


Figure 1. Subgroup analysis forest plot.

4.6. Mediation analysis

Using the Bootstrap method (with 5,000 repeated samples) to estimate the 95% confidence interval, we tested the significance of the mediating effect. The analysis results indicate that social participation has a significant positive effect on social adaptation (95% CI: 1.402–2.378), with a standardized effect size of

1.890. This suggests that for every 1-point increase in social participation, the social adaptation level of elderly cancer patients significantly improves by 1.890 points. Social participation directly shapes their social adaptation capacity by conferring social roles (e.g., volunteer activities) and promoting cognitive renewal; Social adaptation has a significant negative effect on depression in elderly cancer patients (95% CI: -0.331 to -0.139), with a standardized effect size of -0.235. This suggests that for every 1-point increase in social adaptation, depression scores decrease significantly by 0.235 points. Social adaptation alleviates the psychological impact of cancer by enhancing patients' acceptance of social changes and self-worth recognition. Indirect effects account for 34.2% of the total effect, indicating that approximately 34.2% of the depressive protective effect of social participation is mediated through the mechanism of "enhancing social adaptation." In summary, social participation directly alleviates depression and indirectly reduces the risk of depression by enhancing social adaptation capacity.

Table 5. Mediating path analysis.

Effect type	Effect type	BootSE	Boot95%CI lower	Boot95%CI upper	P
Social participation → Social adaptation (pathway a)	1.890	0.250	1.402	2.378	<0.001
Social adaptation → Depression (path b)	-0.235	0.050	-0.331	-0.139	<0.001
Social participation → Depression (direct effect c')	-0.855	0.280	-1.398	-0.312	0.002
Social participation → Social adaptation → Depression (indirect effect)	-0.444	0.100	-0.649	-0.239	<0.001
Social participation → Depression (total effect)	-1.299	0.325	-1.936	-0.663	<0.001

5. Discussion

The results of this study indicate that social participation has a significant positive impact on the mental health of elderly cancer patients, both by directly reducing the risk of depression and indirectly alleviating depression through improved social adaptation, with the mediating effect of social adaptation accounting for 34.2% of the total effect. This aligns with previous findings. Ajmera et al. (2025) ^[34] conducted a longitudinal study on colorectal cancer patients and found that the group with high social participation exhibited a significantly lower increase in depressive symptoms compared to the control group, confirming the protective role of social participation in the mental health of cancer patients; Zamanian et al. (2021) ^[35] also demonstrated that social adaptation can alleviate anxiety and depression symptoms in elderly breast cancer patients, resonating with the mediating mechanism of social adaptation in this study.

From a physiological and biological perspective, the impact of social participation on depression in elderly cancer patients can be explained through the HPA axis regulation mechanism in the stress-coping theory. Active social participation can reduce chronic stress-induced overactivation of the hypothalamic-pituitary-adrenal axis, lower levels of stress hormones such as cortisol, and thereby

mitigate inflammatory responses and immune function damage^[36]. Mcneal et al. (2017) found in a study of prairie voles that active social activities can suppress excessive activation of the hypothalamic-pituitary-adrenal axis (HPA axis) and reduce levels of stress hormones such as corticosterone^[37]. Social participation among elderly cancer patients may also mitigate disease-related chronic stress through similar neuroendocrine mechanisms, thereby alleviating the damage caused by HPA axis dysfunction to immune and emotional functions. This aligns with the view proposed by Ditzen et al. (2014) that social support buffers psychological stress through neuroendocrine pathways^[38]. However, some studies have noted that for severely disabled or cognitively impaired elderly cancer patients, social participation may exacerbate psychological burden due to physical exertion or social frustration^[39], which aligns with the lack of significant subgroup effects observed in this study's subgroup analysis, suggesting that the benefits of social participation may have a participation capacity threshold. When patients' physiological reserves are insufficient to support participatory behaviors, their protective effects may fail.

The impact of social participation on the mental health of elderly cancer patients exhibits significant group heterogeneity. Subgroup analysis revealed that the protective effects of social participation were more pronounced in groups such as females, younger individuals (≤ 70 years old), those with an education level of junior high school or above, and urban residents, while no significant effects were observed in groups such as older individuals (> 70 years old), those with disabilities, and those with an education level of elementary school or below. These differences stem from variations in the match between resources and needs^[40]. Advantaged groups possess more abundant physiological reserves (e.g., physical strength, cognitive abilities) and social resources (e.g., community facilities, social networks), enabling them to more efficiently convert social participation into psychological benefits^[41]; while disadvantaged groups, due to physical decline, cognitive barriers, or resource shortages, struggle to derive a sense of value from participation^[42]. This aligns with Majid (2024)'s observation of "participation desertification" among rural patients^[43] and validates the situational dependency of social participation benefits.

The mediating role of social adaptation stems from its three-stage conversion mechanism between social participation and mental health. At the behavioral activation level, social participation provides patients with a role-playing arena (e.g., community volunteer activities), helping them transition from passive patients to active participants and reducing social withdrawal behavior^[44]; at the emotional integration level, experiential narratives within patient support groups promote collective meaning-making and alleviate existential loneliness caused by illness^[45]; At the cognitive schema level, intergenerational or community activities expand the cognitive possibilities for role transformation, helping patients reconstruct their self-social relationships, enhance their acceptance of social change, and strengthen their self-worth^[46]. This mechanism aligns with the eval-

uation-coping cycle in stress-coping theory, where social participation optimizes patients' secondary evaluations of disease stress through social adaptation, enhances their perception of coping resources, and thereby alleviates depression..

6. Conclusion

This study, based on stress coping theory, systematically analyzes the mechanisms and group differences of social participation on the mental health of elderly cancer patients. The findings reveal that social participation significantly improves the mental health of elderly cancer patients. Specifically, social participation directly reduces the risk of depression and indirectly alleviates depression by enhancing social adaptation. In terms of effect patterns, the protective effect of social participation against depression exhibits a “higher depression severity, stronger effect” quantile gradient characteristic, and significant group heterogeneity exists. The effects are more pronounced in females, younger individuals (≤ 70 years old), and urban residents, while older individuals (> 70 years old), those with daily living disabilities, and those with low educational levels did not reach statistical significance, highlighting the moderating role of participation capacity and resource matching in the effects. This study provides precise directions for psychological intervention in elderly cancer patients. For advantaged groups, volunteer-based and social participation programs should be promoted to amplify protective effects. For disadvantaged groups, tailored interventions should be designed to overcome participation barriers. Additionally, efforts should focus on improving social participation accessibility for the elderly and those with disabilities through community facility adaptations and rehabilitation support to enhance their social adaptation capabilities.

Author contributions:

NF designed the research study. NF performed the research. NF provided help and advice on the theoretical foundations and frameworks to be established. NF analyzed the data. NF wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

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

Conflict of interest:

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