BMC Palliative Care

RESEARCH

Open Access

Relationships between health personality and death anxiety: mediating role of death coping self-efficacy among Chinese clinical medical freshmen

Junping Zhong[1,2†], Xiao Li[1†], Yiming Zhou[1,3†], Huohuo Dai[4,5], Deling Zhang[6], Huili Chen[7], Tianya Wang[1], Enming Zhang[8], Zhijie Zou[1*], Qiuxiang Chen[3*] and Qing Zhang[1*]

Abstract

Background Death anxiety in physicians is considered to be a possible factor affecting the quality of palliative care. As the reserve force of future medical careers, the level of death anxiety among clinical medical freshmen and its impact mechanism deserves attention. Previous studies have indicated that personality traits and self-efficacy may be factors influencing death anxiety. However, there is limited research on the current state of death anxiety among clinical medical freshmen, and the impact of health personality, death coping self-efficacy on death anxiety. The objectives of this study were to investigate the death anxiety levels of clinical medical freshmen, explore whether death anxiety is affected by health personality and death coping self-efficacy, and examine whether death coping self-efficacy mediates the association between health personality and death anxiety among clinical freshmen.

Methods A cross-sectional survey among 378 clinical medical freshmen was conducted at a university in Wuhan, Hubei Province, China between June and July 2023. Demographic questionnaire, the Chinese versions of the Health Personality Assessment (HPA), Death Coping Self-efficacy Scale (DCSS) and Death Anxiety Scale (DCS) were used. SPSS 25.0 statistical software was used for descriptive analysis, independent sample *t-tests*, one-way ANOVA, and Pearson correlation analysis. The mediating effect analysis was performed with PROCESS version 4.1 Model.

Results A total of 360 valid questionnaires were collected. Clinical medical freshmen exhibited high levels of death anxiety was (45.55 ± 7.57). Health neuroticism has a significant positive impact on death anxiety ($\beta = 0.407$, $t = 2.323$, $P < 0.05$). In contrast, death anxiety was significantly impacted negatively by death coping self-efficacy (β=-0.105,

†Junping Zhong, Xiao Li and Yiming Zhou are co-first authors.

*Correspondence:
Zhijie Zou
zouzhijie@whu.edu.cn
Qiuxiang Chen
1395732884@qq.com
Qing Zhang
whzhqing@163.com

Full list of author information is available at the end of the article

t=-3.441, $P < 0.05$). The association between health neuroticism and death anxiety was partially mediated by death coping self-efficacy; the mediating impact accounted for 18.44% of the total effect, with a 0.092 coefficient.

Conclusions This study revealed that clinical medical freshmen had high levels of death anxiety. Health neuroticism and death coping self-efficacy directly affected clinical medical freshmen' death anxiety. Death coping self-efficacy mediated the relationship between health neuroticism and death anxiety among clinical medical freshmen. Interventions by medical educators that focus on both individuals' health personality and death coping self-efficacy may be most effective in reducing death anxiety among clinical medical freshmen.

Keywords Health personality, Death anxiety, Death fear, Coping, Self-efficacy, Clinical medical freshmen, China

Introduction

A recent World Health Organization (WHO) report in 2021 stated that the global demand for palliative care was projected to be more than 56.8 million people per year, which will continue to grow due to the increasing aging of the population. Doctors, who are one of the most important providers of palliative care, are responsible for delivering expert assistance to patients suffering from terminal patients and their respective families. A sizable percentage (68%) of medical professionals working in palliative care reported having moderate to severe degrees of death anxiety [1]. Research has shown that doctors' high death anxiety reduces communication with patients and is detrimental to the quality of death [2, 3]. As future doctors, the level of death anxiety among clinical medical freshmen deserves attention.

