

**Original Article**



# The Mediating Role of Sedentary Behavior between Social Support and Social Isolation: Ovarian Cancer in Elderly Women Cross-Sectional Study of Patients

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## Abstract:

**Background:** Social isolation is a significant global public health issue for the elderly, posing severe challenges to social and public health, and significantly impacting the rehabilitation of elderly patients. While extensive research has been conducted on the epidemiology and influencing factors of social isolation, the potential mechanisms of social support and individual behavioral characteristics remain underexplored. Sedentary behavior and social support have been identified as key factors affecting social isolation; however, the relationship between sedentary behavior, social support, and social isolation remains unclear, particularly the mediating role of sedentary behavior, which has not been adequately studied in the context of elderly ovarian cancer patients in China.

**Objective** This cross-sectional study aims to investigate the current situation of social isolation and general influencing factors of elderly ovarian cancer patients. At the same time, it explores the relationship between sedentary behavior, social support and social isolation, and analyzes the mediating role of sedentary behavior in social support and social isolation.

**Methods:** A convenience sampling method was used to select elderly ovarian cancer patients treated and followed up at the First Affiliated Hospital of Zhejiang University School of Medicine, Zhejiang Province, China, from May 1, 2022, to December 31, 2024. The study involved surveys using a general information questionnaire, the Lubben Social Network Scale-6, the Social Support Rating Scale, and the Chinese Adult Static Behavior Questionnaire.

The average sedentary behavior duration for elderly ovarian cancer patients in our country is 6.96 (5, 10.29) hours per day, with a social support score of 31 (27,37) and a social isolation score of (9.13±0.87). The incidence of social isolation among elderly ovarian cancer patients is 80.4%, with 75.7% isolated by family and 89.7% by friends. In the general data, age, education level, place of residence, monthly income, disease duration, history of chronic diseases, and bone marrow suppression are the primary factors influencing social isolation in elderly ovarian cancer patients ( $P<0.05$ ). Social support is negatively correlated with sedentary behavior time ( $r=-0.664$ ,  $P<0.01$ ) and positively correlated with social isolation scores ( $r=0.578$ ,  $P<0.01$ ). Sedentary behavior time is negatively correlated with social isolation ( $r=-0.291$ ,  $P<0.01$ ). Social support can directly influence social isolation or indirectly through sedentary behavior; sedentary behavior acts as a partial mediator between social support and social isolation in elderly ovarian cancer patients, with a mediation effect of -0.468, accounting for 45% of the total effect.

**Conclusion:** Elderly ovarian cancer patients in our country face a higher risk of social isolation. Particular attention should be given to those who are older, have lower education levels, live in urban areas, have lower monthly incomes, shorter disease durations, more than three comorbidities, and bone marrow suppression. These factors make elderly ovarian cancer patients more susceptible to social isolation,

necessitating the development of personalized care interventions. Social support can directly or indirectly influence the level of social isolation among elderly ovarian cancer patients through sedentary behavior. Healthcare professionals should actively develop strategies to reduce sedentary behavior in elderly ovarian cancer patients, enhance social support, and prevent and delay the onset and progression of social isolation. This will promote the physical and mental health of elderly ovarian cancer patients and improve their quality of life.

**Keywords:** elderly; ovarian cancer; social isolation; social support; sedentary behavior; mediating effect

## Introduction

Ovarian cancer is one of the most common malignant tumors in the female reproductive system, with a leading mortality rate and a high incidence among elderly patients [1-2]. After being diagnosed with cancer, patients often face social isolation due to self-isolation, psychological and emotional issues, and side effects of treatment. Social isolation [3] refers to an individual's active or passive detachment from society, where activities, social interactions, and engagement are disrupted or isolated, potentially leading to negative physiological and psychological outcomes. It is a concept that objectively and quantitatively describes social relationships. Social isolation can manifest as objective social isolation and subjective social isolation [4]. Objective social isolation involves physical barriers and the isolation from others, typically reflected in the size of one's social network and the frequency of interactions with its members. Subjective social isolation refers to an individual's perception of a decline in social support. Social relationships are a fundamental aspect of human life; positive social relationships can convey care, responsibility, and other positive emotions, fostering healthy behaviors that protect health and promote recovery [5]. However, the lack of positive social relationships (i.e., social isolation) can lead to falls [6], cognitive impairment [7], motor disorders [8], depression [9], increased risk of cardiovascular disease [10], and even death [11]. Clearly, social isolation can have numerous adverse effects on people's health and well-being, particularly for the elderly. As China becomes one of the countries with a severe aging population, the number of elderly ovarian cancer patients is expected to surge [12], highlighting the importance and urgency of assessing and addressing social isolation among elderly ovarian cancer patients in China. According to data from the World Health Organization [13], the number of people aged 60

and over worldwide will reach 1.4 billion by 2030. In China [14], the proportion of the elderly population aged 60 and over will be 18.7%. However, most current research focuses on ordinary elderly individuals or those with chronic conditions such as elderly hemodialysis patients and liver cirrhosis patients. Ran Z et al. [15] conducted a meta-analysis using Stata 16.0, searching eight electronic databases. The results showed that the social isolation rate among the elderly is 33%; Yan Ru et al. [16] reported a social isolation rate of 45.2% among elderly hemodialysis patients; Wei Suyu et al. [17] found a social isolation rate of 54.17% among patients with decompensated liver cirrhosis. Ovarian cancer, known for its stealthy nature, often goes undetected until it is in the middle or late stages, and it is highly prone to recurrence, making it a significant cause of global morbidity and mortality [18]. Therefore, when elderly ovarian cancer patients are diagnosed, they often experience negative emotions such as fear, sadness, and anxiety, as well as feelings of shame about aging [19], leading to psychological burdens and barriers, which can result in reluctance to engage in social activities and increased social isolation. Secondly, surgery and chemotherapy remain the primary treatments for ovarian cancer [20]. However, the adverse effects of surgery, such as trauma, bone marrow suppression from chemotherapy, nausea and vomiting, and peripheral nerve damage [21-22], can lead to physical impairment in patients. Given that these patients are already elderly, their physical functions are further compromised, leading them to often stay at home and reduce outdoor activities, which in turn leads to a decrease in social interactions and a narrowing of social circles. Additionally, influenced by traditional Chinese cultural values, elderly patients with ovarian cancer are reluctant to openly discuss their physical and mental health

issues with their children to avoid burdening them; with modernization, urbanization, and economic changes, many young people move to more economically developed cities to seek better education and job opportunities, resulting in 'empty-nest elders' [23]. Due to the weakening of family support, elderly patients with ovarian cancer are more likely to experience social isolation. Considering the impact of disease, economy, society, and personal factors, we hypothesize that elderly patients with ovarian cancer may be facing significant social isolation (H1). Currently, there is a lack of research on the social isolation status of elderly patients with ovarian cancer both domestically and internationally, so it is necessary to further describe the level of social isolation among elderly patients with ovarian cancer and identify the corresponding risk factors.

