

Grandparenting and life satisfaction among Chinese elderly migrants: Mediating role of loneliness and self-esteem

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Research Article

Keywords: Grandparenting, Life satisfaction, Elderly migrants, Mediation analysis

Posted Date: June 21st, 2022

DOI: <https://doi.org/10.21203/rs.3.rs-1744840/v1>

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Abstract

Background: Grandparenting is a common form of childcare in China. In recent years, the impact of grandparenting on life satisfaction has been widely studied. But we know little about the psychological mechanisms that link them. In addition, few studies have paid attention to elderly migrants who face the dual challenges of aging and migration. Thus, this study aims to examine the relationship between grandparenting and life satisfaction among Chinese elderly migrants, and try to explore the mediating role of loneliness and self-esteem.

Methods: All 723 participants were recruited in Nanjing, Jiangsu Province, China. Firstly, we described the demographic characteristics of the participants. Secondly, we used Spearman's correlation analysis to examine whether there were correlations between grandparenting, loneliness, self-esteem and life satisfaction. Finally, we used the PROCESS Model 6 to complete the mediation analysis.

Results: Elderly migrants had a high level of life satisfaction (26.70 ± 5.47). The proportion of grandparenting was 80.4. Grandparenting was positively associated with life satisfaction among elderly migrants ($r = 0.223, p < 0.001$). The total effect of grandparenting on life satisfaction was 2.965 ($p < 0.001$). Loneliness and self-esteem mediated the relationship between grandparenting and life satisfaction. The total indirect effect was 1.414 (95%CI: 0.849, 2.014) and the ratio to the total effect was 47.7% ($1.414/2.965$). The mediating effect contained three paths: Loneliness ($B = 0.287$; 95%CI: 0.072, 0.563; Ratio= 9.7%); Self-esteem ($B = 0.957$; 95%CI: 0.516, 0.1.404; Ratio= 32.3%); and Loneliness → Self-esteem ($B = 0.170$; 95%CI: 0.040, 0.331; Ratio= 5.7%).

Conclusion: Grandparenting is a common phenomenon among Chinese elderly migrants, and it is a positive predictor of life satisfaction. Loneliness and self-esteem mediate the relationship between grandparenting and life satisfaction.

1. Introduction

Grandparenting has become a common social phenomenon due to the increase in overlapping lives between grandparents and grandchildren, as well as young mothers returning to the workforce[1–3]. In this context, the impact of grandparenting on their physical and mental health has drawn widespread scholarly attention[4, 5]. For example, life satisfaction is one of the hot spots in grandparenting studies and a significant association has been found[5–8]. Population migration is a key issue and a significant factor of Chinese population's sustainable development[9]. In statistics, there are 264 million elderly people, and 13.5 million elderly migrants in China[9, 10]. Prior studies have shown that migration is often accompanied with language and cultural differences, and unfamiliar living environments, which could lead to difficulties in the social integration[11, 12]. Due to the dual threats of aging and migration, elderly migrants suffer a worsen health and well-being than those with no migration experience[11, 13, 14]. Grandparenting is an important reason for the migration of elderly migrants. However, few studies have drawn attention to the impact of grandparenting on life satisfaction among elderly migrants and we

know little about the underlying mechanisms. In China, with the population aging, migration and full opening of the two-child policy, there may be a significant expansion of the size for elderly migrants who will be involved in grandparenting. Thus, we conducted this study aimed at examining the impact of grandparenting on life satisfaction among Chinese elderly migrants, and attempted to explain the underlying mechanisms that link them.