Death anxiety is used to describe an emotional state of unease, worry, or terror brought on by the danger of death when the inevitable nature of death is recalled [4]. It found that around the age of 20, human death anxiety peaks and then significantly declines, and college students are just at this stage [5]. Evidence from a systematic evaluation suggested that medical students had high levels of death anxiety [6]. Female medical students reported higher death anxiety than male students [7]. The results also found that those who discussed death in the family more openly showed lower personal anxiety [8]. According to Wolf et al. [9], junior medical students experienced higher levels of death anxiety than senior students (fourth year). These studies emphasized the death anxiety among undergraduate medical students. Regrettably, death anxiety among clinical medical freshmen has been overlooked in the present literature.

In the research that has been conducted, it has been determined that a concept known as personality traits is associated with death anxiety, serving as an intrinsic factor influencing an individual's susceptibility to death anxiety. Researchers have developed a concept called "health personality" that encompasses personality in significant health domains, drawing on the Big Five personality model [10]. Health personality refers to an individual's attitude, personality, and emotional responses to their own health and health-related issues [10], which comprises health neuroticism, health extroversion, health openness, health agreeableness, and health conscientiousness. Health neuroticism refers to anxiety or stress related to healthcare. Health extroversion is defined as the willingness to discuss health issues with close family or friends. Health openness features an individual's acceptance of changing health routines. Health agreeableness was related to trust in physicians to provide optimal health care. Health conscientiousness is defined as self-discipline in health practices [10, 11]. A new perspective on personality is presented by health personality, which incorporates health outcomes [12]. Studies have shown that health personality is significantly associated with self-reports of health, and mental health [13], and death anxiety is theoretically and empirically related to mental health [14]. However, studies investigating the relationship between health personality and death anxiety are lacking. The hypothesis is thus proposed that health personality will have effect on death anxiety among clinical medical freshmen.

Social cognitive theory posits that self-efficacy, as an important mediator between cognition and behavior [15–17], has been proven to be a key protective attribute to death anxiety [18, 19]. Death coping self-efficacy was defined as the competencies and skills that people employ to cope with their own or others' deaths, as well as their attitudes and beliefs about these competencies, including the ability to cope with loss and death, familiarity with grief and support systems, death-ready behaviors, and the bravery to talk about and face death [20]. Previous research has found a strong link between self-efficacy and death anxiety. Hoelterhoff et al. [19] surveyed 109 undergraduate college students and found that self-efficacy acted as a mediator between post-traumatic stress disorder and death anxiety. Researchers from China explored the relationship between death self-efficacy, coping with death, and death anxiety, and found that discovered that a major and favorable predictor of coping with death was death self-efficacy, and death anxiety and death self-efficacy were negatively correlated [21]. Therefore, it is reasonable to assume that death anxiety may be directly influenced by death coping self-efficacy.

Personality traits as an integral aspect of the fundamental self-concept and self-evaluation, of which self-efficacy is a component [22]. Self-efficacy is closely associated with personality, serving as a vital internal psychological resource for people. Chinese researchers discovered a substantial correlation between personality factors and death coping self-efficacy [23]. Specifically, the ability to communicate about death, absorb grief, and understand funeral customs were all correlated with high levels of conscientiousness, agreeableness, openness, and low levels of neuroticism. Furthermore, higher degrees of extroversion, openness, agreeableness, and responsibility combined with lower levels of neuroticism may result in higher levels of self-efficacy [24]. Thus, we hypothesize that health personality may impact death coping self-efficacy in clinical medical freshmen.

Although personality, self-efficacy, and death anxiety have all been compared pairwise in the past, however, few studies have explored the mediating role of death coping self-efficacy on death anxiety from a particular health personality perspective. Meanwhile, investigation on the current status of death anxiety among clinical medical freshmen is also lacking. Therefore, it should be further examined whether the health personality of clinical medical freshmen affects their death anxiety through the mediation of death coping self-efficacy. Based on the above empirical studies and social cognitive theory, we put forth the following research questions:

(1) What is the level of death anxiety among clinical medical freshmen?
(2) Do the health personality and death coping self-efficacy affect death anxiety among clinical medical freshmen?
(3) Does death coping self-efficacy mediate the relationship between health personality and death anxiety among clinical medical freshmen?