Social support [24] is a multidimensional concept that encompasses individual and environmental factors. Social support enables individuals to feel part of a social network when they seek information in society. Through interactions and connections with others, individuals gain various types of social support, which helps them build positive social relationships. Social support can be categorized into three aspects: subjective social support, objective social support, and the utilization of support. Subjective social support refers to the emotional support an individual perceives or feels, such as the sense of respect, understanding, and support they receive in society. Objective social support is tangible, visible, or actual support, such as direct material assistance and the presence and participation in social networks. The utilization of social support indicates that different individuals may use it differently; some may help others even without receiving support, while others may be unwilling to lend a hand despite having received ample support. Support among people is a reciprocal process [25-26]. Previous research [27] has shown that social support is negatively correlated with social isolation. Higher levels of social support indicate greater access to resources, information, and help, reflecting higher social engagement and, consequently, lower levels of social isolation. Therefore, we hypothesize that social support can positively predict social isolation in elderly ovarian cancer patients (H2).

Sedentary behavior [28] refers to activities where, in a conscious state, the energy expenditure is below 1.5METs when sitting, leaning back, or lying down, such as using electronic devices, reading, and conversing while seated, leaning back, or lying down. Studies [29] have shown that the higher the level of sedentary behavior, the greater the risk of social isolation. According to the time hypothesis [30], an individual has limited time for activities throughout the day. If an individual spends more time sitting, their social engagement decreases. Therefore, patients with higher levels of sedentary behavior tend to experience more severe social isolation. Hence, we can hypothesize that sedentary behavior is negatively correlated with the level of social isolation among elderly ovarian cancer patients (H3).

The lack of family support and social assistance results in elderly patients having low initiative in social activities, which affects their social interactions and exacerbates social isolation[31]. Moreover, patients with lower social levels tend to experience more intense loneliness, leading to more severe sedentary behaviors such as sitting still or lying down for extended periods. This further reduces their enthusiasm for social engagement, narrows their social circles, and decreases their social frequency, making them more susceptible to social isolation[32]. Therefore, we hypothesize that low levels of social support negatively impact sedentary behaviors in elderly ovarian cancer patients (H4), and that sedentary behaviors mediate the relationship between social support and social isolation (H5).

Previous studies have primarily focused on the interrelationships between sedentary behavior, social support, and social isolation. However, there is a lack of research on the current level of social isolation among elderly ovarian cancer patients and the relationships among sedentary behavior, social support, and social isolation. This study aims to explore the level of social isolation and its influencing factors in elderly ovarian cancer patients, as well as the mediating effect of sedentary behavior between social support and social isolation. The goal is to reduce sedentary behavior, enhance social support, promote the healthy development of social networks, and decrease social isolation, thereby improving the

quality of life for elderly ovarian cancer patients.

method

### Design and Participants

This cross-sectional study adopted the convenient sampling method, and the elderly ovarian cancer patients who were treated and followed up in the First Affiliated Hospital of Zhejiang University School of Medicine from May 1, 2022 to December 31, 2024 were selected as the subjects of this study for questionnaire survey.

### Inclusion Criteria

① Pathologically diagnosed with malignant ovarian tumor; ② Completed the debulking surgery for ovarian cancer and completed the standard regimen (paclitaxel + carboplatin) chemotherapy; ③ Age between 60 and 80 years; ④ Aware of their condition and voluntarily participating in the study; ⑤ No language communication barriers. Exclusion criteria: ① Patients with other malignant tumors; ② Patients with severe underlying diseases; ③ Patients with cognitive impairment or mental disorders; ④ End-stage patients.

### Sample Size Counter

According to the sample size calculation method [33], the sample size is 5~10 times of the number of variables. This study included a total of 14 independent variables, and the sample size was calculated to be at least 88 by taking 5 times of the number of variables and considering 20% invalid questionnaires. Finally, the sample size of this study was 214 cases.

### Ethical considerations

This study has been approved by the Ethics Committee of The First Affiliated Hospital of Zhejiang University School of Medicine, with the number of ethics approval: Lun Shen 2025 Research No.0350-Fast.

### Survey tools

#### General information questionnaire

A general data questionnaire was designed according to the literature analysis. Demographic data included age, marital status, educational level, place of residence, living status, income and BMI. Disease-related data included disease course, comorbidities, multiple medications and bone marrow suppression.

#### Lubben Social Network Scale6 (LSNS-6)

The Simplified LUBBEN Social Network Scale (LSNS-6) is used to assess patients' social isolation. Developed by Lubben *et al.* [34] and adapted into Chinese by Chang *et al.* [35], the scale consists of two dimensions: family network and friend network, with six items in total. Scoring 0 to 5 points for each of the 9 items or more, with a total score ranging from 0 to 30. A total score of less than 12 indicates social isolation, with higher scores indicating lower levels of social isolation. Scoring below 6 in any single dimension is considered indicative of family or friend isolation. The Cronbach's  $\alpha$  coefficient for the scale is 0.832.

#### Social Support Rating Scale (SSRS)

The Social Support Rating Scale (SSRS) is used to assess the level of social support patients receive. The scale is divided into three dimensions: objective support, subjective support, and utilization of support, comprising 10 items. For items 1-4 and 8-10, only one option can be selected, with scores of 1, 2, 3, or 4 assigned based on the chosen options. Item 5 is scored as A, B, C, D, E, with a total score. Each item represents a range from 'none' to 'full support,' with scores ranging from 1 to 4. For items 6 and 7, 'no source' is scored as 0, while other sources are scored accordingly. A total score of 22 or less indicates low levels of support, 23 to 44 indicates moderate levels, and 45 to 66 indicates high levels. The Cronbach's  $\alpha$  coefficient for this scale is 0.896.