1.1 Grandparenting and life satisfaction

Grandparenting refers to the behavior that grandparents provide care to their minor grandchildren, and invest time, energy, emotion, economy, material and other aspects of support. The role of grandparent is a crucial aspect in later life and most people aged ≥ 50 face this transition[1]. In statistics, almost 50% of grandparents participate in the care for their grandchildren in China[15, 16]. And there is a similar proportion in Europe, although the proportions vary between countries[17]. Life satisfaction reflects the comparison between one's life expectations and actual life situation[18, 19]. As an important indicator of subjective well-being, it also plays an important role in people's lives[20]. Previous studies have found that grandparenting is significantly associated with grandparents' life satisfaction. But the results have yielded inconclusive.

According to the theory of role accumulation[21], multiple roles can bring them more power, prestige and social identity, which may affect their health in a positive pathway. When elderly people become grandparents, they can derive satisfaction and emotional benefits from the grandparenting role[22]. Several studies have found that grandparenting is beneficial to grandparents' health and well-being, including lower depression[8], higher self-reported health[5, 23] and life satisfaction[5, 6, 8]. In contrast, the theory of role strain[24] argues that when a person is in multiple roles, such as spouse, grandparent or colleague, role conflict can put strain on their role obligations. Grandparenting make them suffer negative health outcomes[25, 26]. In addition, some researchers argue that the level of care and regional cultural differences may also influence the effects of grandparenting on health and well-being[27, 28]. For example, in China and some other East Asian countries, multigenerational co-habitation is considered a desirable living arrangement that would promote filial piety and family solidarity, and grandparents regard participating in the care of their grandchildren as a responsibility[8]. Researchers often found that grandparenting is positively associated with health and well-being in studies of East Asian countries[8, 22, 27]. However, in the USA, grandparents would not assume the responsibilities of grandchildren care unless their adult child was in a period of crisis, such as poverty, substance abuse and incarceration[7, 29, 30]. Custodial care is a relatively common phenomenon and is well investigated in these countries[31]. Studies show that custodial care promotes negative effects on grandparents' health and well-being[7, 25]. A recent systematic review shows that custodial grandparents are more likely to report poorer perceived health and higher levels of psychological distress than non-custodial caregivers and non-caregivers in the USA[32]. Furthermore, the intensity of care varied may also influence the effects of grandparenting on health and well-being[33]. For example, (Tang et al., 2016) found that low to medium levels of care were positively associated with life satisfaction compared to high levels of care and no care[4]. (Xu et al.,

2012) found that the intensity of grandparenting was positively associated with grandparents' life satisfaction[34].

1.2 Grandparenting, loneliness, self-esteem and life satisfaction

In addition to the direct impact of grandparenting on grandparents' life satisfaction, it is of great interest to examine the potential mechanisms involved in this pathway. Loneliness is the subjective feeling of inadequate social relations[35]. Up to one-third of elderly people suffer varying degrees of loneliness[36, 37]. In past studies, researchers have found that the feeling of loneliness is a core factor affecting the overall health and well-being of all age groups, especially elderly people, such as higher levels of depression[38], anxiety[39], and lower levels of life satisfaction[40–42]. Grandparenting facilitates the interaction between grandparents and their grandchildren. Previous studies have confirmed that grandparenting is negatively correlated with loneliness. For example, Tang et al.(2016) found that Chinese grandparents who participate in grandchild care had a lower level of loneliness than non-caregivers[4]. Similar result was also found in a German study[43]. Overall, grandparenting may alleviate loneliness and further improve life satisfaction. So, we speculate that loneliness mediates the relationship between grandparenting and life satisfaction among elderly migrants.

