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RESEARCH

Quality of life and death anxiety among caregivers of patients with advanced cancer: the mediating effect of trait anxious personality and the moderating effect of social support

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Abstract

Purpose To explore the mediating role of trait anxious personality in the association between quality of life (QoL) and death anxiety (DA), as well as to test the moderating effect of social support in the mediation model.

Methods The Death Anxiety Scale, Quality of Life Scale, State-Trait Anxiety Scale, and Social Support Rating Scale were used to measure 588 family caregivers of advanced cancer patients. We then constructed a moderated mediation model.

Results The presence of QoL was negatively associated with DA ($\beta = -0.67$, $p < 0.01$). Trait anxious personality partially mediated the relationship between QoL and DA (indirect effect $\beta = -0.08$, $p < 0.01$). Social support moderated both the antecedent and subsequent segments of the mediating paths of "QoL → trait anxious personality → DA" and the direct relationship between QoL and DA. Among caregivers with a low level of social support, the mediating effect coefficient of trait anxious personality was higher at 0.25 (95% confidence interval (CI): 0.059–0.182), in contrast to caregivers with a high level of social support, where the mediating effect coefficient of trait anxious personality was 0.11 (95% CI: 0.029–0.072).

Conclusion QoL is directly associated with an increased risk of DA and indirectly related to DA by increasing the risk of trait anxious personality among caregivers. Social support can moderate the mediating effect of trait anxious personality and the relationship between QoL and DA. The intervention strategy for preventing DA among caregivers who have encountered QoL reduction should focus on reducing trait anxious personality and social support.

Keywords Caregivers · Death anxiety · Quality of life · Trait anxious personality · Social support · Moderated mediation model

Background

In 2020, the number of new cancer cases worldwide was 19.29 million, and cancer was responsible for 9.96 million deaths [1]. The global cancer burden is expected to be 28.4 million cases in 2040, an increase of 47% from 2020 [1]. Caregivers of advanced cancer patients provide direct needs to the patients and witness many clinical symptoms, diagnostic and treatment measures, and the terminal states of the patients [2]. Long-term exposure to death-threatening environments can trigger thoughts and anxiety about death [3]. A study [4] found that being exposed to frequent death reminders was associated with higher death anxiety in caregivers than in cancer patients. The diagnosis process of cancer is a reminder of death with a strong signal. Caregivers feel the threat of death and have a psychological and emotional state of fear; this state is death anxiety (DA) [5, 6]. Some studies [7–9] believed that caregivers have a high level of DA. In China, due to the differences in terms of socio-economic culture and lifestyle, there are few research on DA.

Researches [10, 11] showed that caregivers experience reduced quality of life (QoL) while caring for patients with advanced cancer, resulting in increased DA. DA among family caregivers of advanced cancer patients reduces the quality of

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care and leads to reduced communication on end-of-life care[[12, 13] and medical decision making [14] between caregivers and advanced cancer patients. Therefore, it is crucial to explore the impact of the QoL on DA among caregivers of advanced cancer patients.

Previous studies [15, 16] have reported that caregivers of advanced cancer patients who showed trait anxious personality have severe DA. According to the trait anxiety theoretical model [17], when individuals are stimulated by internal or external negative events (such as major diseases, natural disasters, and traffic accidents), high levels of trait anxious personality will lead to more state anxiety, such as DA. Some studies [18, 19] believed that the trait anxious personality may increase the level of DA of caregivers. A study [20] found that QoL can increase the DA risk in caregivers of patients with advanced cancer, and trait anxious personality is the most critical mediator.

As a negative psychological state, the trait anxious personality has been reported to be improved by external interventions such as social support [21]. Some studies have shown [22, 23] that individuals with high levels of social support can better adjust themselves and actively resist negative impacts when their QoL declines. The stress process theory [24] suggested that the "stressor" was the reason for the decline in the QoL of caregivers, and then caregivers might develop stress responses such as DA. Therefore, social support is essential for caregivers to cope with stress. However, there is insufficient evidence regarding the mediating effect of trait anxious personality and the moderating effect of social support between QoL and DA.