#### Chinese Adult Static Behavior Questionnaire:

The questionnaire, developed by Tian Tian *et al.* [36] in 2019, consists of 10 self-administered closed-ended questions designed to measure the time spent on various sedentary activities, including watching TV, using computers or the internet, reading books and magazines, sitting for chatting or phone calls, driving or riding in various modes of transportation, dining, hobbies, napping, working or studying while sitting, and other activities that involve sitting or lying down. The average daily time spent on each type of sedentary activity is calculated as (the number of days per week engaged in the activity  $\times$  the average daily time spent) / 7. The total average daily sedentary activity time is the sum of the average daily times spent on each type of

sedentary activity, excluding naps. The intra-group correlation coefficient (ICC) of the questionnaire is 0.82, indicating high reliability. This study follows previous literature [37-38], dividing the sedentary behavior time into groups based on a threshold of 5 hours per day: patients who spend 5 hours or more per day are classified as the sedentary group, and those who spend less than 5 hours per day are classified as the non-sedentary group.

### Data Compilation

This study employed a questionnaire survey, including on-site and telephone follow-ups during outpatient visits. Before the survey began, all members of the research group received unified training to ensure that patients were informed about the survey and guided through the questionnaire using clear and understandable language. The survey officially commenced after obtaining the patients' consent. For illiterate patients, the researchers assisted with completing the questionnaire without any prompting. During data processing, the researchers identified and removed questionnaires with missing items. All collected data were verified and entered into the system by two members of the research team. A total of 220 questionnaires were returned for completion, with 6 invalid questionnaires excluded, resulting in 214 valid questionnaires, achieving a recovery rate of 97.27%.

### Statistical Method

Statistical analysis was conducted using SPSS23.0 and Amos 24.0. Categorical data were presented as frequencies and percentages, while measurements that followed a normal distribution were described using mean  $\pm$  standard deviation. For measurements that did not follow a normal distribution, the median (quartiles) [M (Q1, Q3)] was used. For one-way analysis of variance with a normal distribution, t-tests or one-way ANOVA were used to compare groups. The correlation between variables was assessed using Spearman's

rank correlation. Based on the statistical results, a structural equation model was constructed, and the bootstrapping method was used to test for mediating effects. Multigroup path analysis was performed, with 5000 samples. Differences were considered statistically significant if  $P < 0.05$  or  $P < 0.01$ .

### Bear Fruit

Descriptive characteristics and comparison of social isolation in elderly patients with ovarian cancer

This study surveyed 214 elderly Chinese women with ovarian cancer, aged 60 to 80 (mean age  $67.63 \pm 5.18$  years). Among the participants, 190 were married, 1 was divorced, and 23 were widowed or divorced. They were distributed as follows: 118 lived in urban areas, and 96 in rural areas. Educational levels ranged from primary school or below for 129, secondary school or vocational school for 77, and college or higher for 8. Of these, 5 lived alone, and 209 did not. Personal monthly income ranged from less than 2000 yuan for 109, 2000 to 5000 yuan for 85, and more than 5000 yuan for 20. Body weight was categorized as low for 35, normal for 163, and overweight for 16. The duration of the disease ranged from less than 12 months for 20 cases, 12 to 24 months for 108 cases, and more than 24 months for 86 cases. Chronic diseases were present in 150 cases with fewer than 3 and 64 cases with 3 or more. Multiple medications were used in 166 cases with fewer than 4 and 48 cases with 5 or more. Bone marrow suppression was observed in 49 cases, while 165 cases had no bone marrow suppression. Univariate analysis revealed that age, educational level, place of residence, monthly income, disease duration, chronic disease history, and bone marrow suppression were significant factors affecting social isolation among elderly ovarian cancer patients ( $P < 0.05$ ), with statistically significant differences. See Table 1 for details.

**Table 1 Comparison of general data and statistical differences in social isolation of elderly ovarian cancer patients (n = 214)**

project	N (%)	social segregation	statistics	P
age				

60 to 70 years old	147 (68.7)	9.48±1.49	2.272	0.024
71 to 80 years old	67 (31.3)	8.34±1.11		
marital status				
married	190 (88.8)	9.31±2.44	2.352	0.098
unmarried	1 (0.5)	7		
Widowed / divorced	23 (10.7)	7.74±2.12		
degree of education			4.838	0.009
Primary school and below	129 (60.3)	8.74±2.17		
Secondary school and technical secondary school	77 (36)	9.43±2.53		
College degree or above	8 (3.7)	12.38±2.8		
domicile				
city	118 (55.1)	8.71±1.2	-1.968	0.045
rural area	96 (44.9)	9.64±1.5		
Living conditions				
living alone	5 (2.3)	7.2±1.09	-1.270	0.205
Not alone	209 (97.7)	9.17±1.4		
monthly income				
< 2000	109 (50.9)	8.28±1.24	11.360	0.000
2000-5000	85 (39.7)	9.58±1.11		
> 5000	20 (9.4)	11.85±1.10		
BMI index number				
Underweight	35 (16.3)	9.03±1.87	1.220	0.297
Weight is normal	163 (76.2)	9.27±1.56		
overload	16 (7.5)	7.88±1.18		
course of disease				
<December	20 (9.3)	6.4±1.66	7.357	0.001
December to April	108 (50.5)	9.4±1.27		
> 24 months	86 (40.2)	9.42±1.54		
Merge chronic disease history				
<3	150 (70.1)	9.48±1.70	2.691	0.008
More than 3	64 (29.9)	8.30±1.55		
Multiple medications				
Less than 4	166 (77.6)	9.36±1.60	1.873	0.062
More than 5	48 (22.4)	8.31±1.64		
arrest of bone marrow				
not have	165 (77.1)	9.63±1.56	-5.165	0.000
have	49 (22.9)	7.43±1.26		

### Correlation analysis of social support, sedentary behavior and social isolation scores in elderly ovarian cancer patients

In this study, the sedentary behavior duration and social support scores of elderly ovarian cancer patients did not follow a normal distribution. The average sedentary behavior duration was 6.96 (5, 10.29) hours per day, with 135 participants (63.1%) engaging in sedentary behavior for at least 5 hours per day. The total social support score ranged from 27 to 37, with subjective support ranging from 13 to 19, objective support from 8 to 9, and utilization of support from 6 to 8. Low-level social support accounted for 9.3%, medium-level for 87.9%, and high-level for 2.8%.

The total social isolation score was  $(9.13 \pm 0.87)$ , with family isolation at  $5.62 (\pm 0.64)$  and friend isolation at  $3.51 (\pm 0.19)$ . The incidence rates of social isolation, family isolation, and friend isolation were 80.4%, 75.7%, and 89.7%, respectively.