Self-esteem can be conceptualized as “self-regard, an evaluation of one's worthiness”[44] and it is an important indicator of a successful life[45]. Several studies have found that there is a significant correlation between self-esteem and life satisfaction[41, 46–48]. This holds for different cultures. For example, a study involving six European countries - the United Kingdom, Sweden, the Netherlands, Luxembourg, Austria, and Italy - showed that self-esteem was significantly associated with life satisfaction on elderly people[48]. Similar results have been found among elderly people in China[46], Poland[47] and Germany[41]. In addition, several studies have shown that loneliness is negatively associated with self-esteem[49–53]. [52] found that people with a high level of loneliness tended to report lower levels of self-esteem. (Çivitci et al., 2009) found that self-esteem can mediate the relationship between loneliness and life satisfaction[49]. In China, due to the "family continuity" complex embedded in traditional culture, grandparents usually regard grandparenting as their responsibilities and an expression of self-worth in later life[54]. A study of 429 Chinese older people found that intergenerational support was associated with life satisfaction, with loneliness and self-esteem playing a partially mediating role[55]. Thus, we speculate that self-esteem may be another important mediator in the relationship between intergenerational care and life satisfaction.

1.3 The current study

From what has been discussed above, we can find that there might be some relationships between grandparenting, loneliness, self-esteem and life satisfaction among elderly people. In addition, loneliness and self-esteem may play crucial roles between grandparenting and life satisfaction. However, few studies have paid attention to elderly migrants who face the dual threat of aging and migration. This

study aims to examine whether these relationships also exist in elderly migrants. To answer this question, we implemented this study and proposed the following four hypotheses:

Hypothesis 1

Grandparenting was positively correlated with life satisfaction among elderly migrants.

Hypothesis 2

Loneliness played a mediating role between grandparenting and life satisfaction among elderly migrants.

Hypothesis 3

Self-esteem played a mediating role between grandparenting and life satisfaction among elderly migrants.

Hypothesis 4

Loneliness and self-esteem co-played a serial mediating role between grandparenting and life satisfaction among elderly migrants.

2. Methods

2.1 Participants

The data in this study came from the Social Science Foundation Project of People's Republic of China "A follow-up study on the mechanism of intergenerational relationship on the mental health of elderly migrants". This project was performed from September 2019 to September 2020 in Nanjing, Jiangsu Province, China. Considering the diverse levels of economic development in each district and the specificity of the research population, the project used a snowball sampling method and participants came from over 20 streets and communities in seven districts of Nanjing. (Qinhuai, Qixia, Gulou, Xuanwu, Jianye, Yuhuatai, and Jiangning District). All participants were informed of the purpose of the study and volunteering to participate. All participants were face-to-face interviewed using a structured questionnaire. All interviewers had medical research background and received uniform and standardized training prior to the project. This study used the first phase survey data of the project. Inclusion criteria were: 1) aged 50 and above; 2) household registration not moved to Nanjing; 3) moved to Nanjing \leq 10 years. Finally, a total of 723 participants were included in this study after screening.

2.2 Measures

2.2.1 Grandparenting

Grandparenting was obtained from a question in the above-mentioned questionnaire by asking "Are you now involved in the care of grandchildren? (0 = No, 1 = Yes)".

2.2.2 Loneliness

The 3-item R-UCLA Loneliness Scale[56] was used to measure loneliness of the elderly migrants. Each item is scored on a scale from 1 (hardly ever or never) to 3 (almost always) and the total score ranges from 3 to 9. Higher scores indicate higher loneliness. The Chinese version[57] has high reliability and validity among elderly. Cronbach's α for the present sample was 0.867.

2.2.3 Self-esteem

Bachman Revision (1970) of Rosenberg's Self-Esteem Scale (RSE-B)[58, 59] was used to measure self-esteem of the elderly migrants. RSE-B consists of 10 items, with items 1, 2, 3, 5, 7, and 9 being reverse-scored in the process of data entry. Each item is scored on a scale from 1 (strongly agree) to 5 (strongly disagree) and the total score ranges from 10 to 50. Higher scores indicate higher self-esteem. Cronbach's α for the present sample was 0.814.

2.2.4 Life satisfaction

Satisfaction with Life Scale (SWLS)[60] was used to measure life satisfaction of the elderly migrants. SWLS contains 5 items. Each item is scored on a scale from 1 (strongly disagree) to 7 (strongly agree) and the total score ranges from 5 to 35. Higher scores indicate higher life satisfaction. The Chinese version[61, 62] has been widely used to measure the life satisfaction of elderly, with satisfactory reliability and validity. Cronbach's α for the present sample was 0.914.