Methods

Study design and aims

This study uses self-reported data from a cross-sectional survey. The objectives of this study were to investigate the death anxiety levels of clinical medical freshmen, explore whether death anxiety is affected by health personality and death coping self-efficacy, and examine whether death coping self-efficacy mediates the association between health personality and death anxiety among clinical freshmen.

Participants and sample

The study was carried out between June and July 2023. It was conducted at a university in Wuhan, Hubei Province, using convenience sampling. The recruited participants were enrolled in a full-time undergraduate early-contact clinical course. The inclusion criteria were: (1) full-time; (2) clinical medical students; (3) first-year undergraduate students. Students studying elsewhere or on a leave of absence during the survey period were excluded.

The formula equation of sample size was determined according to the cross-sectional study: $n = \frac{z_{\alpha}^2 * \sigma^2}{\delta^2}$ [25], $\alpha = 0.05$ was determined, then $U_{\alpha/2}$=1.96. The maximum standard deviation of death anxiety of clinical medical freshmen measured in the pre-experiment was 7.65, the allowable error δ was 1, and the calculated sample size was 140. Considering 10%~20% invalid questionnaires, the sample size was calculated to be 154 ~ 168. Finally, 360 Chinese clinical medical freshmen completed the questionnaire.

Measures

Demographic questionnaire

The demographic questionnaire's design was informed by evaluations of the literature and earlier research, which included gender, nationality, whether only child or not, place of residence, student leader experience, health status, the way family members talk about death and frequency of receiving palliative care education courses in a year. Participants were questioned about their experiences taking care of patients who are dying, witnessing the death of relatives, and whether they hope to receive palliative care education.

Health personality assessment (HPA)

The Health Personality Assessment was developed by Martin et al. [10] and Dai et al. [11] adapted it into Chinese in 2023. The measurement consists of 15 items, including 5 dimensions: health neuroticism (e.g., "I often worry when I am going to the doctor", 3 items), health extroversion (e.g., "I talk to my family and friends about my health", 3 items), health openness (e.g., "I am interested in changing my health routines", 3 items), health agreeableness (e.g., "I trust that my doctor will take my health concerns seriously", 3 items) and health conscientiousness (e.g., "I strive to reach my health goals", 3 items). A scale of 1 (strongly disagree) to 5 (strongly agree) is used for each item. Notably, HPA cannot be regarded as a variable to calculate the total score because the five dimensions are mutually exclusive, and need to be examined independently. The range of scores on the dimensions from 3 to 15 represents the lowest and highest scores. A higher score indicates that the individual's health personality is more oriented toward this dimension. It is worth noting that items 6,7,11 in the scale are reversed. The original scale's Cronbach Alpha was 0.890, suggesting good validity and reliability; this study's Cronbach Alpha was 0.744.

Death coping self-efficacy scale (DCSS)

The measurement initially was developed by Robbins [26] for palliative care units. The scale has 29 items and the sub-dimensions are Palliative care (e.g., "Providing emotional support for the patient's family"), coping with grief (e.g., "Understand bereavement and grief "), and preparing for death (e.g., "Asking to know if you have a terminal illness "). A score ranging from 1 (very uncertain) to 5 (very definite) is assigned to each item. The range of scores on the scale from 29 to 145 represents the lowest and highest scores. Higher self-efficacy in handling death is indicated by a higher score. It was first introduced by Lin et al. [20] in 2022. The original scale's Cronbach Alpha was 0.905, suggesting good validity and reliability; this study's Cronbach Alpha was 0.883.