When considering the relationship between QoL and DA within the context of intervention strategies, it is necessary to comprehend the mechanism by which trait anxious personality mediates this association, as well as the moderating effect of social support under the same framework. At present, there is little research in this area. On the other hand, limited attention has been given to DA among caregivers of patients with advanced cancer, with an even lesser understanding of the roles played by trait anxious personality and social support in linking QoL to DA.

Methods

Study participants

A cross-sectional survey was conducted on caregivers of end-of-life cancer patients diagnosed in the inpatient department of Yat-sen University Cancer Center from August 2022 to November 2022. Using random cluster sampling, all caregivers of breast cancer, liver cancer, bladder cancer, brain tumor, stomach cancer, and lung cancer were included to participate in the self-administered questionnaire survey. The inclusion criteria for caregivers were (1) age ≥ 18 years old, (2) demonstrated an understanding of the research procedures and possessed the ability to read and communicate in Chinese, (3) caregivers provided care for at least 6 months, and (4) no major illness and history of mental illness. The inclusion of cancer patients were (5) age ≥ 18 years old and (6) patients were diagnosed as an inpatient with grade III–IV malignancy (WHO2021). The exclusion criteria for caregivers were (1) cognitive impairment and inability to communicate normally and (2) workers who volunteers or are hired to take care of late stage cancer patients, who do not belong to the patient's family measures. Strict quality control was implemented during the survey, including participants filling out the questionnaire independently, the neutral explanation of the questionnaire, and the timely examination after the questionnaires were collected.

General information questionnaire

Characteristics of participants included age, gender, education, monthly income, degree of relationship, marital status, basic illness(for example: hypertension, diabetes, and cardiopathy), religious beliefs, and length of care. Patients' characteristics included age, gender, treatment, daily activity level, recurrence of cancer, and physical symptoms.

Templer's death anxiety scale

In 1970, American psychologist Templer [25] developed and published the DA Scale with 15 items. The 3-week test–retest reliability of the English original version was 0.83, and the internal consistency coefficient KR20 was 0.76. Scholars from many countries have used this scale to measure the DA levels of patients and their caregivers. It has high reliability and validity and has been used as the gold standard for detecting DA [26].

Yang [27] introduced this scale to China in 2012. The Chinese version of the scale includes four dimensions: stress and pain, emotion, cognition, and time. Nine items are positively scored, and six items (items 2, 3, 5, 6, 7, and 16) are reverse scored. The total score ranges from 0 to15. The cutoff point is 7, with scores above 7 indicating DA. Higher scores suggest more DA. Cronbach's α of the scale in this study was 0.71, and the test–retest reliability was 0.831.

Quality of life scale

The World Health Organization on Quality of Life Brief Scale (WHOQOL-BREF) is a simplified scale based on

WHOQOL-100 [28]. It includes 26 items and can be divided into four dimensions: physical health, mental health, social relationships, and social environment. Items 3, 4, and 26 are reverse scored. The higher the score, the better the QoL. Cronbach's α of the scale in this study is 0.90, and the test–retest reliability is 0.86 [29].

Social support revalued scale

The Social Support Revalued Scale (SSRS) was compiled by Xiao [30] in 1986 and contains 10 items. The scale was divided into three dimensions: subjective support (items 1, 2, 3, and 5), objective support (items 6, 7, and 10), and social support (items 4, 8, and 9). The total score ranges from 12 to 66. The cutoff point is 22, with scores above indicating social support. Higher scores suggest more social support. Cronbach's α of the overall scale is 0.80 [31].

Trait-state anxiety inventory

Spielberger [32] compiled the State-Trait Anxiety Scale in 1970. The Chinese version of the State-Trait Anxiety Inventory (STAI) was developed in 1980. STAI has two subscales: state anxiety subscale (S-AI) and trait anxiety subscale (T-AI). This article only quotes the trait anxiety subscale. The total score ranges from 0 to 54. The cutoff point is 40, with scores above indicating trait anxious personality. Higher scores suggest more trait anxious personality. The scale had an internal consistency reliability of 0.90 and a test–retest reliability of 0.86 [32].