2.2.5 Demographic variables

Demographic data such as age, sex, marital status, education level, religious belief, household registration, retirement pension and yearly income were collected. Marital status was categorized into: divorced or widowed, married and with a spouse. Education level was classified as primary school or lower, junior or senior high school, and college or higher. Yearly income was categorized as: 0-5000¥, 5001-10000¥, 10001-20000¥ and > 20000¥.

2.3 Analytic strategies

All analyses were done in the SPSS 26.0 software and the significance level was set at 0.05 (two-tailed). Firstly, we implemented descriptive analysis to describe the demographic characteristics of the participants. Then, we conducted the Spearman's correlation analysis to examine the correlations between grandparenting, loneliness, self-esteem and life satisfaction, as grandparenting is a dichotomous variable and the others are continuous. Finally, we used the SPSS PROCESS macro 4.0[63] to explore the mediating role of loneliness and self-esteem between grandparenting and life satisfaction with a bootstrap sample of 5000. The mediating effects were significant if the bootstrap 95% CIs did not contain zero.

3. Results

3.1 Descriptive analysis

The demographic characteristics of all 723 participants were shown in Table 1. In this study, the mean age of elderly migrants was 63.74 years old (SD = 5.58, Range = 50–86), 218 (34.2%) were male and 505 (65.8%) were female. The marital status and education level of participants were terrible. 307 (42.5%) were divorced or widowed, and 357 (49.4%) were primary school or lower. In addition, 105 (14.5%) had religious belief, 495 (68.5%) were rural household registration and 435 (60.2%) had retirement pension.

Table 1
Demographic characteristics of participants.

Variables	Category	N	Mean ± SD / Percentage
Age		723	63.74 ± 5.58
Sex	Male	218	30.2%
	Female	505	69.8%
Marital status	Divorced or widowed	307	42.5%
	Married and with a spouse	416	57.5%
Education level	Primary school or lower	357	49.4%
	Junior or senior high school	319	44.1%
	College or higher	47	6.5%
Religious belief	No	618	85.5%
	Yes	105	14.5%
Household registration	Rural	495	68.5%
	Town	228	31.5%
Retirement pension	No	288	39.8%
	Yes	435	60.2%
Yearly income (¥)	0-5000	262	36.2%
	5001–10000	138	19.1%
	10001–20000	102	14.1%
	> 20000	221	30.6%

3.2 Correlation between grandparenting, loneliness, self-esteem and life satisfaction

Results of the Spearman's correlation analysis between grandparenting, loneliness, self-esteem and life satisfaction were presented in Table 2. Elderly migrants had a high level of life satisfaction (26.70 ± 5.47). The proportion of grandparenting was 80.4. Results showed that grandparenting, loneliness, self-esteem and life satisfaction were significantly correlated with each other ($p < 0.001$). Grandparenting was significantly correlated with loneliness ($r = -0.139$, $p < 0.001$), self-esteem ($r = 0.215$, $p < 0.001$), and life satisfaction ($r = 0.223$, $p < 0.001$). Loneliness was significantly correlated with self-esteem ($r = -0.305$, $p < 0.001$) and life satisfaction ($r = -0.340$, $p < 0.001$). Moreover, self-esteem was significantly correlated with life satisfaction ($r = 0.516$, $p < 0.001$). Based on the significant correlations between grandparenting, loneliness, self-esteem and life satisfaction, we further explored the mediating roles of loneliness and self-esteem between grandparenting and life satisfaction in the following section.

Table 2
Means, SDs, Ranges, and correlations between grandparenting, loneliness, self-esteem and life satisfaction.

