



# Resourcefulness as a mediator in the relationship between self-perceived burden and depression among the young and middle-aged stroke patients: A cross-sectional study

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## ABSTRACT

**Objective:** To explore the relationships among self-perceived burden, resourcefulness and depression, and to study further whether resourcefulness mediates the effects of self-perceived burden on depression in young and middle-aged stroke patients.

**Methods:** A cross-sectional survey was conducted with 1050 young and middle-aged stroke patients. We used a general demographic questionnaire, Self-Perceived Burden Scale (SPBS), Resourcefulness Scale© (RS) and Hamilton Depression Scale (HAMD) to assess self-perceived burden, resourcefulness, and depression. Statistical methods included correlation analysis, multiple linear regression, and structural equation model.

**Results:** 1018 valid questionnaires were collected with a response rate of 96.95%. Resourcefulness was inversely correlated with self-perceived burden ( $r = -0.367, p < 0.01$ ) and depression ( $r = -0.625, p < 0.01$ ); Self-perceived burden was positively associated with depression ( $r = 0.698, p < 0.01$ ). Multiple linear regression analyses showed that resourcefulness mediated the effects of self-perceived burden on depression; The structural equation model demonstrated that the resourcefulness mediated the relationship between self-perceived burden and depression.

**Conclusion:** Resourcefulness is a mediator between self-perceived burden and depression. Medical staff adjust the psychological state of stroke patients based on the theory of resourcefulness, thereby improving their problem-solving ability, actively encouraging patients to establish problem-solving strategies, providing disease rehabilitation knowledge and skills, and promoting the improvement of resourcefulness level.

## 1. Introduction

Stroke is the second leading cause of death and a major cause of disability worldwide [1]. Critical features of stroke include high morbidity, disability and mortality, which produce a heavy burden to patients, their families and social medical service systems [2]. An epidemiological survey [3] showed that more than 25 million people were diagnosed with stroke and 70% to 80% of patients had

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varying degrees of sequelae, globally. There are 4.5 million stroke patients with disability in China, accompanied by various degrees of self-care limitations and psychological problems. Stroke incidence is on the rise among young and middle-aged people. Stroke gradually endangers young and middle-aged people. The proportion of patients aged 40–64 is more than 50% [4].

For the purpose of this study, patients aged 18–44 years were considered young patients and patients aged 45–64 years were considered middle-aged patients. Stroke has posed a serious threat to the young and middle-aged people in China [5,6]. Sudden changes in their social and family roles occur after the stroke as they face both physical and psychological challenges and experience symptoms of anxiety and depression [7]. Recently, more evidence has shown that most young and middle-aged stroke patients experience different levels of self-perceived burden (SPB), and more than 50% of them have varying of psychological disorder [8,9].

SPB refers to feelings such as reduced self-worth, shame and blame, which are caused by the physical and psychological burden on the caregivers due to the limitation of physical activities [10]. Due to limitations in physical functioning after illness, stroke patients are unable to work and assume family responsibilities, which increases their self-perceived burden [11]. In addition, stroke patients have a longer course of disease and higher treatment costs, which adds tremendous psychological pressure and economic burden to the stroke patients and their families [12]. Previous studies have shown that self-perceived burden can lead to negative emotions, such as depression, guilt, and even suicide, affecting patients' rehabilitation and quality of life [13,14].

Post-stroke depression (PSD) is an emotional disorder that occurs after stroke. It is characterized by loss of interest, fatigue, sense of worthlessness or excessive guilt, loss of attention or determination, drastic increase or loss of weight or appetite, insomnia or sleepiness, and even repeated thoughts of death or suicide or self-mutilation [15]. PSD can aggravate patients' mental pain, delay the recovery of neurological function, reduce patients' quality of life and life satisfaction, and increase the risk of stroke death and recurrence of stroke [16]. Therefore, mental health promotion among the stroke patients has gained more attention.