Death anxiety scale (DAS)

The measurement was developed by Professor Templer [27] and Yang et al. [28] adapted it into Chinese. The Chinese DAS contains 15 items, including 4 dimensions: emotional (e.g., "I am not at all afraid to die", 6 items), stress and pain (e.g., "I fear dying a painful death", 4 items), time awareness (e.g., "I often think about how short life really is", 2 items), and cognitive (e.g., "The thought of death seldom enters my mind", 3 items), among which six items are scored in reverse. A scale of 1 (strongly agree) to 5 (strongly disagree) is used for each item. Higher death anxiety is indicated by a higher score. A total score of more than 35 indicates high death anxiety. The original scale's Cronbach Alpha was 0.815, suggesting good validity and reliability; this study's Cronbach Alpha was 0.763.

Data collection procedure

This research used the questionnaire star platform electronic questionnaire (https://www.wjx.cn/vj/wyKemx2.aspx), filling in limit set in the same IP address cannot repeat fill in using anonymous way. Firstly, two investigators and two questionnaire checkers were given unified and relevant training. Then, after obtaining the consent of the clinical college, during the break, the researchers collected the students and provided them with a comprehensive explanation of the objective, relevance, and filling procedure of the research, along with unified instruction. After obtaining their informed consent, a questionnaire QR code was issued on site for clinical medical freshmen to fill in the questionnaire independently.

Data analysis

The IBM SPSS 25.0 Statistics was used for all statistical analyses. The Statistical significance was defined as a two-tailed *p*-value less than 0.05. Descriptive characteristics were described as mean ± standard deviation (SD) for continuous variables and frequency (%) for categorical variables. One-way analysis of variance (ANOVA) and independent samples *t-test* were used to compare death anxiety scores based on demographic differences. The relationship between health personality, death coping self-efficacy and death anxiety was examined using Pearson correlation analysis. Additionally, Model 4 in Hayes's PROCESS macro was used to calculate the mediating influence of death coping self-efficacy [29]. The dependent variable was death anxiety, and the independent factors were health personality. Death coping self-efficacy was entered as a mediator variable. The significance of the mediating effect was tested using a bootstrap with a 95% bias-corrected confidence interval (CI). If its 95% CI was not included as zero, it indicated that the mediating effect is statistically significant.

Results

Demographic characteristics

This study involved 378 clinical medical freshmen, 360 of whom completed the survey with a questionnaire completion rate of 95.24%. Within the 360 clinical medical freshmen, there were 203 (56.4%) were female and 137 (38.1%) were only children. The majority (72.5%) of the participants are Han Nationality. Most of the students (74.2%) had experience as student leaders. Moreover, 288 (80.0%) students self-reported good health, 4.7% of families had never discussed death, 86.1% didn't participate in education programs on palliative care during the preceding year, 87.2% had not cared for dying patients, 45.0% reported having lost a close member, and 89.7% said they hope to carry out palliative care education. Table 1 presents more demographic data.

Scores of health personality, death coping self-efficacy and death anxiety

Table 2 shows the mean score for each dimension as well as the overall score for each scale.

Correlations analysis of health personality, death coping self-efficacy and death anxiety

Health neuroticism and death anxiety ($r = 0.138$, $P < 0.01$) and death coping self-efficacy ($r = -0.233$, $P < 0.05$) showed a statistically significant association. There was a negative connection ($r = -0.473$, $P < 0.01$) between death coping self-efficacy and death anxiety. See details in Table 3.

Impact of health personality and death coping self-efficacy on death anxiety

Health neuroticism has a significant positive impact on death anxiety ($\beta = 0.407$, $t = 2.323$, $P<0.05$), and death anxiety is significantly impacted negatively by death coping self-efficacy ($\beta=-0.105$, $t=-3.441$, $P<0.05$) among clinical medical freshmen. See details in Table 4.