Data analysis

Descriptive analysis was used to describe the sociodemographic characteristics and study variables, and t test and chi-square test were used to compare the distribution of DA with SPSS 26.0 (IBM Corp, Armonk NY, USA). Pearson correlation analysis was used to verify the correlation between caregivers' social support (regulatory factor) and their DA (dependent variable), QoL (independent variable), and trait anxious personality (intermediate variable). The moderating effect of trait anxious personality and social support on the mediation model between QoL and DA was investigated using model 4 of PROCESS macro version 4.1 (Ohio State University, Hayes, USA) [33]. Finally, bootstrapping method was performed to verify the statistical significance of the mediating effect.

Results

A total of 678 caregivers in the study and 588 caregivers without missing critical research variables were included in this survey, with an effective rate of 93.0%. In total, 297 were female (50.5%) and 291 were male (49.5%). Most were married (490, 83.3%), and aged between 18 and 78 years old, with an average age of 42.48 ± 12.26 years.

This study showed a high DA score among caregivers of advanced cancer patients was 7.92 ± 2.68. The QoL was not optimistic, with scores in the physiological domain, psychological domain, social domain, environmental domain, and subjective QoL of 51.63 ± 11.86, 56.67 ± 13.78, 51.58 ± 17.39, 51.68 ± 13.62, and 63.76 ± 14.10, respectively. The QoL among caregivers of patients with advanced cancer was poor after combining the four domains and subjective QoL. The trait anxiety personality was 64.10 ± 12.94, which indicates mild trait anxiety. The social support was 36.12 ± 2.68, indicating a medium level of social support. Tables 1 and 2 showed that there were differences in DA between length of care, caregiver's gender, religious beliefs, and patient's daily activity level, somatic symptoms, and treatment.

Table 3 provided the significant correlation between QoL, trait anxious personality, social support, and DA. DA exhibited a significant negative correlation between social support and QoL but was positively related to anxious personality. Trait anxious personality showed a significant correlation between social support and QoL. QoL was positively associated with social support.

The results of mediation analysis showed that the total effect of QoL on DA was statistically significant ($\beta = -0.25$, $p < 0.001$). Significant effect coefficient of direct pathway (QoL → trait anxiety personality: $\beta = -0.43$, $p < 0.001$; trait anxiety personality → DA: $\beta = 0.22$, $p < 0.001$) and indirect pathway (QoL → trait anxiety personality → DA: $\beta = -0.08$, $p < 0.001$) indicated that trait anxiety personality mediated the relationship between QoL and DA. The direct influence coefficient of QoL on DA ($\beta = -0.17$, $p < 0.001$) also had a statistical significance, indicating that trait anxiety personality played a partially mediating role in the relationship between QoL and DA, and the ratio of the mediating effect to the total effect was 31.11% (Table 4).

Figure 1 showed the moderated mediation model results. The social support had significant effects on three regression paths (QoL → trait anxiety personality: ($\beta = -0.34$, $p < 0.001$); QoL → DA: ($\beta = -0.15$, $p < 0.001$); trait anxiety personality → DA: ($\beta = 0.18$, $p < 0.001$)). In other words, social support significantly moderated the

Table 1 Study caregivers characteristics ($N=588$)