Spearman correlation analysis showed that sedentary behavior time was negatively correlated with social support score ( $r = -0.664$ ,  $P < 0.01$ ), sedentary behavior time was negatively correlated with social isolation score ( $r = -0.291$ ,  $P < 0.01$ ), and social support score was positively correlated with social isolation score ( $r = 0.578$ ,  $P < 0.01$ ). See Table 2 for details.

**Table 2 Correlation analysis of sedentary behavior, social isolation and social support dimensions in elderly ovarian cancer patients (n=214)**

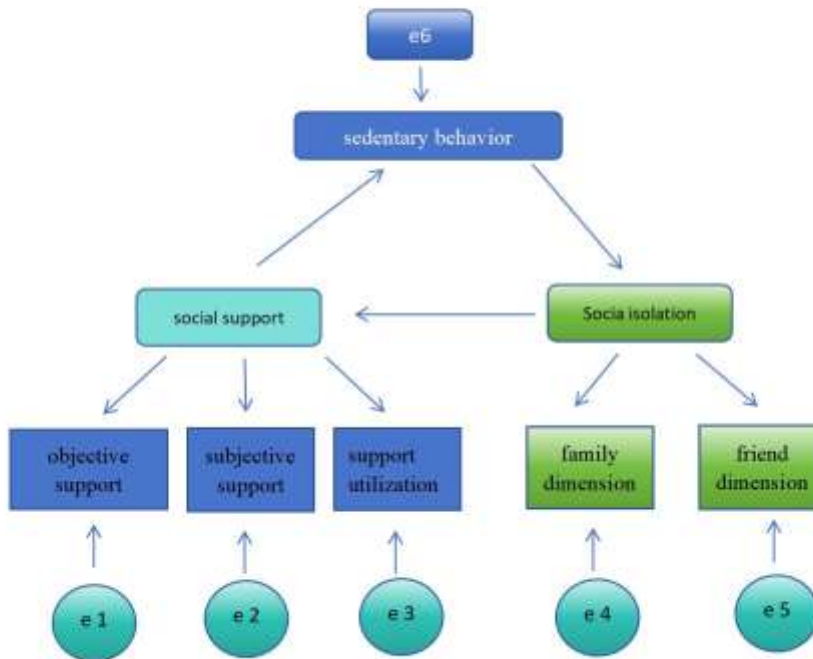
project	Family dimension	The friend dimension	Total social isolation score	Objective support	Subjective support	Support utilization	Total social support score	Time spent sitting
Family dimension	1							
The friend dimension	0.542**	1						
Total social isolation score	0.834**	0.899**	1					
Objective support	0.521**	0.518**	0.612**	1				
Subjective support	0.392**	0.452**	0.517**	0.647**	1			
Support utilization	0.256**	0.437**	0.408**	0.558**	0.619**	1		
Total social support score	0.422**	0.532**	0.578**	0.782**	0.948**	0.774**	1	
Time spent sitting	-0.129**	-0.307**	-0.291**	-0.464**	-0.652**	-0.534**	-0.664**	1

Note: \*\* $P < 0.01$

### Mediation effect analysis of sedentary behavior on social support and social isolation in elderly ovarian cancer patients

According to the theoretical model assumed in advance, the results are shown in Figure 1 through data fitting and verification.

Figure 1



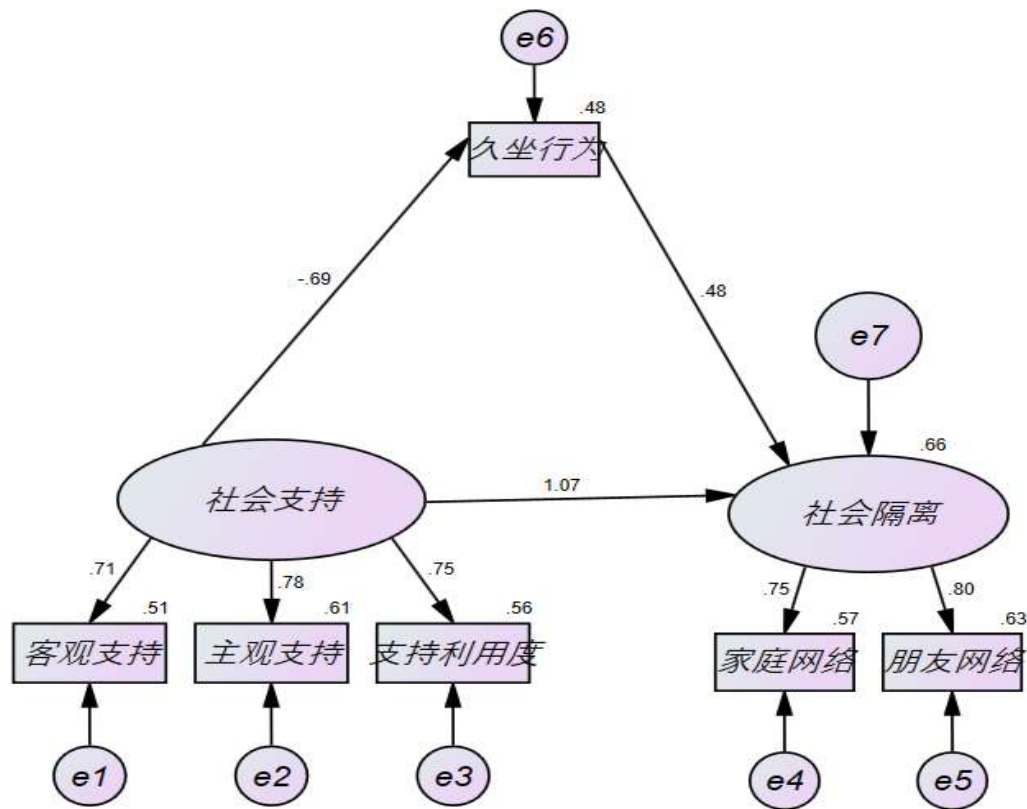
**Figure1 Mediation model of sedentary behavior in social support and social isolation**

The fitting indices of the model all reached ideal levels, indicating that the overall model fits the data well and that the hypothetical model aligns with the actual data. Table 3 shows that the mediating effect of sedentary behavior on social isolation is -0.468, accounting for 45% of the total effect. After bootstrap testing, the confidence

interval does not include 0, indicating a significant mediating effect. Additionally, the model's fit indices are:  $\chi^2/df = 3.864$ , GFI = 0.952, AGFI = 0.856, IFI = 0.946, TLI = 0.883, RMSEA = 0.035, NFI = 0.992, CFI = 0.946. The Bootstrap results for the mediating effect are shown in Table 3.