Table 1 Students' death anxiety scores with different characteristics ($N = 360$)

Characteristics	*n* (%)	Mean ± SD	t/F	*P* value
Gender			1.422	0.156
Male	157(43.6)	46.20 ± 7.93		
Female	203(56.4)	45.05 ± 7.27		
Ethnic group			-0.736	0.462
Han Chinese	261(72.5)	45.37 ± 7.44		
Other	99(27.5)	46.03 ± 7.94		
Whether only child or not			0.921	0.358
Yes	137(38.1)	46.02 ± 7.44		
No	22361.9)	45.26 ± 7.66		
Place of residence			-0.706	0.481
City	231(64.2)	45.34 ± 7.79		
Village	129(35.8)	45.93 ± 7.17		
Student leader experience			1.825	0.069
Yes	267(74.2)	45.98 ± 7.31		
No	93(25.8)	44.32 ± 8.19		
Health status			-0.073	0.942
Good	288(80.0)	45.54 ± 7.62		
Normal	72(20.0)	45.61 ± 7.42		
Have seen relatives die			0.481	0.631
Yes	162(45.0)	45.77 ± 7.48		
No	198(55.0)	45.38 ± 7.67		
The way family members talk about death			2.384	**0.041***
Never	17(4.7)	45.41 ± 9.85		
Trying to avoid	85(23.6)	47.53 ± 8.60		
Only when necessary, and not in front of children	79(21.9)	45.52 ± 6.38		
Feeling uncomfortable	47(13.1)	45.60 ± 6.93		
Quite open	132(36.7)	44.30 ± 7.26		
Had experienced caring for dying patients			0.491	0.624
Yes	46(12.8)	46.07 ± 7.80		
No	314(87.2)	45.48 ± 7.55		
Frequency of receiving palliative care education courses within one year			-1.195	0.233
0 times	310(86.1)	45.36 ± 7.63		
1–3 times	50(13.9)	46.74 ± 7.16		
Hope to receive palliative care education			-0.883	0.378
Yes	323(89.7)	45.43 ± 7.38		
No	37(10.3)	46.59 ± 9.13		

*$P < 0.05$

Mediating role of death coping self-efficacy on health personality and death anxiety among clinical medical freshmen

To test the mediation effect, we controlled for the significant variables identified in the univariate analyses. Use the Hayes method to check the mediation model. The mediating effect test was conducted with health neuroticism as the independent variable, death coping self-efficacy as the mediating variable, and death anxiety as the dependent variable. Table 5 showed the results of the mediating effect of death coping self-efficacy between health personality and death anxiety. The total effect of health neuroticism on death anxiety was significant ($\beta = 0.499$, $P < 0.05$, 95%CI [0.156, 0.842]). The upper and lower 95% confidence intervals for the direct relationship between health neuroticism on death anxiety, as well as the mediation role of death coping self-efficacy (Bootstrap 5000 times), did not encompass 0, demonstrating that health neuroticism can both directly and indirectly predict death anxiety through the mediation effect of death coping self-efficacy. The direct effect value was 0.407 and the mediating effect value was 0.092 accounting for 81.56% and 18.44% of the total effect.

Table 2 Scores of health personality, death coping self-efficacy and death anxiety ($N = 360$)

Scales / dimensions		Mean ± SD
Health Personality		
	HN	9.33 ± 2.27
	HE	9.33 ± 2.00
	HO	8.67 ± 1.30
	HA	11.29 ± 1.90
	HC	10.87 ± 2.04
Death Coping Self-efficacy	Total score	98.14 ± 12.99
	Palliative care	44.48 ± 5.96
	Coping with grief	26.69 ± 5.95
	Preparing for death	26.97 ± 4.35
Death Anxiety	Total score	45.55 ± 7.57
	Emotional	15.34 ± 3.83
	Stress and pain	14.57 ± 2.76
	Time awareness	6.43 ± 1.80
	Cognitive	9.21 ± 2.12

HN: Health neuroticism; HE: Health extraversion; HO: Health openness; HA: Health agreeableness; HC: Health conscientiousness