Variables	Mean	SD	Range	1	2	3	4
1. Grandparenting			0, No; 1, Yes	1			
2. Loneliness	4.02	1.41	3–9	-0.139 ^{***}	1		
3. Self-esteem	37.60	5.15	21–50	0.215 ^{***}	-0.305 ^{***}	1	
4. Life satisfaction	26.70	5.47	5–35	0.223 ^{***}	-0.340 ^{***}	0.516 ^{***}	1

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed).

3.3 Serial mediation model

The mediating roles of loneliness and self-esteem between grandparenting and life satisfaction were shown in Table 3, Table 4 and Fig. 1. In the serial mediation model, grandparenting was entered as the independent variable; life satisfaction as the dependent variable; loneliness and self-esteem as the mediating variables, and age, sex, marital status, education level, religious belief, household registration, retirement pension and yearly income as the control variables.

Table 3 showed that grandparenting had a significant negative effect on loneliness ($B = -0.390$, $p < 0.01$), and positive effect on self-esteem and life satisfaction ($B = 2.077$, $p < 0.001$; $B = 1.551$, $p < 0.001$), meaning that grandparenting could reduce the feeling of loneliness and enhance self-esteem and life satisfaction. Hypothesis 1 was confirmed. Grandparenting was positively correlated with life satisfaction. Loneliness had a significant negative effect on self-esteem ($B = -0.942$; $p < 0.001$) and life satisfaction ($B = -0.734$; $p < 0.001$), implying that reducing loneliness could improve self-esteem and life satisfaction. Self-esteem had a significant positive effect on life satisfaction ($B = 0.461$; $p < 0.001$), implying that higher self-esteem could lead a higher level of life satisfaction.

Table 4 and Fig. 1 showed that the total effect of grandparenting on life satisfaction was significant ($B = 2.965$; $p < 0.001$), meaning that participating in the care of grandchildren can enhance grandparents' life

satisfaction. And the direct effect of grandparenting on life satisfaction decreased when loneliness and self-esteem entered ($B = 1.551$; $p < 0.001$). Besides, the total indirect effect was significant ($B = 1.414$; 95%CI: 0.849, 2.014) and the ratio to the total effect was 47.7% ($1.414 / 2.965$), which meant that loneliness and self-esteem mediated the relationship between grandparenting and life satisfaction. Specifically, the mediating roles of loneliness and self-esteem contained three paths. Path 1 was grandparenting → loneliness → life satisfaction ($B = 0.287$; 95%CI: 0.072, 0.563; Ratio = 9.7%). Hypothesis 2 was confirmed. Loneliness played a mediating role between grandparenting and life satisfaction. Path 2 was grandparenting → self-esteem → life satisfaction ($B = 0.957$; 95%CI: 0.516, 1.404; Ratio = 32.3%). Hypothesis 3 was confirmed. Self-esteem played a mediating role between grandparenting and life satisfaction. Path 3 was grandparenting → loneliness → self-esteem → life satisfaction ($B = 0.170$; 95%CI: 0.040, 0.331; Ratio = 5.7%). Hypothesis 4 was confirmed. Loneliness and self-esteem co-played a serial mediating role between grandparenting and life satisfaction. All three mediating paths were significant because the bootstrap 95% CIs did not contain zero. In addition, through pairwise comparison of the three paths, we found that the effect of path 2 was significantly higher than the other two paths, as the bootstrap 95% CIs did not contain zero.

Table 3
Regression coefficients in the serial mediation analysis.

Result variable	Predictor variable	Fitting index			Significance	
		R	R ²	F	B	t
Loneliness	Grandparenting	0.265	0.070	5.971 ^{***}	-0.390 ^{**}	-2.919
Self-esteem	Grandparenting	0.431	0.186	16.281 ^{***}	2.077 ^{***}	4.495
	Loneliness				-0.942 ^{***}	-7.321
Life satisfaction	Grandparenting	0.567	0.322	30.683 ^{***}	1.551 ^{***}	3.412
	Loneliness				-0.734 ^{***}	-5.677
	Self-esteem				0.461 ^{***}	12.687

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed). B, regression coefficient. Age, sex, marital status, education level, religious belief, household registration, retirement pension and yearly income were analyzed as control variables.