Characteristics	Group	*n* (%)	Mean	*SD*	*p*
Gender	Male	291 (49.5)	7.20	2.85	0.008**
	Female	297 (50.5)	8.64	2.29	
Education	Primary school	38 (6.5)	8.34	2.69	0.721
	Junior high school	171 (29.1)	7.99	2.50	
	High school or technical Secondary school	167 (28.4)	7.85	2.76	
	College degree or above	212 (36.1)	7.65	2.75	
Monthly income (yuan)	< 5000	194 (33.0)	7.78	2.54	0.465
	5000–10,000	187 (31.8)	8.11	2.85	
	> 10,000	207 (35.2)	7.89	2.64	
Degree of relationship	Spouse	231 (39.3)	8.26	2.76	0.070
	Child	215 (36.6)	7.85	2.73	
	Brothers and sisters	75 (12.8)	7.43	2.41	
	Other relatives	40 (6.8)	7.15	2.49	
	Friends	3 (0.5)	8.67	1.53	
	Parents	24 (4.1)	8.08	2.22	
Age (years)	18–29	98 (16.7)	8.05	2.58	0.826
	30–45	255 (43.4)	7.99	2.74	
	46–60	189 (32.1)	7.81	2.72	
	≥ 61	46 (7.8)	7.74	2.37	
Marital status	Unmarried	88 (15.0)	7.39	2.81	0.091
	Married	490 (83.3)	8.01	2.66	
	Divorced	6 (1.0)	7.17	1.94	
	Widowed	4 (0.7)	9.75	0.50	
Length of care (months)	≤ 12	191 (32.5)	6.57	2.56	0.006**
	12–24	143 (24.3)	7.17	2.82	
	25–36	153 (26.0)	9.25	1.92	
	≥ 37	101 (17.2)	9.53	1.76	
Basic illness	None	559 (95.1)	7.94	2.68	0.443
	Have	29 (4.9)	7.55	2.71	
Religious beliefs	None	407 (69.2)	8.91	2.01	0.009**
	Have	181 (30.8)	5.70	2.65	

SD standard deviation

**$p < 0.01$

three associations of "QoL → trait anxiety personality," "QoL → DA," and "trait anxiety personality → DA."

Table 5 showed further analysis results of the moderated mediation model. The indirect and direct effects of QoL on DA at low level (mean-SD), moderate level (mean), and high level (mean + SD) of social support were examined. The results found that the indirect effects of "QoL → trait anxiety personality → DA" were statistically significant at all three levels of social support. When the level of social support increased from low to high, the indirect effect coefficients of QoL on DA changed from 0.25 to 0.11, showing a statistically downward trend.

Figure 2 showed the conditional effects of "QoL → trait anxiety personality," "QoL → DA," and "trait anxiety personality → DA." The three conditional effects decrease with increasing social support, and all 95% CI do not include 0. These results indicated that regardless of the level of social support, social support could moderate the associations of "QoL → trait anxiety personality," "QoL → DA," and "trait anxiety personality → DA."

Discussion

Our study explored the moderated mediating effects of trait anxious personality and social support on the relationship between QoL and DA among caregivers of patients with advanced cancer. Our results showed that QoL was negatively correlated with DA among caregivers; trait anxiety personality mediated the association between QoL and DA.

Table 2 Study patients' disease-specific characteristics ($N = 588$)

Characteristics	Group	*n* (%)	Mean	*SD*	*p*
Gender	Male	295 (50.2)	8.07	2.52	0.180
	Female	293 (49.8)	7.77	2.82	
Age (years)	18–29	36 (6.1)	8.14	2.62	0.182
	30–45	178 (30.3)	8.10	2.81	
	46–60	220 (37.4)	8.03	2.66	
	61–75	154 (26.2)	7.52	2.54	
Daily activity level	Complete self-care	127 (21.6)	5.71	2.78	0.007**
	Mild dependence	166 (28.2)	6.83	2.11	
	Moderate dependence	232 (39.5)	9.61	1.79	
	Heavy dependence	63 (10.7)	9.05	1.76	
Recurrence of cancer	Have	345 (58.7)	7.66	1.70	0.156
Physical symptoms	None	243 (41.3)	7.29	2.79	
	Have	359 (61.1)	9.33	1.67	0.006**
Receive treatment	None	229 (38.9)	5.71	2.45	
	Have	436 (74.1)	7.61	2.65	0.008**
	None	152 (25.9)	8.82	2.55	

SD standard deviation

**$p < 0.01$

Table 3 The partial correlations among DA, QoL, trait anxious personality, and social support

	Death anxiety	Quality of life	Trait anxious personality	Social support
Death anxiety	1			
Quality of life	−0.666**	1		
Trait anxious personality	0.622**	−0.55**	1	
Social support	−0.672**	0.595**	−0.58**	1

Adjusted for patients' daily activity level, somatic symptoms, treatment, caregivers' gender, religious beliefs, and length of care