Resourcefulness is the ability to independently carry out one's daily activities (personal resourcefulness) and to seek the assistance of other persons when unable to complete daily activities independently (social resourcefulness)[17]. The ability of individuals to perform their daily tasks independently in adverse situations, including the ability to use self-help strategies to cope with adversities or challenges, is defined as personal resourcefulness. The ability of individuals to pursue help from formal (e.g., professional) or informal (e.g., family or friends) sources when they are unable to function independently is defined social resourcefulness [18]. Research [19] has shown that people with higher resourcefulness levels are more adaptable to meet challenges, with higher quality of life and higher life satisfaction. When individuals face stress, resourcefulness is the most important predictor of people's health, and the higher the level of resourcefulness, the lower the degree of depression [4,20,21]. Resourcefulness appears to protect mental health by acting as a buffer against stress and helping people cope after the occurrence of disease [22].

Research had shown that resourcefulness is associated with perceived stress and depression, and decreased health-related quality of life [18]. Based on Newman's system model theory, this study proposes the research hypothesis that elastic defense lines can prevent stressor from directly invading individuals, and use resourcefulness as elastic defense. When people feel pressure, they can timely adjust internal and external resources to deal with pressure through resourcefulness, and reduce depression and other negative emotions. This study aimed to explore the relationship among self-perceived burden, resourcefulness and depression, and to examine whether resourcefulness mediates the effects of self-perceived burden on depression in young and middle-aged stroke patients.

## 2. Design and methods

### 2.1. Study design

This study was a cross-sectional survey involving young and middle-aged stroke patients.

### 2.2. Ethical considerations

The study conformed to ethical standards and was approved by the Ethics Committee of Zhengzhou university (Ethical No:2020-KY-459). Informed consent was obtained from study participants prior to the data collection.

### 2.3. Participants

The inclusion criteria of this study: (1) aged 18–64 years; (2) diagnosed with stroke through CT or MRI; (3) Within 7~30 days after stroke [23]; (4) with a good language communication skills. Exclusion criteria: (1) severe acute and chronic diseases; (2) severe cognitive impairment; (3) diagnosed mental disorder.

### 2.4. Instruments

#### 2.4.1. General questionnaire

The general questionnaire was designed by researchers on the basis of literature to include demographic variables such as age, gender, spouse status, education status, disease type and monthly household income.

#### 2.4.2. Resourcefulness scale©

The Resourcefulness Scale© (RS) has been widely used to measure the resourcefulness [24]. The scale consists of 28 items and two dimensions, 16 items measure personal resourcefulness, the other 12 items measure social resourcefulness. The items on the scale were

scored 0 (extremely non-descriptive of one's behavior) to 5 (extremely descriptive) with Likert 6 grades, total scores range from 0 to 140, with higher scores indicating greater resourcefulness [25]. The scale was translated into a Chinese version and showed good reliability and validity [26]; the internal consistency Cronbach's alpha coefficient of the scale was determined to be 0.825, and the retest reliability coefficient was 0.852. In this study, the Cronbach's alpha was 0.824.

#### 2.4.3. Self-Perceived Burden Scale

Self-Perceived Burden Scale (SPBS) is widely used to measure self-perceived burden in chronic disease patients [27]. This scale is a self-rating scale with 10 items and 3 dimensions: physical burden, emotional burden, economic burden. Each item was scored on a 5-point Likert scale to indicate the degree of self-perceived burden experienced. Likert-type responses range from 1 (no burden) to 5 (maximum burden), total scores range from 10 to 50, with higher a score indicating greater self-perceived burden. The scale has shown good reliability and validity by Chinese researchers, the internal consistency reliability of the questionnaire was 0.91 [28]. In the present study, the Cronbach's alpha was 0.900.

#### 2.4.4. The Hamilton Depression Scale

The International edition of The Hamilton Depression Scale (HAMD) is a commonly used scale for evaluating severity of depression symptoms [29]. This scale consists of 24 items and seven dimensions, including anxiety, weight, cognitive impairment, diurnal variation, retardation, insomnia and despair. Most of the items in the scale range between 0 (rarely or not at all) and 4 (most or all of the time), a few items of the scale range between 0 and 2 to describe how often the respondent experienced each sensation in the past week. Total scores range from 0 to 76, with higher scores indicating severity of depressive symptoms. The respondents are considered to be at risk for depression if they score a HAMD greater than 20. The study showed it was valid and reliable scale in Chinese, the internal consistency Cronbach's alpha coefficient of the scale was determined to be 0.99 [30]. In this study, the Cronbach's alpha was 0.886.

