# Preparation for future care moderates the relationship between loneliness and depression among Chinese rural older adults: A cross-sectional study

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# Abstract

Background: Loneliness and depression are common mental health concerns among older adults in rural China. Loneliness has been identified as a risk factor for depressive symptoms, while preparation for future care can be a protective factor. Little is known about the complex relationships among these factors in rural older adults. This study aimed to explore whether preparation for future care moderated the association between loneliness and depressive symptoms.

Methods: A total of 481 rural older adults aged 60 years and above were recruited in Shandong, China. Loneliness, preparation for future care, and depressive symptoms were measured. Statistical analyses included d escriptive analysis, univariate analyses, and moderating effects analyses.

Results: Our findings showed that preparation for future care and its related dimensions of gathering information, making decisions, and concrete planning can moderate the relationship between loneliness and depression. When the level of preparation for future care and its dimensions were higher, the effect of loneliness on depressive symptoms was weaker.

Conclusions: As the first study on how preparation for future care moderates the relationship between loneliness and depression in rural older adults, the findings are significant. Preparation for future care should be taken into consideration when interventions are being developed to reduce depressive symptoms in older adults.


# Background

Aging populations are a concern throughout the world, and China has the largest population of any country [1]. By 2018, individuals aged 60 years and over accounted for 17.9% of the population of China [2]. As they age, older adults often suffer from physical dysfunction, loneliness, depression [3], and poor quality of life [4]. Compared with older adults in urban areas, the social and economic conditions of older adults in rural areas are often worse, as they tend to have less education and lower incomes [5]. Furthermore, older adults in rural areas have less access to health care resources and opportunities compared to their urban counterparts [6], which leads to China's rural older population often experiencing poor physical and mental health and a lower quality of life [7, 8]. Moreover, with the increasing urban development in China, most young rural residents have moved to an urban environment, leaving behind a great number of older adults in rural areas [9]. Rural older adults, owing to such factors as poor living conditions, "empty-nest syndrome," and lack of social interactions [9], may also experience more serious health problems.

Depression, is one of the most prevalent mental health issues among older adults [10], and it is becoming a central public health concern. Depression is characterized by low mood, lack of energy, and/or somatic symptoms [11]. As the body ages, mental cognition and physical functioning decline, which may be related to depression [12, 13]. Previous studies indicated that depression could influence physical and mental health, quality of life [4], and suicidal tendencies [14]. However, depression in old age is often seen

as a normal part of aging and neglected by doctors [12]. Thus, it is vital to identify and assess depression and its related factors among older adults.

Loneliness is a subjective emotion related to not having many or good interpersonal relationships [9], and is often experienced by older adults, especially in rural areas. Traditional Chinese culture values filial piety, and older adults have often been taken care of by their adult children in the home. However, as their adult children find jobs and move to urban areas, rural older adults are experiencing empty-nest syndrome, and suffer from more loneliness than older adults in urban areas [9]. A previous cross-sectional study reported that 78.1% of the older population in Anhui Province experienced moderate to severe loneliness [15]. Previous research reported that loneliness could predict depression among older populations [3, 16]. However, as not all older adults who experience loneliness also suffer from depression, some protective factors might exist.

As people age, they face a decline in physical functioning, an increase in chronic diseases, and frailty; thus, preparation for future care (PFC) is necessary to cope with increasing care needs. PFC is a concept developed by Sörensen and Pinquart [17], and is a health-promotion activity that encompasses both thoughts and actions. It includes five factors: awareness of future care needs, gathering information, make decisions, concrete planning, and avoidance of care planning. Older adults who engage in PFC have been shown to have better health outcomes and greater life satisfaction [18]. Sörensen et al. [19] explored whether PFC was related to subsequent mental health (e.g., depression and anxiety), and a two-year longitudinal study indicated that failure to engage in PFC is a remarkable risk factor for depression and anxiety among older populations. It was proposed that the PFC model was based on proactive coping, which could buffer the stress older adults experience from the aging process [20]. Loneliness is a mental stressor [21] often experienced by older adults, and PFC might buffer the negative outcomes of loneliness. However, whether PFC could also moderate the relationship between loneliness and depression among rural older populations has scarcely been explored.

Considering this background, the present study aimed to explore the relationships among loneliness, depression, and PFC in community-dwelling older adults in rural China. Additionally, we examined the moderating effects of PFC on the path from loneliness to depression. Therefore, we first hypothesized that loneliness is a risk factor (H1), whereas PFC is a protective factor (H2), for depression. Subsequently, we also hypothesized that PFC would moderate the relationship between loneliness and depression (H3) among Chinese rural older populations (Figure 1).