Table 3 Bootstrap results of mediation effect (n=214)

effect	Effect size	SE	95%CI	Relative effect values
gross effect	1.033	0.158	0.790~1.338	—
direct effect	1.500	0.240	1.139~1.941	145%
indigo effect	-0.468	0.133	-0.700~-0.272	-45%



**Figure 2** Mediation model of sedentary behavior in social support and social isolation

## Discussion

The current situation of social isolation of elderly ovarian cancer patients

The study found that the total social isolation score for elderly ovarian cancer patients is  $(9.13 \pm 0.87)$ , the family isolation score is  $(5.62 \pm 0.64)$ , and the friend isolation score is  $(3.51 \pm 0.19)$ . The incidence rates of social, family, and friend isolation are 80.4%, 75.7%, and 89.7%, respectively. The study indicates that the incidence of social isolation among elderly ovarian cancer patients is 80.4%, significantly higher than that of community elders (44.33%) [39] and elderly in nursing homes (51.6%) [40], thus confirming our hypothesis (H1). This could be due to the fact that all participants in this survey were women, who tend to be more sensitive and delicate compared to men, making them more prone to anxiety, which increases their psychological burden, reduces social interactions, and makes them more susceptible to social isolation [41]. Additionally, during the management of ovarian cancer, patients may reduce their social activities to avoid cross-infection, leading to a narrower social circle,

reduced frequency of social interactions, and decreased quality of social interactions. Therefore, compared to community and nursing home elders, elderly ovarian cancer patients are more likely to experience social isolation. This suggests that healthcare providers should pay attention to the social isolation of elderly ovarian cancer patients, actively assess and intervene to reduce the level of social isolation, thereby promoting the physical and mental health of these patients.

The findings of this study also indicate that the incidence of friend isolation is higher than family isolation. This may be due to the influence of traditional filial piety culture in our country, where most elderly people live with their children and have reduced contact with friends [42]. Additionally, older individuals are often frail and have difficulty traveling, making friend isolation more prevalent compared to family isolation. Therefore, the current situation of friend isolation among elderly ovarian cancer patients is a matter of concern.

Our survey results indicate that elderly ovarian cancer patients with age and more than three comorbidities are more likely to experience social

isolation. This may be due to the increased incidence of frailty and sarcopenia in older patients with multiple comorbidities, which can lead to a decline in physical strength and health [43]. This, in turn, limits their ability to perform daily activities and reduces their interaction with friends and society, hindering social engagement. Patients with lower education levels and lower monthly incomes face increased economic burdens due to their illnesses. Additionally, patients with lower education levels are less adept at expressing themselves and have fewer social resources, leading to increased psychological burdens and poor social interactions. With the rapid economic development in China, the heterogeneity in economic, social, and cultural aspects has deepened. The differences in wealth, education levels, and other internal family factors within cities have widened, leading to significant disparities in community taste, humanistic environment, related services, and community culture among different social strata. This has resulted in increasingly pronounced clustering and isolation phenomena in community spaces [44], making elderly ovarian cancer patients living in cities more prone to social isolation. Patients with shorter disease duration and bone marrow suppression are also more likely to experience social isolation. This may be because patients find it difficult to accept their diagnosis of ovarian cancer, leading to increased psychological burdens and negative emotions. Additionally, treatment can cause bone marrow suppression, making patients more fatigued and often leading them to stay at home for rest [45], thereby increasing the level of social isolation. Therefore, medical staff should develop personalized interventions to reduce the level of social isolation according to the demographic characteristics of elderly ovarian cancer patients.

Correlation analysis of social support, sedentary behavior and social isolation in elderly ovarian cancer patients

The findings of this study indicate that elderly ovarian cancer patients exhibit a correlation between social support, sedentary behavior, and social isolation (all  $P < 0.01$ ). The scores for social support are negatively correlated with sedentary behavior duration and positively correlated with social isolation scores. This suggests that patients with lower levels of social support are more likely

to engage in sedentary behavior, supporting our hypothesis (H4) and aligning with the findings of Yao Shuang *et al.* [46]. Elderly ovarian cancer patients with lower social support are more prone to social isolation, which supports our hypothesis (H2) and is consistent with the results of Yu Yong *et al.* [47]. Due to changes in family structure, disease-related distress, and other factors leading to low subjective and objective support levels, elderly ovarian cancer patients with lower social support levels also experience a decline in their initiative to utilize social support due to the erosion of their social roles. This can make them feel marginalized, useless, or unwelcome [48], leading to increased sedentary behavior at home, reduced social interaction, and a higher likelihood of social isolation.

Our research also reveals a negative correlation between sedentary behavior and social isolation scores, indicating that elderly ovarian cancer patients who prefer sedentary activities are more likely to experience social isolation. This supports our hypothesis (H3) and aligns with the findings of Gao Yu [49]. The reasons for this are twofold: first, the rapid advancement in entertainment electronics has led to an increase in elderly people preferring to lie down or sit while watching screens for entertainment; second, ovarian cancer patients not only suffer from the pain of their condition but also face physical limitations due to aging and various chronic diseases, which restrict their physical activity [50]. This leads to a reduced social circle and increased social isolation. Therefore, it is recommended that family members of elderly ovarian cancer patients use WeChat video calls, phone calls, and other forms of communication to maintain regular contact with their elderly loved ones. They should also participate in disease management together, boost the patient's confidence, and enhance social support. Additionally, a 'trinity' model involving government, community, and hospitals [51] should be adopted to establish patient disease management records, set up long-term follow-up mechanisms, screen for social isolation risk groups, and provide early intervention. By offering good social support, this approach can provide more material and emotional assistance to elderly ovarian cancer patients with low social support levels, increase positive emotional expression, and promote the expansion of social networks, thereby reducing social isolation. At the same time, healthcare providers should educate elderly ovarian cancer patients about the r

isks of prolonged sitting to raise their awareness. Healthcare providers should develop personalized exercise plans tailored to the physical and mental needs of elderly patients [52]. The government should enhance community recreational facilities and implement measures such as wearable devices that alert users to prolonged sitting [53] to reduce sedentary behavior among elderly ovarian cancer patients, promote social interaction, and reduce social isolation.