### 2.5. Data collection

The data were collected in three neurology wards in Henan Province Zhengzhou from October 2017 to December 2018. The targeted sample was 1050 young and middle-aged stroke patients, which exceeded key psychometric criteria of 20:1 subjects to number of scale items ratio and exceeded the specification of  $N > 1,000$  as "excellent" [31]. Our targeted sample met the general rule in psychometric research that a large sample is essential.

All the investigators received consistent instructions and information, and used uniform guidelines in data collection to minimize errors. Participants were recruited according to inclusion criteria and exclusion criteria. Participants were informed of the significance and purpose of the study. The questionnaires were completed anonymously to protect participants' privacy. The data were obtained by a one-to-one, face-to-face interviews by the data collectors. Finally, questionnaires with more than 20% missing data were excluded from the data analysis.

### 2.6. Data analysis

SPSS version 21.0 and AMOS 22.0 were used for data analysis. Frequencies, percentages, means and standard deviations were used for descriptive statistics of social demographic variables, self-perceived burden, resourcefulness and depression. Correlation coefficients were examined to test the relationships among the self-perceived burden, resourcefulness, and depression. Hierarchical multiple regression analysis was used to determine whether self-perceived burden and resourcefulness had significant effects on depression.

Standardize each variable, with age, gender, marital status, education status and monthly household income as control variables, depression as the dependent variable, and self-perceived burden as the independent variable to establish Equation 1; Establish regression Equation 2 with resourcefulness as the dependent variable and self-perceived burden as the independent variable; Add resourcefulness to Equation 1 to establish Equation 3. Then, A structural equation modeling approach (using AMOS version 22.0) and bootstrap method were employed [32] to confirm the relationship among self-perceived burden, resourcefulness, and depression.

Several indices, such as  $\chi^2/df$ , RMSEA, GFI, AGFI, NFI and IFI were used to determine whether the hypothesized model fit the observed data or not. When  $\chi^2/df$  is less than 5.0, GFI, NFI, IFI and AGFI values are greater than 0.90, the RMSEA values is less than 0.08, which indicated the model fit well.

## 3. Results

### 3.1. Descriptive statistics

Thirty-two incomplete questionnaires were eliminated from this study. Therefore, 1018 fully answered questionnaires were included in the data analysis, indicating a response rate of 96.95%. Ages of study participants ranged from 18 to 64 years. In terms of gender, 596 (58.5%) were males and 422 (41.5%) were females. Table 1 presents the characteristics of the study participants. The means, standard deviations of the SPBS, RS and HAMD, and all the subscales are shown in Table 2.

### 3.2. Preliminary correlation analyses

The correlations among the study variables are shown in Table 3. The results showed that the resourcefulness scores were negatively correlated with self-perceived burden ( $r = -0.376, p < 0.01$ ) and depression ( $r = -0.625, p < 0.01$ ). The results also showed that self-perceived burden was positively associated with depression ( $r = 0.698, p < 0.01$ ).

### 3.3. Multiple regression analysis

The result of Equation 1 ( $\beta=0.694, P < 0.01$ ) showed that self-perceived burden can positively predict the level of depression; Equation 2 ( $\beta=-0.489, P < 0.01$ ) showed that self-perceived burden can negatively predict the level of resourcefulness; Equation 3 showed that self-perceived burden ( $\beta=0.362, P < 0.01$ ) and resourcefulness ( $\beta=-0.676, P < 0.01$ ) significantly predict depression levels. The research results indicate that the direct and indirect effects of self-perceived burden on depression levels are statistically significant, and resourcefulness may play a mediating role between self-perceived burden and depression. The results are shown in Table 4.

### 3.4. Structural equation modeling

Structural equation modeling was conducted to determine the direct, indirect, and total effects among the self-perceived burden, resourcefulness, and depression. The modeling with these three latent variables is presented in Fig. 1. The modified goodness-of-fit indexes ensured that the model was acceptable, and the results were as follows:  $\chi^2/df = 3.266, p < 0.01$ , CFI = 0.916, GFI = 0.920, AGFI = 0.928, NFI = 0.933, IFI = 0.960, RMSEA = 0.072. According to the estimated squared multiple correlations of two endogenous latent variables, the structural equation modeling accounted for 5% of the variance in resourcefulness and 34% of the variance in depression. The standardized total, indirect, and direct effects of self-perceived burden and resourcefulness on depression are presented in Table 5. The results indicated that self-perceived burden had a significant direct effect on depression and resourcefulness. Meanwhile, resourcefulness had a significant direct effect on depression. The bootstrapped 95% confidence interval (CI) showed that the indirect effect of resourcefulness in the relationship between self-perceived burden and the depression was significant. This indicated that 14.58% (0.07/0.48) of the variance in depression was produced by resourcefulness as a partial mediator. Through path analysis, the path coefficient of direct impact of self-perceived burden on depressive symptoms was 0.40, after adding the resourcefulness, and the mediation effect value was 0.07 ( $-0.22 \times -0.34$ ).