# Methods

*2.1. Participants*

This was a cross-sectional study with older adults living in rural communities in Shandong, China, which is a typical northern Chinese province and has one of the largest aging populations in China. Data were collected between March and May, 2015. Household surveys were conducted by trained research assistants, who also read questionnaires to participants if they were illiterate. Individuals included in the

study fulfilled the following criteria: (1) aged ≥ 60 years, (2) had the physical and mental abilities to participate in interviews, and (3) were willing to participate in the study and sign an informed consent form. Individuals who were younger than 60 years old or has serious physical or mental health issues were excluded. Ultimately, a total of 481 participants were recruited. This study was approved by the institutional review board of the School of Nursing, Shandong University (approval number: 2017-R–105).

### *2.2. Measures*

#### *2.2.1. Sociodemographic and physical health characteristics*

Participants' gender, age, marital status, living status, educational background, self-rated financial status, and medical insurance were obtained in this study.

We also collected participants' physical health information by assessing for a number of illnesses and healthy lifestyle indicators (including smoking, drinking, and exercise). As for illnesses, we selected medical disorders reported to be prevalent among older adults and asked participants whether they had experienced one or more of the following medical conditions during the previous year: diabetes mellitus, hypertension, osteoarthritis, liver disorders, kidney disorders, cancer, congestive heart failure, chronic obstructive pulmonary disease, heart attack, gastrointestinal disorders, hearing problems, or ophthalmologic disorders [22].

#### *2.2.2. Loneliness*

Loneliness was assessed with the Chinese version of the UCLA Loneliness Scale (ULS; Version 3) [23]. The ULS consists of 20 items and measures feelings of loneliness using a 4-point Likert scale, ranging from 0 ("never") to 4 ("often"). When summing the item scores, items 1, 5, 6, 9, 10, 15, 16, 19, and 20 are reverse scored. The scores in the present study ranged between 20–80, with higher scores signifying more intense feelings of loneliness. Cronbach's α of the scale was 0.893 in the current study.

#### 2.2.3. Preparation for future care

The short-form of the Preparation for Future Care Needs (PFCN) scale [24, 17] was used in this study. The PFCN short-form has 15 items and 5 dimensions to assess the process of care planning, namely awareness of future care needs (AW), avoidance of care planning (AV), gathering information (GA), making decisions (MD), and concrete planning (CP). The 15-item PFCN has been validated in large samples of older adults, and showed good internal consistency in the current sample (Cronbach's α = 0.879). For the dimensions, Cronbach's α was 0.662 for AW, 0.765 for AV, 0.809 for GA, 0.811 for MD, and 0.847 for CP in this study. Items are rated on a 5-point Likert scale, with a possible range of scores from 3 to 15 for each dimension (3 items). Additionally, the total PFC score includes the four positive planning behaviors (AW, GA, MD, and CP), while the negative planning behavior, AV, is regarded as a single item [24].

#### *2.2.4. Depression*

Depression was evaluated using the Patient Health Questionnaire–9 (PHQ–9) [25], which was developed according to the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV). The PHQ–9 has been widely used in depression screening, and showed good validity, with a Cronbach's α of 0.866 in the current study. It comprises nine items, with higher scores indicating more serious depressive symptoms.

### *2.3. Statistical analyses*

Descriptive analyses, independent *t*-tests, and a one-way analysis of variance (ANOVA) were performed to describe basic patient characteristics and compare the distribution of depression. The correlations of main variables (loneliness, depression, total PFC, and each dimension of PFC) were analyzed using Pearson correlation analyses. The moderating effects were analyzed using the PROCESS macro for SPSS [26]. The bias-corrected 95% confidence interval (CI) was calculated with 5,000 bootstrapping re-samples. If the 95% CI did not contain 0, it indicated that the mediating effect was significant. Likewise, if the 95% CI of the interaction did not contain 0, a significant moderating effect could be established. All statistical analyses were conducted using SPSS22.0. Statistical significance was defined as a two-tailed p-value < 0.05. Additionally, all moderating models were controlled for covariates which significantly correlated with depression in univariate analyses, and the study variables were standardized.

## Results

### *3.1. Basic characteristics and depression levels of participants*

A total of 481 older adults were recruited into the study; however, 45 participants were excluded for having over 15% of the data missing on the PFCN, PHQ–9, or ULS. Thus, data were collected from a total of 436 participants in this study, with a mean age of approximately 70.77 years. A majority of the participants were female (52.3%) and/or had at least one illness (66.5%). Four participants (9.1%) were illiterate. More information is provided in Table 1.

The distribution of depression among participants is also shown in Table 1. By comparison of the means using an independent *t*-test and ANOVA, we found that participants who were female, aged ≥ 80 years, illiterate, lived alone, had a poor self-rated financial status, seldom exercised, and/or had two or more illnesses presented higher depression scores.

### *3.2. Bivariate correlations among main variables*

Table 2 shows the means, SDs, and correlations among the main variables. Bivariate correlations revealed that loneliness was positively correlated with depression ($r = 0.407$, $p < 0.001$). Total PFC scores and scores for each dimension were positively correlated with each other. However, contrary to our hypothesis, except for MD, the total PFC score and each dimension of PFC were not significantly correlated with depression or loneliness. Thus, H1 was supported, while H2 was not.