The mediating effect of sedentary behavior on social support and social isolation in elderly ovarian cancer patients

The findings of this study also indicate that social support can directly influence the occurrence of social isolation among elderly ovarian cancer patients and indirectly through the partial mediating effect of sedentary behavior. The mediating effect of sedentary behavior accounts for 45% of the total effect, which aligns with our hypothesis (H5). This suggests that sedentary behavior is an internal risk factor and a significant pathway through which social support influences social isolation. Specifically, social support can increase the sedentary behavior of elderly ovarian cancer patients, thereby increasing their risk of social isolation. The analysis reveals that in our society, family is the core of social relationships. Due to pressures from family and work, children often fail to provide adequate support to elderly ovarian cancer patients. Additionally, traditional beliefs can lead elderly patients to feel abandoned, resulting in insufficient utilization of social support. In the absence of social support, elderly patients are more likely to adopt sedentary behaviors. Furthermore, studies have found that sedentary behavior can increase levels of pro-inflammatory factors, making elderly patients feel more isolated and lonely[54], leading to a gradual decline in their willingness to socialize. Social support is closely linked to social isolation. Over time, due to insufficient social support, elderly ovarian cancer patients may lose interest and ability in social activities, ultimately leading to and exacerbating social isolation[55]. Therefore, by integrating Internet mobile platforms, we can develop smart phones [56] and animal-assisted [57] programs tailored for the elderly to enhance social support and help elderly ovarian cancer patients achieve a sense of self-worth. Additionally, organizing events such as social

gatherings and volunteer services for elderly ovarian cancer patients can boost their confidence in treatment, reduce sedentary behavior, encourage active participation in social activities, enhance self-efficacy, and build a robust social network, thereby reducing the level of social isolation among elderly ovarian cancer patients.

### **Boundedness :**

First: This study is a survey of elderly ovarian cancer patients in a hospital. It is a single-center study with a small sample size, which limits its representativeness. In the future, multi-center studies can be carried out to expand the sample size.

Second, the tools used in this study to collect data are all self-report forms, which may have certain information bias. Therefore, qualitative research can be combined to further explore the factors affecting social isolation of elderly ovarian cancer patients.

Finally, this study adopted a cross-sectional survey, while social isolation is dynamically developing. In the future, longitudinal studies can be conducted to explore the dynamic trajectory of social isolation in elderly ovarian cancer patients, so as to provide a more comprehensive reference for further adjustment of intervention strategies.

### **Brief Summary**

Older ovarian cancer patients are more likely to experience social isolation, especially those who are older, have lower education levels, live in urban areas, have lower monthly incomes, shorter disease durations, and have a history of three or more chronic diseases, as well as those with bone marrow suppression. Additionally, there is a significant correlation between social support, sedentary behavior, and social isolation. Social support can directly lead to social isolation in older ovarian cancer patients, and sedentary behavior can indirectly contribute to the development of social isolation. Therefore, healthcare providers should pay attention to the current state of social isolation among older ovarian cancer patients, comprehensively assess their physical and mental health, and use information technology to actively leverage family and social support, reduce sedentary behavior, promote social interaction, thereby reducing social isolation, improving physical and

mental health, and achieving the goal of health promotion.

### Acknowledgments

This work was supported by the Zhejiang Province Traditional Chinese Medicine Science and Technology Project (No.2025ZL378), Scientific Research Fund of Zhejiang Provincial Education Department (No.Y202455335) and Special Research Fund for Nursing Discipline Construction of The First Affiliated Hospital of Zhejiang University School of Medicine (No.2024ZYHL10).

### Declaration of Conflict of Interest

None.

### Reference Documentation :

- Huang Haitao, Chen Shuyu, Geng Xu, et al. Study on the incidence and mortality trends of ovarian cancer among Chinese women from 2005 to 2016 [J]. *Chinese Journal of General Practice*, 2022,25(8):990-994.
- Wu Lu, Ma Yan, Markia Kamalibek, et al. Advances in the treatment of recurrent ovarian cancer [J]. *Chinese Journal of Family Planning and Obstetrics*, 2023,15(9):29-34.
- Coyle CE, Dugan E. Social isolation, loneliness and health among older adults[J]. *J Aging Health*, 2012,24 (8) : 1346-1363.
- Taylor RJ, Taylor HO, Chatters LM. Social Isolation from Extended Family Members and Friends among African Americans: Findings from a National Survey[J]. *J Fam Soc Work*,2016 ,19(5):443-461. doi: 10.1080/10522158.2016.1181127. Epub 2016 May 23. PMID: 27942198; PMCID: PMC5142749.
- Wan Lipeng. The association between loneliness, social isolation and depression: a prospective study based on UK Biobank [D]. Shandong: Shandong University, 2023
- Kuang Li, Hu Hanyu, Liu Guannan, et al. Analysis of the Current Situation and Influencing Factors of Social Isolation Among Elderly People with Hearing Impairment in Communities [J]. *China Nursing Management*, 2024,24(8):1158-1163. DOI:10.3969/j.issn.1672-1756.2024.08.008.
- Zhao D, Chai S, Gao T, [7]Zhao D, Chai S, Gao T, et al. Physical Mobility, Social Isolation and Cognitive Function: Are There Really Gender Differences?[J] *Am J Geriatr Psychiatry*,2023, 31(9):726-736.
- Zhou C, Wu F. Social isolation, loneliness, and motoric cognitive risk syndrome among older adults in China: A longitudinal study[J]. *Int J Geriatr Psychiatry*,2023,38(4):e5911. DOI: 10.1002/gps.5911. PMID: 37029567.
- Zhu S, Kong X, Han F, et al. Association between social isolation and depression: Evidence from longitudinal and Mendelian randomization analyses[J]. *J Affect Disord*, 2024, 1(350):182-187
- Zheng X, Zhang K, Ma J. The Longitudinal Relationship between Frailty, Loneliness and Cardiovascular Disease: A Prospective Cohort Study [J]. *J Nutr Health Aging*,2023;27(12): 1212-1218.
- Zheng D, Rose L, Borgundvaag B,et al. Impact of an intergenerational program to improve loneliness and social isolation in older adults initiated at the time of emergency department discharge: study protocol for a three-arm randomized clinical trial[J]. *Trials*,2024,25(1):425.
- FANG E F, XIE C, SCHENKEL J A, et al. A research agenda for ageing in China in the 21st century (2nd edition): focusing on basic and translational research, long-term care, policy and social networks [J]. *Ageing Res Rev*, 2020,64:101174.
- World Health Organization. *Aging and Health*. World Health Organization.2024. <https://www.who.int>
- National Bureau of Statistics. *Seventh National Census Bulletin*. National Bureau of Statistics. 2024. <https://www.stats.gov.cn>
- Ran Z, Wei J, Yang G, [15]Ran Z, Wei J, Yang G, et al. Prevalence of social isolation in the elderly: A systematic review and meta-analysis[J]. *Geriatr Nurs*,2024 ,58:87-97. doi: 10.1016/j.gerinurse.2024.05.008. Epub 2024 May 22. PMID: 38781629.
- Yin Yanru, Zhou Hongchang, Liu Mengru, et al. A Study on the Current Situation of Social Isolation Among Elderly Patients on Maintenance Hemodialysis [J]. *Chinese Journal of Nursing*, 2023,58(7):822-829. DOI: 10.3761/j.issn.0254-1769.2023.07.008.
- Wei Suyu, Huang Cai Mei, Huang Li Zhi, et al. Investigation and Analysis of the Current Situation and Influencing Factors of Social Isolation Among Patients with Decompensated Liver Cirrhosis [J]. *Chinese*