*$p < 0.05$; **$p < 0.01$

Table 4 Standardized direct effect, indirect effect, and the total effect of the mediation model

	Model pathways	Effect	LLCI	ULCI	Proportion
Direct effect	Quality of life → Trait anxious personality**	−0.43	0.407	0.496	
	Trait anxious personality → Death anxiety**	0.22	0.289	0.371	
	Quality of life → Death anxiety**	−0.17	0.155	0.178	68.89%
Indirect effect	Quality of life → Trait anxious personality → Death anxiety**	−0.08	0.102	0.152	31.11%
Total effect	Quality of life → Death anxiety**	−0.25	0.311	0.389	
$R^2 = 0.125$ $p < 0.01$					

Adjusted for patients' daily activity level, somatic symptoms, treatment, caregivers' gender, religious beliefs, and length of care

LLCI lower levels for the confidence interval, *ULCI* upper levels for the confidence interval

**$p < 0.001$

Social support played a moderating role in the above relationships. A high level of social support could weaken the direct association between QoL and DA, especially reducing the mediating effect of trait anxiety personality.

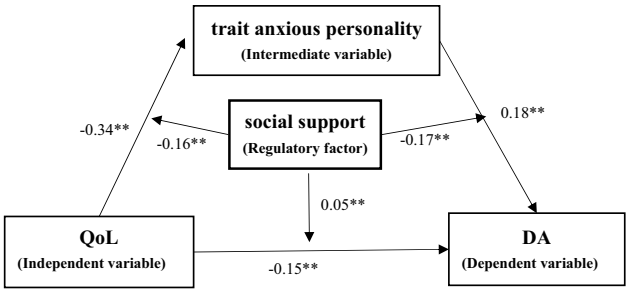

Fig. 1 The moderated mediation model of trait anxious personality and social support on the relationship between QoL and DA among caregivers of patients with advanced cancer. Note: (1) Adjusted for patients' daily activity level, somatic symptoms, treatment, caregivers' gender, religious beliefs, and length of care. (2) QoL quality of life. (3) DA death anxiety. (4) $^{**}p < 0.01$

Table 5 Conditional indirect effects of QoL on DA at different levels of social support

Social support level	Effect	BootSE	*p*	BootLLCI	BootULCI
M − 1*SD*	0.25	0.033	0.031	0.059	0.182
M	0.19	0.025	0.000	0.018	0.112
M + 1*SD*	0.11	0.032	0.026	0.029	0.072

Adjusted for patients' daily activity level, somatic symptoms, treatment, caregivers' gender, religious beliefs, and length of care

LLCI lower levels for the confidence interval, *ULCI* upper levels for the confidence interval

$^{**}p < 0.001$

The level of DA among caregivers of patients with advanced cancer was high. Overall, 428 (76.3%) participants had high levels of DA (≥ 7 points). The results were identical to previous studies [7–9], suggesting that DA among caregivers of patients with advanced cancer cannot be ignored.

Our study found that QoL was negatively correlated with DA among caregivers of patients with advanced cancer; the results were identical to previous studies [9, 10, 34]. Due to the long care time, fear of the patient's disease progression, heavy financial burden, and patient's physical symptoms (such as pain and vomiting) reduce the caregiver's QoL and increase DA [9–11, 34, 35]. It is proposed that understanding the action mechanism of QoL and DA may be beneficial in developing interventions to reduce DA among caregivers.

The study showed that trait anxious personality partially mediated the association between QoL and DA among caregivers of patients with advanced cancer. According to the trait anxiety theoretical model [17], when individuals are stimulated by internal and external negative events (such as major diseases, natural disasters, and traffic accidents), high levels of trait anxious personality may lead to more DA. The results were identical to this theory and previous studies, indicating that trait anxious personality is an important factor in inducing DA among caregivers of patients with advanced cancer [17, 20]. In addition, the study showed that caregivers who had encountered QoL reduction were more inclined to have trait anxious personality. Trait anxious personality, acting as a mediating factor, mediated the relationship between QoL and DA. Our study identified that trait anxious personality may serve as one of the internal mechanisms explaining the heightened risk of DA among caregivers who have experienced QoL reduction.