**Table 2.** Bivariate correlations among the main variables

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | M ± SD |
|---|---|---|---|---|---|---|---|---|
| 1. Loneliness | - | - | - | - | - | - | - | 36.23 ± 9.51 |
| 2. AW | -0.030 | - | - | - | - | - | - | 9.28 ± 2.90 |
| 3. AV | 0.036 | -0.296*** | - | - | - | - | - | 8.89 ± 3.04 |
| 4. GA | -0.072 | 0.404*** | -0.193*** | - | - | - | - | 6.30 ± 2.86 |
| 5. MD | -0.049 | 0.336*** | -0.254*** | 0.684*** | - | - | - | 6.56 ± 3.00 |
| 6. CP | -0.118* | 0.334*** | -0.254*** | 0.690*** | 0.760*** | - | - | 5.89 ± 2.98 |
| 7. Total PFC score | -0.034 | 0.639*** | -0.309*** | 0.859*** | 0.865*** | 0.865*** | - | 28.03 ± 9.48 |
| 8. Depression | 0.407*** | -0.032 | 0.019 | -0.047 | -0.058 | -0.062 | -0.025 | 13.96 ± 4.78 |

*Note:* AW = awareness of future care needs, AV= avoidance of care planning, GA = gathering information, MD = making decision, CP = concrete planning, and PFC = preparation for future care; $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

### *3.3. The moderating effect of PFC on loneliness and depression*

As shown in Table 3, the interaction of total PFC with loneliness was statistically significant (B = 0.009, 95% CI = 0.004–0.013), which means PFC could moderate the relationship between loneliness and depression. Thus, H3 was supported. We further tested the moderating effect of the five dimensions of PFC. Similar to total PFC, GA (B = 0.033, 95% CI = 0.019–0.047), MD (B = 0.027, 95% CI = 0.012–0.042) and CP (B = 0.022, 95% CI = 0.007–0.037) could moderate the relationship between loneliness and depression; however, AW and AV failed to moderate the relationship between loneliness and depression. Thus, Hypotheses 3c, 3d, and 3e were supported, while Hypotheses 3a and 3b were not. The final moderating model is shown in Figure 2.

Furthermore, the significant moderating model was further tested by analyzing the effects of loneliness on depression at different levels of PFC. We divided the total PFC, GA, MD, and CP into three levels: low (mean minus one SD), medium (the mean), and high (mean plus one SD). As shown in Table 4, the effect of loneliness on depression was most severe in the low-level total PFC group, and least severe in high-level group, which was also shown for GA, MD, and CP. The results of a simple slope analysis (Figure 3) also clearly depicted the relationship between loneliness and depression at different levels of total PFC, GA, MD, and CP; thus, the lower the PFC, the stronger the impact of loneliness on depression (the higher the slope).

# Discussion

### *4.1. The main findings*

To our knowledge, this study is the first to explore the relationships among loneliness, depressive symptoms, and PFC among older adults in rural China. This study found that older adults in rural China often experience some degree of loneliness and depression. Loneliness was positively correlated with depressive symptoms, and total PFC, as well as the GA, MD, and CP dimensions of PFC, were shown to moderate the relationship between loneliness and depression. Thus, these findings indicate that older

adults who are well-prepared for future care are less likely to develop depressive symptoms due to loneliness than those who are not well-prepared.

Many previous studies have reported that loneliness is a significant risk factor for depressive symptoms in older populations [27], and our results support the positive correlation between loneliness and depressive symptoms in older adults in rural China. With the rapid development of urbanization in China, a large number of the young rural labor force flows to cities, leading many rural older adults to experience empty-nest syndrome [28], which may be one of the reasons why rural older adults often feel lonely. Compared with the rich and colorful community activities available to older adults in urban areas, the construction of spiritual civilization in rural areas is relatively backward, and the social activities of older adults in rural areas are relatively poor [29], which may be another reason for the high rates of loneliness in rural older populations. Since loneliness is a risk factor for developing depressive symptoms, special attention should be paid to the mental health care of lonely older adults.

Previous studies have found that adequate PFC is a protective factor for depression, and inadequate PFC increases the risk of depression [19]. However, previous studies have not explored the mechanism of how PFC affects depression. The current study found that although PFC is not directly related to depression, it can moderate the relationship between loneliness and depression, which can, to some extent, prevent lonely older adults from developing depressive symptoms. The income of older adults in rural areas mainly comes from farming. As these individuals age, their decreased physical functioning impairs their ability to farm; thus, they lose their primary source of income, and struggle to remain self-sufficient. Traditional Chinese Confucian culture emphasizes filial piety, which means older adults mainly rely on their adult children for their support and care [30]. As a result, rural older adults whose children work in cities often feel there is no one they will be able to rely on in the future. The absence of a source of income and caregivers makes these individuals worry about how they will be able to look after themselves in the future, which can lead to depressive symptoms. Adequate PFC can enable older adults to have a better sense of control over their lives as they age and alleviate their worries about future care. Therefore, depressive symptoms can be prevented to some extent. Furthermore, PFC is essentially a positive coping style for possible difficulties in the future [20], which is widely known to be a buffer between stressors (e.g., loneliness) and adverse outcomes (e.g., depression) [31].