- Journal of Clinical New Medicine, 2023,16 (5):512-516. DOI:10.3969/j.issn.1674-3806. May 19,2023.
18. Havasi A, Cainap SS, Havasi AT, Cainap C. Ovarian Cancer-Insights into Platinum Resistance and Overcoming It. *Medicina (Kaunas)*. 2023 Mar 10;59(3):544. doi: 10.3390/medicina59030544. PMID: 36984544; PMCID: PMC10057458.
  19. Sun T, Zhang SE, Yan MY, et. Association Between Self-Perceived Stigma and Quality of Life Among Urban Chinese Older Adults: The Moderating Role of Attitude Toward Own Aging and Traditionality[J]. *Front Public Health*,2022,10:767255. doi: 10.3389/fpubh.2022.767255. PMID:35223724; PMCID: PMC8873104.,
  20. Pullen RL Jr. Ovarian cancer. *Nursing*. 2024 Jun 1;54(6):17-28. doi: 10.1097/NSG.000000000000002. Epub 2024 May 17. PMID: 38757992.
  21. But Xin, Tian Yalin, Zhou Li, et al. A longitudinal study on the impact of adverse reactions during chemotherapy on the quality of life of patients with gynecological malignancies [J]. *Military Nursing*, 2024,41(8):26-30.
  22. Wu Yahui, Xu Chao, Zhu Shiqi, et al. Analysis of risk factors and predictive efficacy of bone marrow suppression in elderly patients with gastric cancer undergoing radiotherapy and chemotherapy [J]. *Chinese Journal of Health Statistics*, 2024,41(3):452-454,458.
  23. Zhang Z, Kato C, Otsuka Y. Loneliness Factors in Older People and the Influence on Attitudes Toward Informal Care: A Study of Older Chinese People in Urban Areas[J]. *J Prim Care Community Health*, 2023,14:2150-2154. DOI:10.1177/15333147231205166.
  24. War Xing Le. A Study on the Impact of Social Support on the Happiness of the Elderly [D]. *Shandong University of Finance and Economics*, 2021.DOI:10.27274/d.cnki.gsdjc.2021.001027.
  25. Lu Lijun, Chen Qingrong. Social support of the elderly in Jiangsu Province [J]. *Chinese Journal of Gerontology*, 2018,38(22):5582-5584.
  26. Xiao Shuiyuan. Theoretical basis and research application of the Social Support Rating Scale [J]. *Journal of Clinical Psychiatry*, 1994 (02): 98-100.
  27. Luo Lingping, Wei Lei, Gu Jiabin, et al. Meta-analysis of the current status and risk factors of social isolation among elderly people in Chinese communities [J]. *Chinese Journal of Modern Nursing*, 2024,30(9):1159-1166. DOI: 10.3760/cma.j.cn115682-20230712-00024.
  28. Tremblay MS, Aubert S, Barnes JD, et al. SBRN Terminology Consensus Project Participants. Sedentary Behavior Research Network (SBRN) - Terminology Consensus Project process and outcome[J]. *Int J Behav Nutr Phys Act*, 2017 ,14(1):75. doi: 10.1186/s12966-017-0525-8. PMID: 28599680; PMCID: PMC5466781.
  29. Liu Yibing, Hou Ming, Jiang Yu, et al. Analysis of the Current Situation and Influencing Factors of Social Isolation Among Patients with Peritoneal Dialysis [J]. *Chinese Journal of Practical Nursing*, 2023,39(19): 1463-1469. DOI:10.3760/cma.j.cn211501-20221031-03331.
  30. Lu Manman, Zhao Gongming, Fang Shuowen, et al. The Impact of Prolonged Sitting on Depression in Rural Elderly: A Moderated Mediation Model [J]. *Modern Preventive Medicine*, 2023,50(24):4503-4508. DOI:10.20043/j.cnki.MPM.202304270.
  31. Li Xingru and Zhang Chao. Research Progress on the Current Status and Influencing Factors of Sedentary Behavior in Stroke Patients [J]. *Nursing Journal*, 2022,37(11):106-109. DOI: 10.3870/j.issn.1001-4152.2022.11.106.
  32. Joy, Si Qi, Yang Jian. A Two-Sample Mendelian Randomization Analysis of the Causal Relationship Between Different Types of Sedentary Behaviors and Negative Emotions [J]. *Chinese Journal of Sports Medicine*, 2024,43(11):873-884. DOI:10.3969/j.issn.1000-6710.2024.11.004.
  33. Zheng Weijun, He Fan. Sample size calculation method for current situation survey [J]. *Preventive Medicine*, 2020,32(6):647-648. DOI:10.19485/j.cnki.issn2096-5087.2020.06.028.
  34. Lubben J, Blozik E, Gillmann G, [34]Lubben J, Blozik E, Gillmann G, et al. Performance of an abbreviated version of the Lubben Social Network Scale among three European community-dwelling older adult populations[J]. *Gerontologist*, 2006, 46(4):503-13.
  35. Chang Q, Sha F, Chan CH, et al. Validation of an abbreviated version of the Lubben Social Network Scale ("LSNS-6") and its