Our results found that social support could moderate the mediating effect of trait anxious personality between QoL and DA, as well as the direct pathway from QoL to DA among caregivers. As the level of social support increased, the mediating effect of trait anxious personality and the direct effect of QoL on DA gradually weakened. According to the cognitive theory of Beck [36], stressors (such as QoL reduction) result in negative attitudes in the form of cognitive errors and dysfunction, leading to psychological distress, trait anxious personality, and DA. Multiple studies [24, 38, 39] have shown that social support can buffer psychological distress, trait anxious personality, and DA. According to the buffer model theory of social support [24], support from multiple sources (relatives, friends, neighbors, work partners, medical workers, and even strangers) can provide individuals with spiritual, emotional, and material care. This support helps the individual cope with stress and recover from fear of death [37–39]. Our results further found that social support moderated the relationship between trait anxious personality and DA. High levels of social support have a positive impact on trait anxiety personality, providing caregivers with confidence to overcome financial stress, care burden, and fear, and reduce psychological distress and DA. However, these correlations do not prove causal relationships. Thus, further research is warranted.

"It is important for future research to explore the mechanism between QoL and DA among caregivers of patients with advanced cancer. Medical staff should take into account death education [40, 41], mindfulness-based intervention [42] (such as meditation and laughter yoga), rational emotive hospice care therapy [4, 43], and spirituality support [44] as the main strategies to help caregivers find their meaning in life and improve their trait anxious personality and QoL to better deal with impending death. Society could introduce death education courses, integrating topics such as psychological relief knowledge, coping skills of death, help line, and how to ask for help into the curriculum [37–39]. By conducting psychographic painting therapy and creating support groups for caregivers, caregivers who have similar experiences can communicate with others, sharing anticancer experience and treatment mode, and help patients relieve pain and cope with death. Mental health service providers should conduct screening for DA among caregivers and give more psychological support.