PFC includes five aspects: awareness of future care needs (AW), avoidance of care planning (AV), gathering information (GA), making decisions (MD), and concrete planning (CP). Among them, AW and AV describe thoughts, while GA, MD, and CP describe actions [17]. By analyzing the moderating effects of each aspect, we found that GA, MD, and CP could buffer depression, while AW and AV could not. Therefore, it is not enough for older adults to simply realize the importance of PFC, they must also take specific actions, including collecting relevant information, making decisions, and formulating specific future care plans to truly eliminate worries about their future as they age and prevent depressive symptoms.

### *4.2. Implications*

The results of this study have many important implications. Chinese older adults in rural areas often experience poor living conditions, empty-nest syndrome, and a lack of social interactions [9], which can exacerbate feelings of loneliness and depressive symptoms in older people. Depression can lead to a number of adverse health outcomes and even suicide [14].TheChinese government spends a lot of money every year on the prevention and treatment of depression in the older population [2]. The present study found that PFC could reduce the impact of loneliness on depression, which suggests that education on, and improved public awareness of, PFC in rural areas could help more older adults prepare for care in advance, and thus prevent loneliness from developing into depression. Compared with the large amount of funds invested by the government every year for depression prevention and treatment, PFC education and publicity is relatively simple, easy to operate, and cost-effective, which has important practical significance and provides novel insight for the prevention and treatment of depression in the rural older population of China. Notably, PFC education should not only make older adults aware of the importance of PFC but also teach them how to collect information, make decisions, and make specific plans.

Although the population samples in this study were from China, previous studies in other countries have also found that PFC is an important protective factor for mental health [19]. Therefore, the findings of this study may have international implications for mental health promotion in older populations.

### *4.3. Limitations*

This study has some limitations. First, although we have reported the relationships among loneliness, depression, and PFC, the study had a cross-sectional design; thus, we cannot confirm the causal relationships between variables. For example, loneliness may be a risk factor for depression, but conversely, depressive symptoms may be a predictor of loneliness [32]. Therefore, future research needs to use longitudinal study designs to further explore the causal relationships between variables. Second, in this study, the PHQ–9 was chosen as a measure of depression, which is only a screening tool for depressive symptoms, not the “gold standard” for diagnosing depression. At the same time, all the measurements used were self-report scales, which may cause report bias and recall bias. Third, the geographically may be limited because of the small sample size, and all participants are from just one rural region in Shandong Province. Therefore, multi-center, large-sample studies are needed in the future to ensure the representativeness and generalization of research findings.

## Conclusion

This study found that older adults in rural China often experience some degree of loneliness and depression, and PFC can moderate the relationship between loneliness and depression; when the level of PFC and its dimensions were higher, the effect of loneliness on depressive symptoms was weaker. As a result, older adults who are well-prepared for future care may be less likely to develop depressive symptoms due to loneliness. As the first study on how PFC moderates the association between loneliness and depression in rural older adults, the findings are significant. Although PFC is a protective factor for mental health, the current situation regarding the frequency of use of PFC in rural areas is not optimistic.

In the future, health education on PFC in rural areas may be an effective way to increase the use of PFC among rural older adults, and thus promote their mental health.

## List Of Abbreviations

Preparation for future care (PFC); Hypothesis 1 (H1); Hypothesis 2 (H2); Hypothesis 3 (H3); UCLA Loneliness Scale (ULS); Preparation for Future Care Needs scale (PFCN); awareness of future care needs (AW); avoidance of care planning (AV); gathering information (GA); making decisions (MD); concrete planning (CP); Patient Health Questionnaire–9 (PHQ–9); one-way analysis of variance (ANOVA); confidence interval (CI)

## Declarations

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## References

[1] He X, Song M, Qu J, Guo Y, Cao H, Sun R, et al. Basic and translational aging research in China: present and future. Protein Cell. 2019;10:476–487.

[2] National Bureau of Statistics. Statistical communique on national economic and social development. 2018.http://www.stats.gov.cn/tjsj/zxfb/201902/t20190228_1651265.html.

[3] Zhao X, Zhang D, Wu M, Yang Y, Xie H, Li Y, et al. Loneliness and depression symptoms among the elderly in nursing homes: a moderated mediation model of resilience and social support. Psychiatry Res. 2018;268:143–151.

[4] Zhao X, Zhang D, Wu M, Yang Y, Xie H, Jia J, et al. Depressive symptoms mediate the association between insomnia symptoms and health-related quality of life and synergistically interact with insomnia symptoms in older adults in nursing homes. Psychogeriatr. 2019. doi:10.1111/psyg.12441

[5] Yu P, Song X, Shi J, Mitnitski A, Tang Z, Fang X, et al. Frailty and survival of older Chinese adults in urban and rural areas: Results from the Beijing longitudinal study of aging. Arch Gerontol Geriatr. 2012;54:3–8.