- associations with suicidality among older adults in China[J]. *PLoS One*, 2018, 13(8): e0201612.
36. Tian Tien, Gu Bowen. Development and Validation of the Chinese Adult Static Behavior Questionnaire [J]. *China Health Education*, 2019,35(6):525-529,545.
  37. Fu Zhongrong, Zhang Zhenxiang, Lin Beilei, et al. The Current Status and Influencing Factors of Sedentary Behavior in Community Stroke Patients [J]. *Chinese Journal of General Practice*, 2022,25(7):846-850. DOI:10.12114/j.issn.1007-9572.2022.00.013.
  38. Werneck AO, Oyeyemi AL, Szwarcwald CL, [38] Werneck AO, Oyeyemi AL, Szwarcwald CL, et al. Associations between TV viewing and depressive symptoms among 60,202 Brazilian adults: The Brazilian national health survey[J]. *J Affect Disord*, 2018 , 236:23-30. doi: 10.1016/j.jad.2018.04.083. Epub 2018 Apr 17. PMID: 29705400.
  39. Wang Xinxin, Zhang Chengrui, and Luan Wei . Research on Social Isolation of Elderly People in Shanghai Communities and Its Influencing Factors [J]. *Chinese Journal of Preventive Medicine*, 2023,24(11):1159-1165.
  40. Cao Kefeng, Du Fangfang, Dong Yujing. Analysis of the current situation and influencing factors of social isolation of the elderly in nursing institutions in Nanjing [J]. *China Health Industry*, 2022,19(21):199-202[40]
  41. Wang Jing, Liu Yu, Zhang Wenjuan, et al. The current situation and influencing factors of social isolation among elderly patients with type 2 diabetes [J]. *Military Nursing*, 2024,41(5): 15-18,72.
  42. Wei Zixuan. Research on the Social Isolation Status and Its Influencing Factors of Elderly Diabetic Patients [D]. Anhui: Anhui Medical University, 2023.
  43. Zhang Ruiqin, Sun Junjun, Nie Li, et al. Factors Influencing Social Isolation of Elderly People with Chronic Diseases in Rural Areas Based on the Health Ecology Model [J]. *Nursing Research*, 2025,39(7):1084-1093. DOI:10.12102/j.issn.1009-6493.2025.07.005.
  44. Feng Yunting, Gao Yuanhong. Hierarchical differentiation, location matching, and value reshaping of urban community spaces [J]. *Research on Financial Issues*, 2021(3):104-111. DOI:10.19654/j.cnki.cjwtyj.2021.03.012.
  45. Lu Yan, Lu Yun, Qin Yunxia, et al. Prediction Model Construction and Validation for Social Isolation of Patients with Cervical Cancer During Chemotherapy [J]. *Chinese Journal of Health Care Medicine*, 2025,27(1):136-140. DOI:10.3969/j.issn.1674-3245.2025.01.031.
  46. Yao Shuang, Wang Jiping, Xu Jianhua, et al. Analysis of Physical Activity and Sedentary Behavior Status and Influencing Factors in Middle-aged and Elderly Patients with Stable Coronary Heart Disease [J]. *Chinese Journal of Practical Nursing*, 2023,39(18):1402-1409. DOI:10.3760/cma.j.cn211501-20220720-022 92.
  47. Yu Yong, Ou Zhiwen, Wei Ziyu, et al. The chain mediation effect of social isolation and social support on the relationship between stigma and medication adherence in elderly patients with chronic diseases [J]. *Journal of Shaoyang University (Natural Science Edition)*, 2024,21(2):95-102. DOI:10.3969/j.issn.1672-7010.2024.02.012.
  48. Walsh K, Scharf T, Keating N. Social exclusion of older persons: a scoping review and conceptual framework[J]. *Eur J Ageing* 2016, 14(1):81-98. doi: 10.1007/s10433-016-0398-8. Erratum in: *Eur J Ageing*. 2018 Jul 26;16(1):129. doi: 10.1007/s10433-018-0483-2. PMID: 28804395; PMCID: PMC5550622.
  49. Gao Yu. The chain mediation effect of sedentary behavior and loneliness on social isolation and frailty among the elderly in nursing homes [D]. Henan University, 2024.DOI:10.27114/d.cnki.ghnau.2024.00122 0.
  50. Feng Lina, Chen Changxiang, Li Jianmin, et al. Correlation between common chronic diseases and daily activity ability of elderly people in community [J]. *Chinese Journal of Gerontology*, 2016,36(20):5132-5133.
  51. Zhang J, Sun X, Yao A. Use of home and community-based services and loneliness in older people with functional limitations: a cross-sectional study[J]. *BMC Psychiatry*, 2023, 23(1):717.
  52. Yu DS, Li PW, Lin RS, [52]Yu DS, Li PW, Lin RS, et al. Effects of non-pharmacological interventions on loneliness among community-dwelling older adults: A systematic review, network meta-analysis, and meta-regression

- [J]. *Int J Nurs Stud*, 2023 , 144:104524. doi: 10.1016/j.ijnurstu.2023.104524. Epub 2023 May 19. PMID: 37295285.
53. Belcher BR, Kang DW, Yunker AG, [53]Belcher BR, Kang DW, Yunker AG, et al. Interventions to Reduce Sedentary Behavior in Cancer Patients and Survivors: a Systematic Review[J]. *Curr Oncol Rep*,2022 ,24(11):1593-1605. doi: 10.1007/s11912-022-01313-0. Epub 2022 Jul 13. PMID: 35829982.
54. You Y, Chen Y, Fang W, [54]You Y, Chen Y, Fang W, et al. The association between sedentary behavior, exercise, and sleep disturbance: A mediation analysis of inflammatory biomarkers[J]. *Front Immunol* 2023;13:1080782. doi:10.3389/fimmu. 2022. 1080782. PMID: 36713451; PMCID: PMC9 880546.
55. Zhang Yan, Liu Fang, Xu Rui, et al. The relationship between social isolation, depression, and frailty among the elderly in nursing homes [J]. *Nursing Research*, 2022, 36(09):1543-1546.
56. Morikawa M, Lee S, Makino K, [56]Morikawa M, Lee S, Makino K, et al. Association of social isolation and smartphone use on cognitive functions[J]. *Arch Gerontol Geriatr*, 2022 , 101:104706. doi: 10.1016/j. archger.2022.104706. Epub 2022 Apr 15. PMID: 35490476; PMCID: PMC939 9736.
57. Yan Yi, Wu Dongmei, Ye Zixiang, et al. A Systematic Review of the Application of Animal-Assisted Interventions in Elderly Depressed Populations [J]. *Sichuan Mental Health*, 2024,37(04):386-390.