## 4. Discussion

With the acceleration of the pace of social life and the increasingly fierce social competition, the importance of mental health of stroke patients has been neglected, which promotes the growth of a generation of stroke patients prone to depression [33]. Studies have shown that self-perceived burden has a significant predictive effect on depression symptoms [9]. However, there are relatively few empirical studies on factors that influence depression, including the role of resourcefulness as a potential mediator. Therefore, this study explored depression in stroke patients from the perspective of the mediating role of resourcefulness, which has relevance for promoting the physical and mental health of young and middle-aged stroke patients.

**Table 1**  
Characteristics of the sample (N = 1018).

Variables	Group	N (%)
Age	18–44	486 (47.7)
	45–64	532 (52.3)
Gender	Male	596 (58.5)
	Female	422 (41.5)
Marital status	Married	823 (80.8)
	Divorced/widowed/separated	195 (19.2)
Education status	Primary or below	352 (34.6)
	Junior high school	325 (31.9)
	Senior high school	213 (20.9)
	College degree or above	128 (12.6)
Disease type	Ischemic	752 (73.9)
	Hemorrhagic	266 (26.1)
Monthly household income (RMB)	0–5000	150 (14.7)
	5001–10000	585 (57.5)
	>10000	283 (27.8)
Hypertension status	Have	456 (44.8)
	No	562 (55.2)
Coronary heart disease	Have	155 (15.2)
	No	863 (84.8)
Diabetes status	Have	420 (41.3)
	No	598 (58.7)

**Table 2**  
Means, standard deviations of the subscales and total scores of SPBS, RS, HAMD.

Variables	Range of scores	Mean	Standard Deviation
<b>Self-perceived burden</b>	13–42	24.09	5.36
physical burden	7–20	11.85	2.33
emotional burden	5–17	9.87	2.14
economic burden	1–5	2.36	0.97
<b>Resourcefulness</b>	37–125	91.46	17.81
personal resourcefulness	20–73	54.19	15.47
social resourcefulness	16–52	37.27	8.56
<b>Depression</b>	1–27	9.25	4.97
anxiety	0–6	1.99	1.34
weight	0–2	0.96	0.58
cognitive impairment	0–6	1.59	1.96
diurnal variation	0–2	0.60	0.80
retardation	0–4	1.67	0.94
insomnia	0–4	1.45	0.84
despair	0–4	0.98	1.34

Abbreviations: **Self-perceived Burden**, with 3 dimensions: physical burden, emotional burden, economic burden; **Resourcefulness**, consists of two dimensions: personal resourcefulness and social resourcefulness; **Depression**, consists of seven dimensions, including anxiety, weight loss, cognitive impairment, diurnal variation, retardation, insomnia and despair.

**Table 3**  
The Pearson’s rank correlation coefficients of three scales (n = 1018).

Variables	1 Self-perceived burden	2 Resourcefulness	3 Depression
1 Self-perceived burden	–		
2 Resourcefulness	–0.367*	–	
3 Depression	0.698*	–0.625*	–

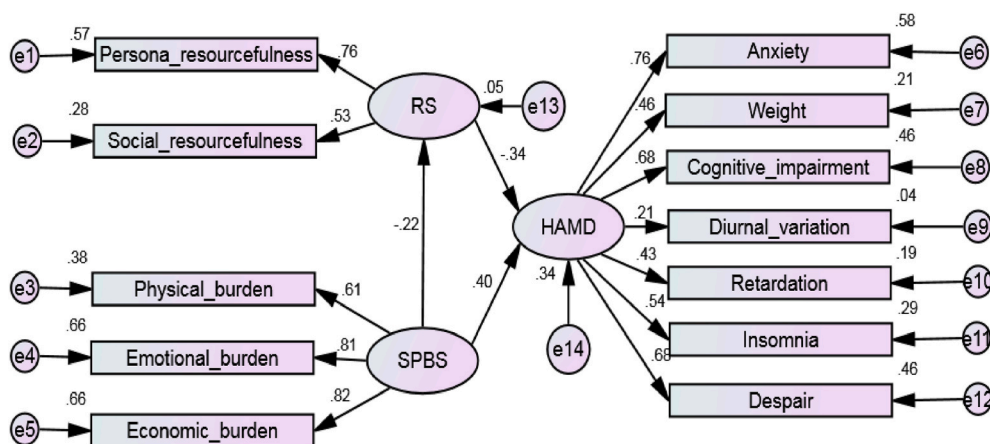
**Table 4**  
Results of the multiple regression analysis.