[6] Qu B, Li X, Liu J, Mao J. Analysis of the current situation regarding the aging rural population in China and proposed countermeasures. Popul Health Manag. 2012;15:181–185.

[7] Dong X, Simon MA. Health and aging in a Chinese population: urban and rural disparities. Geriatr Gerontol Int. 2010;10:85–93.

[8] Tian T, Chen Y, Zhu J, Pengling L. Effect of air pollution and rural-urban difference on mental health of the elderly in China. Iran J Public Health. 2015;44:1084–1094.

[9] Wang G, Hu M, Xiao S, Zhou L. Loneliness and depression among rural empty-nest elderly adults in Liuyang, China: a cross-sectional study. BMJ Open, 2017;7:e016091.

[10] Park M, Unützer J. Geriatric depression in primary care. Psychiatr Clin North Am. 2011;34:469–487.

[11] Jhamb, M, Adbel-Kader K, Yabes J, Wang Y, Weisbord SD, Unruh M, Steel JL. Comparison of fatigue, pain, and depression in patients with advanced kidney disease and cancer—symptom burden and clusters. J Pain Symptom Manag. 2019;57:566–575.

[12] Segel-Karpas D, Palgi Y, Shrira A. The reciprocal relationship between depression and physical morbidity: The role of subjective age. Health Psychol. 2017;36:848.

[13] Issing C, Baumann U, Pantel J, Stöver T. The cochlear implant improves cognition and reduces depression in the elderly. Laryngo-Rhino-Otologie 2019;98:11168.

[14] Wang YY, Jiang NZ, Cheung EF, Sun HW, Chan RC. Role of depression severity and impulsivity in the relationship between hopelessness and suicidal ideation in patients with major depressive disorder. J Affect Disord. 2015;183:83–89.

[15] Wang G, Zhang X, Wang K, Li Y, Shen Q, Ge X, Hang W. Loneliness among the rural older people in Anhui, China: Prevalence and associated factors. Int J Geriatr Psychiatry. 2011;26:1162–1168.

[16] Cacioppo JT, Hawkley LC, Thisted RA. Perceived social isolation makes me sad: 5-year cross-lagged analyses of loneliness and depressive symptomatology in the Chicago Health, Aging, and Social Relations Study. Psychol Aging. 2010;25:453.

[17] Sörensen S, Pinquart M. Developing a measure of older adults' preparation for future care needs. Int J Aging Hum Dev. 2001;53:137–165.

[18] Prenda KM, Lachman ME. Planning for the future: A life management strategy for increasing control and life satisfaction in adulthood. Psychol Aging. 2001;16:206.

[19] Sörensen S, Mak W, Chapman B, Duberstein PR, Lyness JM. The relationship of preparation for future care to depression and anxiety in older primary care patients at 2-year follow-up. Am J Geriatr Psychiatry. 2012;20:887–894.

[20] Aspinwall LG, Taylor SE. A stitch in time: Self-regulation and proactive coping. Psychol Bulletin. 1997;121:417.

[21] Weiss RS. Loneliness: The experience of emotional and social isolation. Cambridge: MIT Press; 1973.

[22] Chen YJ, Tsai YF, Ku YC, Lee SH, Lee HL. Perceived reasons for, opinions about, and suggestions for elders considering suicide: elderly outpatients' perspectives. Aging Ment Health. 2014;18:593e599.

[23] Russell DW. UCLA Loneliness Scale (Version 3): Reliability, validity, and factor structure. J Pers Assess. 1996;66:20–40.

[24] Sörensen S, Chapman BP, Duberstein PR, Pinquart M, Lyness JM. Assessing future care preparation in late life: Two short measures. Psychol Assess. 2017;29:1480.

[25] Kroenke K, Spitzer RL, Williams JBW. The PHQ–9: Validity of a brief depression severity measure. J Gen Intern Med. 2001;16:606–613.

[26] Hayes AF. Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. New York: Guilford Press; 2013.

[27] Domènech-Abella J, Mundó J, Haro JM, Rubio-Valera M. Anxiety, depression, loneliness and social network in the elderly: Longitudinal associations from The Irish Longitudinal Study on Ageing (TILDA). J Affect Disord. 2019;246:82–88.

[28] Huang LJ, Du WT, Liu YC, Guo LN, Zhang JJ, Qin MM, Liu K. Loneliness, stress, and depressive symptoms among the Chinese rural empty nest elderly: A moderated mediation analysis. Issues Ment Health Nurs. 2019;40:73–78.

[29] Vogelsang EM. Older adult social participation and its relationship with health: Rural-urban differences. Health Place. 2016;42:111–119.

[30] Guo Q, Gao X, Sun F, Feng N. Filial piety and intergenerational ambivalence among mother–adult child dyads in rural China. Ageing Soc. 2019;1–16.