Discussion

This study investigated the current status of death anxiety among clinical medical freshmen, examined whether health personality and death coping self-efficacy had an impact on death anxiety, and whether death coping self-efficacy played a significant mediating role in this correlation. The detailed results were as follows: clinical medical freshmen' death anxiety scores were at high levels; Death anxiety is influenced by health neuroticism and death coping self-efficacy. Furthermore, the association between health neuroticism and death anxiety was largely mediated by death coping self-efficacy among clinical medical freshmen. As far as we know, this is the first study to show the indirect effect of death

Table 3 Correlations between health personality, death coping self-efficacy and death anxiety ($N=360$)

	HN	HE	HO	HA	HC	Death Coping Self-efficacy	Death Anxiety
HN	1						
HE	-0.064	1					
HO	0.03	-0.284**	1				
HA	0.011	0.286**	−0.207**	1			
HC	0.055	0.303**	-0.375**	0.479**	1		
Death Coping Self-efficacy	-0.233*	0.237**	-0.222**	0.371**	0.403**	1	
Death Anxiety	0.138**	-0.045	0.029	-0.03	0.065	-0.473**	1

Abbreviations: *$P<0.05$, **$P<0.01$

HN: Health neuroticism; HE: Health extraversion; HO: Health openness; HA: Health agreeableness; HC: Health conscientiousness

Table 4 Regression analysis of death coping self-efficacy between health personality and death anxiety ($N=360$)

Variable		R^2	F	B	SE	t	95%CI	
Outcome variable	**Model variable**						**LLCI**	**ULCI**
Death anxiety	Constant	0.254	81.79	53.106	3.310	16.044	46.597	59.616
	Health neuroticism			0.407	0.165	2.323	0.063	0.752
	Death coping self-efficacy			-0.105	0.031	-3.441	-0.165	-0.045

Table 5 Total, direct and indirect effects of health personality on death anxiety ($N=360$)

Path	Effect	BootSE	*p*	95%CI	
				LLCI	ULCI
Health neuroticism (HN)					
Total effect	0.499	0.175	<0.05	0.156	0.842
Direct effect	0.407	0.135	<0.05	0.063	0.752
Indirect effect	0.092	0.051	<0.05	0.015	0.027

coping self-efficacy on the relationship between health personality and death anxiety from a health personality perspective.

According to our research, the death anxiety level of clinical medical freshmen is generally congruent with those of medical students from China [30], but much higher than students from Turkey and Iran [31, 32]. The significant findings reported in the present research may be partially due to cultural differences. Firstly, in China, it is generally considered unlucky and even forbidden to discuss death in public. Even medical students exhibit this aversion to discussing death, some make an effort to stay clear of situations that could force them to confront or consider death. This cultural avoidance reinforces the mystique of death and may increase medical students' anxiety about death. Another possible factor may be the participants are first-year clinical medical students, who had not received systematic and professional death education in the first year of general education and basic medical courses and did not have systematic knowledge and understanding of death. Moreover, the score of the emotional dimension of clinical medical students is higher, indicating that death anxiety is greatly affected by subjective experience and feelings when they experience the death of another person or intuitively feel that a major accident has occurred. The low time dimension score may be because first-year medical students are generally younger and do not think much about life-related death compared to older adults. Students in this study were more fearful of dying than those in studies by He et al. [7] and Xu et al. [33], which might be explained by the fact that only 13.7% of students had taken programs on palliative care. Numerous studies have claimed that taking education courses on palliative care is more effective in helping students cope with death and lessens their anxiety about dying [34, 35]. Palliative care education and training should be provided to clinical medical freshmen. As clinical leaders and role models, attending physicians and professional role models are useful resources for palliative care education. They can effectively and positively teach and model excellent strategies for coping with death anxiety. Novice clinicians can benefit from the opportunity to learn how to cope with death anxiety from a variety of perspectives.