Variables	Equation 1				Equation 2				Equation 3			
	β	SE	t	P	β	SE	t	P	β	SE	t	P
Age	–0.797	0.143	–5.575	0.000	0.925	0.436	2.123	0.034	0.766	0.378	2.026	0.043
Gender	–0.045	0.394	–0.113	0.910	–0.622	0.176	–3.537	0.000	0.424	0.334	1.268	0.205
Marital status	–0.523	0.550	–0.950	0.343	–0.059	0.126	–0.467	0.641	0.314	0.237	1.324	0.186
Monthly income	–0.684	0.565	–2.979	0.003	0.198	0.197	1.004	0.316	–0.758	0.141	–5.375	0.000
Disease type	–0.116	0.493	–2.437	0.015	0.055	0.418	1.795	0.073	–0.082	0.378	–3.187	0.001
SPBS	0.694	0.075	9.276	0.000	–0.489	0.052	–9.395	0.000	0.362	0.073	4.944	0.000
RS	–	–	–	–	–	–	–	–	–0.676	0.061	–11.099	0.000
F	29.526				18.735				41.426			
P	0.000				0.000				0.00			
Adjusted R <sup>2</sup>	0.256				0.176				0.458			

In this study, the prevalence of depression risk of young and middle-aged stroke patients was 28.5%, which is similar to previous cross-sectional studies that revealed that the prevalence of depression varies from 18.0% to 32.4% in stroke patients [34,35]. The prevalence of depression among the young and middle-aged stroke patients can be influenced by many factors. Previous studies [36, 37] demonstrated that depression was correlated with age, gender, marital status, educational status and household income. This revealed that these variables may exert effects on depression among the young and middle-aged patients through self-perceived burden or resourcefulness in our study.

Correlations were significant among self-perceived burden, resourcefulness, and depression among the young and middle-aged stroke patients. Therefore, the greater self-perceived burden, the greater risk of depression; the higher resourcefulness levels, the less risk of depression, which is consistent with the previous studies [9,38].

The results of Equation 1 showed that self-perceived burden had a significant effect on depression with controlling for the demographic variables. To some extent, this was consistent with previous studies that revealed that young and middle-aged stroke patients generally have different degrees of self-perceived burden that were closely associated with anxiety and depression [9,39]. Psychological interventions based on the focus solution model can enable patients to integrate and utilize personal and social resources, actively seek support, mobilize internal potential, lighten the self-perceived burden, and alleviate anxiety and depression when facing individual or collective problems or challenges [40]. The focused solution model is a psychological intervention model that focuses on the positive direction of people and emphasizes on maximizing the potential of individuals or groups to solve problems [9,39]. Therefore, by helping patients understand the basic knowledge of stroke, master emotional control skills, help patients develop



**Fig. 1.** The standardized structural equation model on the association among self-perceived burden, resourcefulness, and depression (n = 1018). SPBS, the Self-Perceived Burden Scale; RS, resourcefulness scale; HAMD, the Hamilton Depression Scale. e1-e12, the measurement error of each observed variable to estimate latent variables; e13-e14: the residual that may affect the endogenous latent variables except the exogenous latent variables.

**Table 5**

The unstandardized total, indirect, and direct effects of Resourcefulness on depression with perceived stress as mediator (n = 1018).