[31] MacNeill L, DiTommaso E, Brunelle C. Coping style as a moderator of chronic loneliness and substance use in emerging adults. J Depress Anxiety. 2016;5:2167–1044.

[32] Vanhalst J, Klimstra TA, Luyckx K, Scholte RH, Engels RC, Goossens L, 2012. The interplay of loneliness and depressive symptoms across adolescence: exploring the role of personality traits. J Youth Adolesc. 2012;41:776–787.

# Tables

**Table 1.** Basic characteristics and distribution of depression (n = 436)

| Variables | n (%) | Depression (M SD) | F/*t* | *p* |
|---|---|---|---|---|
| Gender | | | 2.154 | **0.032** |
| Female | 228 (52.3) | 14.485.13 | | |
| Male | 208 (47.7) | 13.394.32 | | |
| Age (mean 70.77, SD 7.31) | | | 3.287 | **0.039** |
| 60-69 | 207 (47.5) | 13.344.30 | | |
| 70-79 | 169 (38.8) | 14.284.89 | | |
| ≥ 80 | 60 (13.7) | 15.095.67 | | |
| Education | | | 3.251 | **0.001** |
| Illiterate | 214 (49.1) | 14.805.31 | | |
| Primary school or above | 222 (50.9) | 13.174.09 | | |
| Marital status | | | 1.963 | 0.052 |
| Married | 339 (77.8) | 13.654.34 | | |
| Unmarried (Single/Widowed/Divorced) | 97 (22.2) | 15.065.99 | | |
| Living status | | | 4.286 | **0.014** |
| Alone | 63 (14.5) | 15.836.31 | | |
| With spouse | 266 (61.0) | 13.614.21 | | |
| With spouse and children | 107 (24.5) | 13.824.98 | | |
| Self-rated financial status | | | 12.952 | **0.001** |
| Good | 59 (13.5) | 12.373.54 | | |
| Fair | 311 (71.3) | 13.654.31 | | |
| Poor | 66 (15.2) | 16.686.46 | | |
| Medical insurance | | | 0.946 | 0.345 |
| Yes | 419 (96.1) | 13.914.74 | | |
| No | 17 (3.9) | 15.145.70 | | |
| Smoking | | | 0.999 | 0.319 |
| Yes | 73 (16.7) | 13.394.83 | | |
| No | 363 (83.3) | 14.074.77 | | |
| Drinking | | | 1.179 | 0.239 |
| Yes | 102 (23.4) | 13.415.18 | | |
| No | 334 (76.6) | 14.124.66 | | |
| Exercise | | | 5.827 | **0.003** |
| Usually | 165 (37.9) | 12.864.26 | | |
| Sometimes | 158 (36.2) | 14.474.72 | | |
| Seldom | 113 (25.9) | 14.815.32 | | |
| Number of illnesses (mean 1.17, SD 1.20) | | | 17.501 | **0.001** |

| | | |
|---|---|---|
| 0 | 146 (33.5) | 12.253.62 |
| 1 | 158 (36.2) | 13.844.12 |
| | 132 (30.3) | 15.765.72 |

**Table 3.** The moderating effect of PFC on loneliness and depression

| Moderator: Total PFC | B | SE | *t* | LLCI | ULCI |
|---|---|---|---|---|---|
| Loneliness | 0.151 | 0.023 | 6.593*** | 0.106 | 0.197 |
| Total PFC | -0.044 | 0.024 | 1.814 | -0.004 | 0.091 |
| Loneliness × Total PFC | 0.009 | 0.002 | 3.741*** | 0.004 | 0.013 |
| **Moderator: AW** | | | | | |
| Loneliness | 0.166 | 0.023 | 7.186*** | 0.121 | 0.212 |
| AW | -0.164 | 0.079 | 2.081* | 0.009 | 0.319 |
| Loneliness × AW | 0.007 | 0.008 | 0.822 | -0.009 | 0.023 |
| **Moderator: AV** | | | | | |
| Loneliness | 0.168 | 0.023 | 7.174*** | 0.122 | 0.214 |
| AV | 0.048 | 0.073 | 0.665 | -0.095 | 0.192 |
| Loneliness × AV | 0.003 | 0.007 | 0.439 | -0.011 | 0.017 |
| **Moderator: GA** | | | | | |
| Loneliness | 0.146 | 0.023 | 6.385*** | 0.101 | 0.191 |
| GA | -0.151 | 0.075 | 2.007* | 0.003 | 0.299 |
| Loneliness × GA | 0.033 | 0.007 | 4.583*** | 0.019 | 0.047 |
| **Moderator: MD** | | | | | |
| Loneliness | 0.164 | 0.023 | 7.177*** | 0.119 | 0.209 |
| MD | -0.044 | 0.075 | 0.585 | -0.104 | 0.192 |
| Loneliness × MD | 0.027 | 0.008 | 3.614*** | 0.012 | 0.042 |
| **Moderator: CP** | | | | | |
| Loneliness | 0.149 | 0.024 | 6.331*** | 0.103 | 0.195 |
| CP | -0.120 | 0.079 | 1.509 | -0.036 | 0.276 |
| Loneliness × CP | 0.022 | 0.008 | 2.884** | 0.007 | 0.037 |