This study showed that health neuroticism dimension of health personality impacted clinical medical freshmen' death anxiety, which matched those observed in earlier findings [36, 37]. Health neuroticism reflects an individual's perceived anxiety and stress regarding personal health and medical care [10]. High degrees of neuroticism have been linked in the past to unpleasant emotional reactions like fear and anxiety [38]. Health anxiety was the most characteristic of an individual with a high health neuroticism score [11]. In other words, individuals who exhibit elevated levels of health-related neuroticism are at a higher risk of experiencing health problems or anxiety, which could potentially be a sign of unhealthy coping mechanisms in reaction to health-related stressors [39]. Identifying clinical medical freshmen with high degrees of health neuroticism might be the first step in helping to reduce death anxiety. Medical educators can provide

more personalized health education that considers clinical medical freshmen' individual health personality differences to meet their specific needs. It is worth noting that although our study showed that health neuroticism is an influential factor for death anxiety, the correlation coefficient and weak explanatory power between these two parameters. While in other literature we also found neuroticism to be an influential factor in death anxiety [40, 41]. The reason may be the insufficient sample size, which can be further explored in the future with a larger sample size or longitudinal design.

This study found that death coping self-efficacy was negatively impacted clinical medical freshmen' death anxiety, indicating that clinical medical freshmen who scored higher on death coping self-efficacy had lower death anxiety, which is similar to previous studies in Western countries [42]. Strong evidence of the relationship between death anxiety and death self-efficacy was also found in other investigations [21, 43]. Bandura's theory of self-efficacy suggests that having high levels of self-efficacy may help individuals better regulate anxiety-related thought processes [44]. Individuals with higher levels of self-efficacy for coping with death often perceive or believe that they have higher levels of palliative care, grief coping and death preparedness, that they feel more in charge of their health and lives, and thus, their anxiety of dying gets less [42].

The results of the study of the mediation effect showed that the association between health neuroticism and death anxiety was mediated by death coping self-efficacy, with the mediating effect explaining 18.44% of the total effect. Our hypothesis framework was accepted in the present study. That is to say, consistent with the previous study, health personality (health neuroticism) can influence death anxiety both directly and indirectly through death coping self-efficacy [45]. First, theoretically, death coping self-efficacy, as an intrinsic driver and mediator of psychological and physiological coping mechanisms and positive health behavioral responses [46], can be anticipated based on an individual's fundamental socio-structural characteristics (personality), as well as influencing post-traumatic stress disorder and mental health outcomes [19]. Simultaneously, according to the concept of health personality, those who exhibit higher degrees of health neuroticism are more inclined to use coping mechanisms that are unpredictable and challenging in response to health issues [47], which would make them more anxious and lead to the use of coping measures such as avoidance. As a result, personality differences might prompt individuals to use different emotionally focused coping strategies and other negative coping strategies and result in different levels of predicted mortality coping self-efficacy. Based on this finding, improving death coping self-efficacy should be an effective strategy to reduce death anxiety in clinical medical freshmen. Medical educators can organize culturally sensitive training, for example, designing, developing and implementing multi-modal and multi-channel training in palliative care, combined with professional debriefing and support, to enhance the cognitive capacity of clinical medical freshmen to cope with end-of-life patients, and help them to understand and deal with their feelings of death when dealing with terminally ill patients, thereby lowering unpleasant feelings like dread and anxiety. Additionally, recognizing various health personalities among clinical medical freshmen may contribute to the program's efficiency and effectiveness, however, more study is required to fully evaluate this.

Limitations

Although this study has found some significant results, several limitations need to be considered when generalizing our findings. First, it is unable to definitively explain how death coping self-efficacy and health personality relate to death anxiety because of the cross-sectional methodology. Second, this study employed convenience sampling to collect samples and did not follow up on potential reasons for clinical medical freshmen' refusal to participate in the study, which may introduce some bias to the representativeness of the sample. Future research will further optimize this aspect. Furthermore, although some mediating effects have been verified, due to limitations such as convenience sampling and sample size, the statistical significance of certain effects is weak. The findings need to be confirmed by the longitudinal study using a big-sample in the future. A qualitative study also needs to be considered, aiming to gain a more comprehensive understanding of health personality, death coping self-efficacy and death anxiety in clinical medical freshmen and the relationship between them.