Model pathways	estimate	SE	Percentile 95% CI		Bias-corrected 95%CI	
			Lower	Upper	Lower	Upper
Total effect SPBS→HAMD	0.476	0.057	0.359	0.579	0.361	0.582
Indirect effect SPBS→HAMD	0.076	0.028	0.027	0.142	0.023	0.134
Direct effect SPBS→HAMD	0.400	0.062	0.268	0.512	0.273	0.519
SPBS→RS	-0.220	0.076	-0.375	-0.083	-0.372	-0.077
RS→HAMD	-0.340	0.055	-0.450	-0.232	-0.445	-0.226

Bootstrap replicates = 2000; SPBS, the Self-Perceived Burden Scale; RS, resourcefulness scale; HAMD, the Hamilton Depression Scale.

problem-solving strategies, improve their ability to cope with stress. After resourcefulness was added in Equation 3, resourcefulness were significant predictors of depression. This is similar to previous research showing that resourcefulness is one of the most important predictors of mental health and that greater resourcefulness is associated with lower depression [41,42]. Based on Equation 1, Equation 2, and Equation 3, we can conclude that resourcefulness may play a mediating role between self-perceived burden and depression.

From the above, we speculated that self-perceived burden may indirectly affect depression through resourcefulness. A structural equation modeling was used to verify this relationship. According to the goodness-of-fit indexes, with resourcefulness as the mediator, the structural equation modeling analysis of the effect of self-perceived burden on depression indicated that the data supported the theoretical model. It indicated that self-perceived burden had a direct effect on depression, which is consistent with previous studies that a high level of self-perceived burden has a positive effect on depression [43]. In addition, the results showed that self-perceived burden exerted an indirect effect on depression through resourcefulness.

Based on the results from the study reported here, we can confirm there are linkages from self-perceived burden to depression through resourcefulness to provide theoretical support for the role of resourcefulness in promoting mental health. Self-perceived burden has a direct effect on resourcefulness and greater self-perceived burden negatively impacts resourcefulness, thereby increasing the possibility of depression [18]. Consistent with the stress interaction theory proposed by Lazarus and Folkman (1984), when an individual evaluates the stress caused by environmental stimuli, he/she will choose internal and external coping resources and adopt problem-focused and emotion-focused coping strategies to adjust to the stress. When people are faced with difficulties or pressures in their daily activities, those with higher resourcefulness were less likely to have depressive symptoms [44]. It may be through resourcefulness that an individual's elastic defense line can be increased, they can face facts correctly, actively seek help, reduce stress reactions, and improve their ability to handle problems or challenges; At the same time, when facing situations such as stress and illness, intelligence can mobilize internal resources and adopt positive coping methods to offset the negative impact of self-perceived burden on mental health [45]. These findings provide a theoretical reference for rehabilitation nursing. Psychological interventions can be designed according to the theory of resourcefulness as follows: (1) By helping patients understand the basic knowledge of stroke, master emotional control skills, help patients develop problem-solving strategies, improve their ability to cope with stress, and ultimately improve the level of personal resourcefulness. (2) We can use social resourcefulness to help patients improve interpersonal relationships and family coping, so that patients can obtain help from family and society. Rehabilitation nurses should pay attention to improving the resourcefulness of young and middle-aged stroke patients so as to alleviate their self-perceived

burden. Therefore, future research should examine targeted interventions to enhance personal and social resourcefulness to alleviate patients' self-perceived burden and depression, promote the recovery of diseases, and enable them to return to their family and society as soon as possible.

The limitations of this study were as follows: First, the design of the study was cross sectional and study participants were limited to the Henan province. Longitudinal studies with large samples are recommended. Second, the study was limited to verifying the mediating effect of resourcefulness and there may be other possible mediators. Thus, future studies should continue to explore other possible mediators.

## 5. Conclusion

In summary, resourcefulness was found to mediate the effects of self-perceived burden on depression. Medical staff adjust the psychological state of stroke patients based on the theory of resourcefulness, thereby improving their problem-solving ability, actively encouraging patients to establish problem-solving strategies, providing disease rehabilitation knowledge and skills, and promoting the improvement of resourcefulness level.

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## Author contribution statement

Yiru Zhu: Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Haiping Xu; Dandan Ding; Yanjin Liu; Xiaoli Guo : Conceived and designed the experiments.

Lina Guo : Performed the experiments.

Jaclene A. Zauszniewski: Contributed reagents, materials, analysis tools or data; Wrote the paper.

Miao Wei : Contributed reagents, materials, analysis tools or data.

## Data availability statement

Data will be made available on request.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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