*Note:* Covariates (gender, age, education, number of illnesses, living status, exercise, and self-rated financial status) were controlled. PFC = preparation for future care, AW = awareness of future care needs, AV= avoidance of care planning, GA = gathering information, MD = making decision, and CP = concrete planning; B = unstandardized regression coefficient, SE = standard error, LLCI = lower level of confidence interval, ULCI = upper level of confidence interval. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

**Table 4.** Conditional indirect effects of loneliness on depression per PFC levels

| Moderator: Total PFC | | | | |
|---|---|---|---|---|
| | Effect (B) | SE | LLCI | ULCI |
| Low PFC | 0.232 | 0.029 | 0.175 | 0.290 |
| Medium PFC | 0.151 | 0.023 | 0.106 | 0.197 |
| High PFC | 0.070 | 0.034 | 0.004 | 0.137 |
| Moderator: GA | | | | |
| | Effect (B) | SE | LLCI | ULCI |
| Low GA | 0.239 | 0.028 | 0.184 | 0.294 |
| Medium GA | 0.146 | 0.023 | 0.101 | 0.191 |
| High GA | 0.053 | 0.033 | -0.013 | 0.118 |
| Moderator: MD | | | | |
| | Effect (B) | SE | LLCI | ULCI |
| Low MD | 0.243 | 0.031 | 0.183 | 0.303 |
| Medium MD | 0.164 | 0.023 | 0.119 | 0.209 |
| High MD | 0.085 | 0.033 | 0.021 | 0.149 |
| Moderator: CP | | | | |
| | Effect (B) | SE | LLCI | ULCI |
| Low CP | 0.212 | 0.029 | 0.154 | 0.269 |
| Medium CP | 0.149 | 0.024 | 0.103 | 0.195 |
| High CP | 0.091 | 0.033 | 0.026 | 0.157 |

*Note:* Low (mean minus one SD), medium (the mean) and high (mean plus one SD). B = unstandardized regression coefficient, SE = standard error, LLCI = lower level of confidence interval, ULCI = upper level of confidence interval.

# Figures

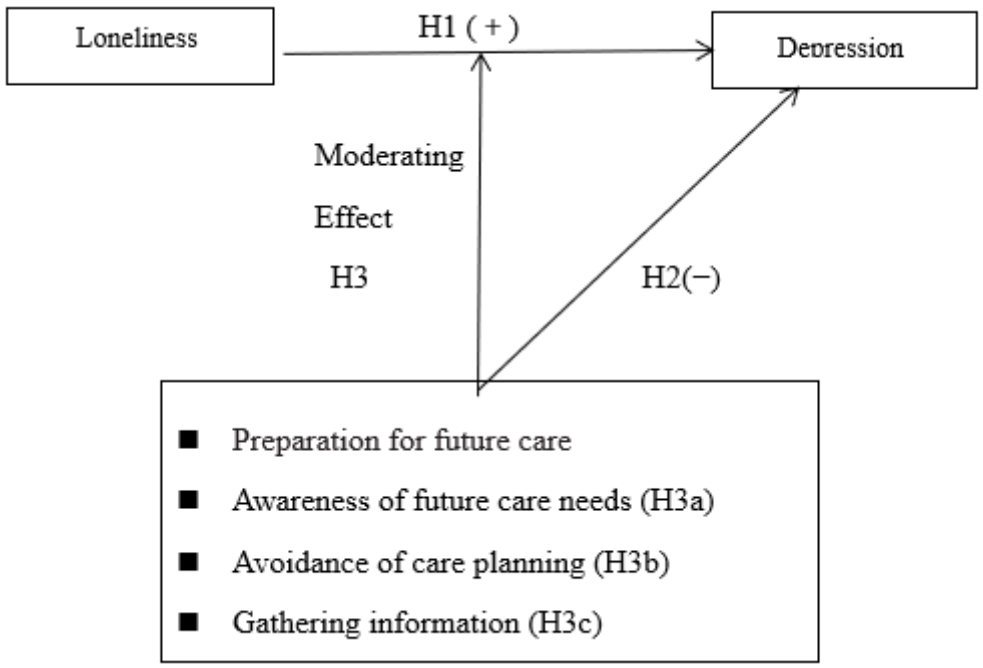
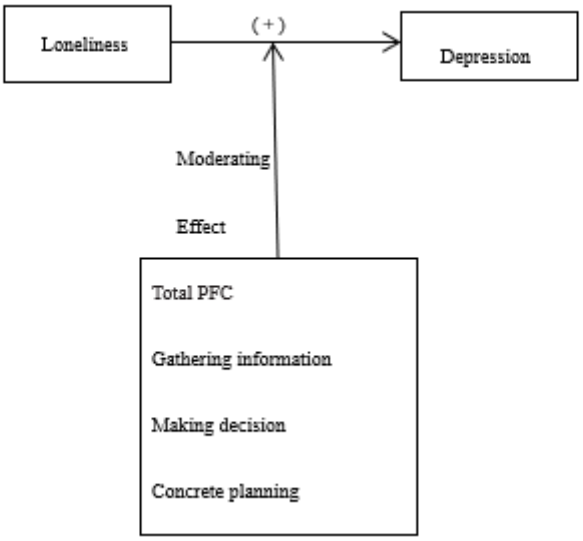