Conclusion

Our study showed that death anxiety among clinical medical freshmen was at a high level, health neuroticism and death coping self-efficacy influenced clinical medical students' death anxiety, while death coping self-efficacy partially mediated the relationship between health neuroticism and death anxiety. Thus, encouraging positive health personality and bolstering death coping self-efficacy can effectively lessen their death anxiety in clinical medical freshmen.

Implications

Our study findings offer substantial practical implications for nursing educators. First, nursing educators should prioritize screening and preventive strategies for death anxiety among clinical medical freshmen, while implementing targeted support interventions for those

demonstrating elevated levels. These interventions may encompass comprehensive palliative care education, Acceptance and Commitment Therapy (ACT), structured group counseling sessions, and peer support initiatives. Second, it is critical to assess health personality in clinical medical freshmen, particularly focusing on individuals with high health neuroticism, to develop differentiated pedagogical strategies that address their specific needs. Third, death coping self-efficacy not only directly reduces death anxiety but also mitigates anxiety stemming from health neuroticism. Consequently, tailored programs to enhance death coping self-efficacy among clinical medical freshmen, such as simulated critical care scenarios, role-playing exercises for end-of-life communication, and interdisciplinary training should be designed and implemented. Integrating these with neuroticism-informed health education modules could optimize death coping self-efficacy regulation and further alleviate death anxiety.

Acknowledgements
We would like to thank all the clinical medicine freshmen who participated in this study.

Author contributions
JZ, XL and YZ contributed equally to this work. First authorship：JZ, XL and YZ. DZ, TW and HC contacted with organization and coordinated the project. JZ, XL and YZ designed the questionnaire and carried out the data collection. JZ, XL and YZ analysed the data. JZ drafted the manuscript. JZ, HD, EZ and QZ reviewed and edited the manuscript. All authors read and approved the final manuscript. Joint/shared supervision：ZZ, QC and QZ.

Funding
This study was supported by the Teaching Reform Research Program of the Wuhan University School of Medicine (grant number 2021079), and Minxi Vocational and Technical College Sanquan Comprehensive Reform Theory Foundation (grant number MXZY23SQYR9).

Data availability
The data used and analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The Ethics Committee of Wuhan University School of Medicine issued an ethical license to the researchers with the ethical number (2020YF2001). All participants were informed about the study and volunteered to participate in the study. In addition, the researchers asked the subjects to sign an informed consent form to indicate their consent before recruitment. All methods were performed by relevant guidelines and regulations.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Author details
[1]School of Nursing, Wuhan University, Located on No. 115 Donghu Road, Wuhan 430071, Hubei Province,, China
[2]Minxi Vocational & Technical College, No.8 Caoxi Road, Longyan 364021, Fujian Province,, China
[3]Renmin Hospital of Wuhan University, No.238 Jiefang Road, WuChang District, Wuhan 430060, Hubei Province, China
[4]Department of Public Health and Primary Care, Leiden University Medical Centre, Leiden 2300 RC, Netherlands
[5]National eHealth Living Lab, Leiden University Medical Centre, Leiden 2300 RC, Netherlands
[6]School of Basic Medicine, Wuhan University, Located on No. 115 Donghu Road, Wuhan 430071, Hubei province, China
[7]Zhongnan Hospital of Wuhan University, No.169 Eastlake Road, WuChang District, Wuhan 430060, Hubei Province, China
[8]No.7 Middle School, Located on No.88 Renmin East Road, Longyan 364000, Fujian Province, China

Received: 3 April 2024 / Accepted: 17 March 2025
Published online: 29 March 2025

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