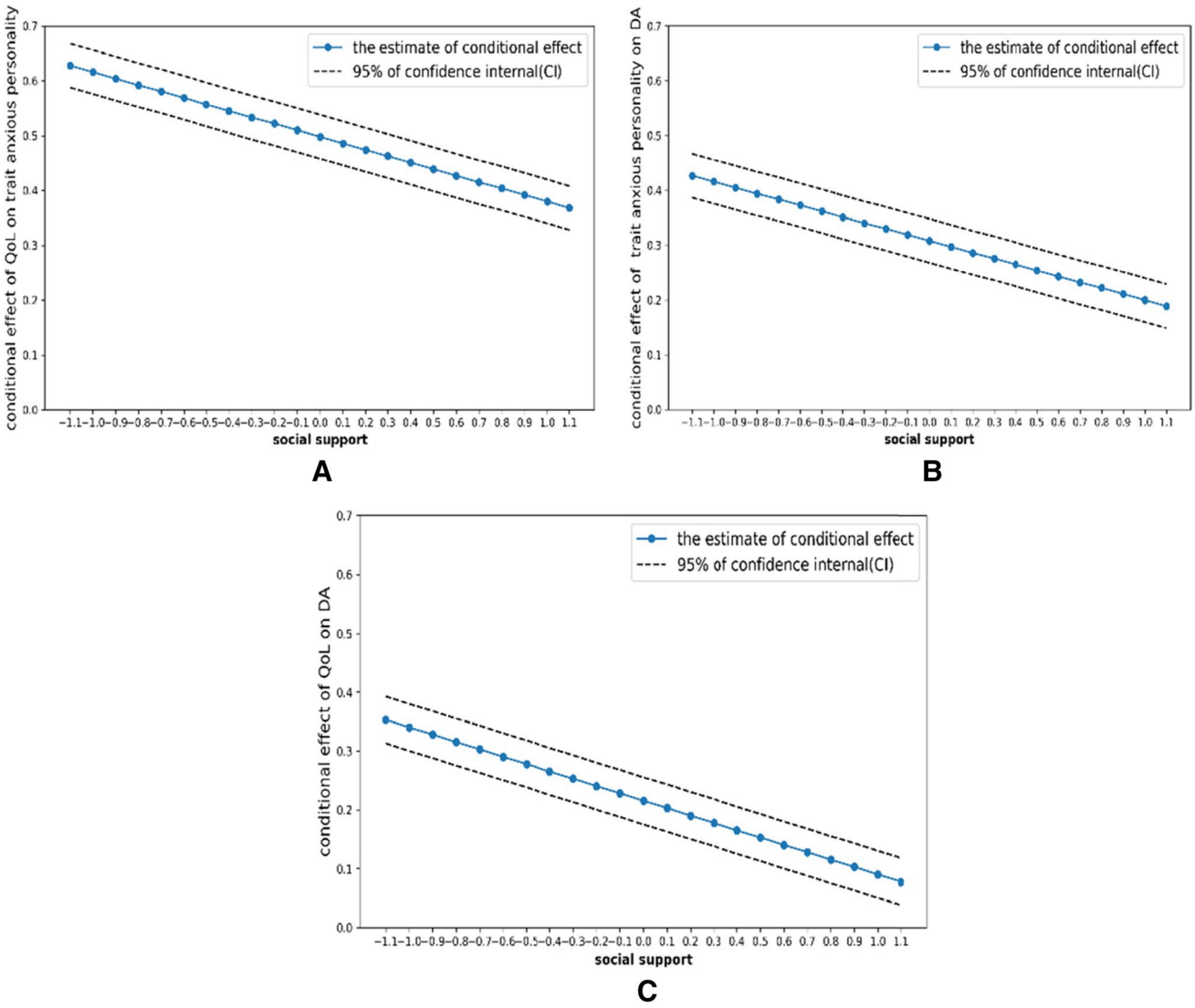

Fig. 2 The conditional effect and 95% of confidence internal (CL) of the moderated mediation model. Note: (1) Adjusted for patients' daily activity level, somatic symptoms, treatment, caregivers' gender, religious beliefs, and length of care. (2) Social support was standardized. (3) QoL quality of life. (4) DA death anxiety. (**A**) The conditional effects of QoL on trait anxiety personality decrease with increasing social support, and all 95% CI do not include 0. (**B**) The conditional effects of trait anxiety personality on DA decrease with increasing social support, and all 95% CI do not include 0. (**C**) The conditional effects of QoL on DA decrease with increasing social support, and all 95% CI do not include 0.

Limitation

The present study had several limitations. First, the participants were recruited from one cancer center; sample representation had certain limitations. We should collect samples in different regions and hospitals of different levels in future research directions. Second, our study only investigated the DA of caregivers at a certain point in time and did not reflect the dynamic change of DA. The causal relationships among trait anxiety personality, social support, QoL, and DA were still not well demonstrated. A longitudinal study is necessary to explore the changing trajectory of caregivers' DA. Finally, our study solely employs a quantitative research approach; qualitative research should be integrated for further research in this area.

Conclusion

QoL is negatively associated with DA, and this association is partially mediated by trait anxious personality. As the level of social support increased, the mediating effect of trait anxious personality and the direct effect of QoL on DA gradually weakened. Our study provides a basis for future

psychological workers to systematically assess and intervene in caregivers' DA. It is vital to improve the level of social support, improve the QoL and care, and reduce the trait anxious personality and DA of caregivers.

Author contribution Z. Zhou and Y. Li contributed to the study conception and design. Material preparation, data collection and analysis were performed by Y. Duan, Q. Zhao, and Y. Li. The first draft of the manuscript was written by Y. Li. Z. Zhou and Q. Zhao commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Data availability The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval The study was approved by the Medical Ethics Committee of Sun Yat-sen University Cancer Center, Guang Zhou, China (No:SL-B2022-416–02). We certify that the study was performed in accordance with the 1964 Declaration of Helsinki and later amendments.

This study strictly follows the principle of informed consent of research subjects, explains the purpose, significance, benefits, and risks of the study in detail to the subjects, and informs about the principle of voluntariness and confidentiality. The study is conducted after subject consent is obtained and informed consent is signed.

Competing interests The authors declare no competing interests.

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