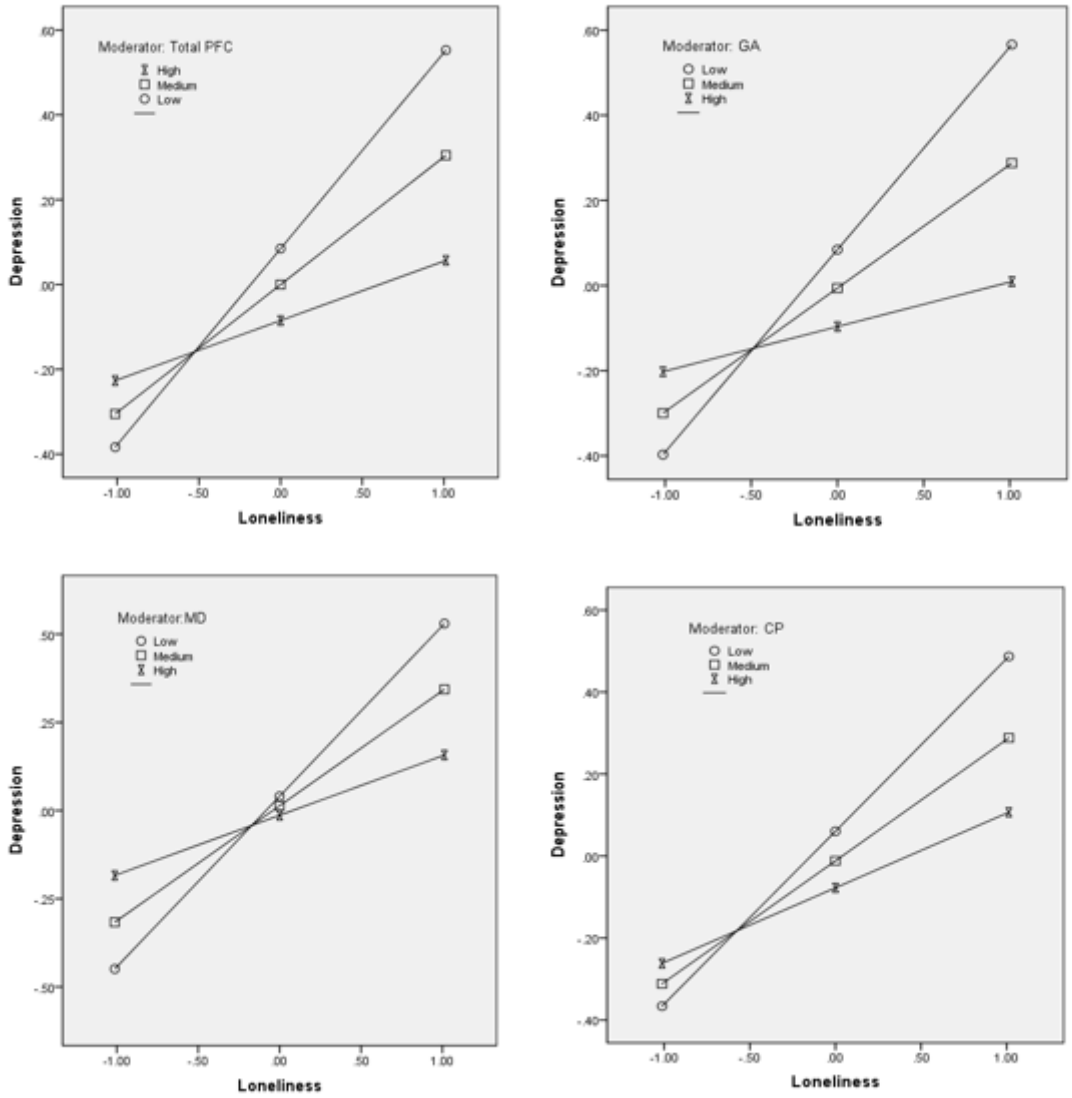

**Figure 1**

Theoretical model (H = hypothesis)




## Figure 2

The final moderating model




## Figure 3

Moderating effects of PFC on the relationship between loneliness and depression Note: low (the mean minus one SD), medium (the mean), and high (the mean plus one SD). PFC = preparation for future care, GA = gathering information, MD = making decision, and CP = concrete planning.