Table 4
The results of the serial mediation analysis.

Path	B	Boot SE	Boot LLCI	Boot ULCI	Ratio
Total indirect effect	1.414 ^a	0.299	0.849	2.014	47.7%
Indirect effect 1 (X → LS → Y)	0.287 ^a	0.125	0.072	0.563	9.7%
Indirect effect 2 (X → SE → Y)	0.957 ^a	0.227	0.516	1.404	32.3%
Indirect effect 3 (X → LS → SE → Y)	0.170 ^a	0.073	0.040	0.331	5.7%
Compare 1 (Indirect effect 1 minus 2)	-0.671 ^a	0.251	-1.153	-0.174	
Compare 2 (Indirect effect 1 minus 3)	0.117	0.083	-0.013	0.304	
Compare 3 (Indirect effect 2 minus 3)	0.788 ^a	0.239	0.310	1.251	

Note: X, Grandparenting; Y, Life satisfaction; LS, Loneliness; SE, Self-esteem. Ratio, the ratio of the indirect effect to the total effect. ^aThe bootstrap 95% CIs not contain zero. Age, sex, marital status, education level, religious belief, household registration, retirement pension and yearly income were analyzed as control variables.

4. Discussion

The main purposes of this study are to examine whether grandparenting affects elderly migrants' life satisfaction and to explore the underlying mechanisms. In line with our expectations, all three hypotheses we presented before were confirmed. Through the Spearman correlation analysis, we found that there was a significant pairwise correlation between grandparenting, loneliness, self-esteem and life satisfaction ($p < 0.001$). Based on these correlations, we further conducted a multiple mediation analysis to explore the underlying mechanisms of grandparenting on life satisfaction. One main finding of this paper is that grandparenting has a positive impact on life satisfaction among elderly migrants, which means that elderly migrants who participate in the care of their grandchildren have a higher level of life satisfaction. Another one is that loneliness and self-esteem partially mediate the relationship between grandparenting and life satisfaction. As shown in Table 4, grandparenting can indirectly predict life satisfaction not only through the single mediating effect of loneliness and self-esteem but also through the serial mediating effect of loneliness → self-esteem. And the single mediating effect of self-esteem is significant stronger than others.

As in hypothesis 1, we find a positive association between grandparenting and life satisfaction among elderly migrants. Due to lack of studies on this particular population, we can only compare our findings with those of the general elderly population and find a similar result[5, 6, 8]. Grandparenting can enhance the interaction between grandparents and their grandchildren, and when they become grandparents, they may derive satisfaction and emotional benefits from the grandparenting role. This also validates the role accumulation theory[21], the role of grandparents can bring them more power, prestige and social identity.

In contrast, the experience of migration for elderly people always brings a range of difficulties, such as language differences, regional discrimination, which may impair their social integration and well-being[11–13]. In this study, we think that these benefits of grandparenting counterbalance the negative effects of migration and the mechanism underlying it is worth exploring. Of course, there are some studies that have found an opposite result to ours[7, 64]. We think this difference is mainly due to the different cultural backgrounds and intensity of care.

As in hypothesis 2 and 3, loneliness and self-esteem partially mediate the relationship between grandparenting and life satisfaction among elderly migrants. Firstly, loneliness mediated the relationship between grandparenting and life satisfaction, with an effect of 9.7%. And self-esteem is 32.3%. A previous study on the impact of intergenerational support on elderly people's life satisfaction showed that loneliness and self-esteem mediated the relationship between intergenerational support and life satisfaction[55]. In addition, some studies found that grandparenting can reduce the feeling of loneliness[4, 43] and improve self-esteem[55]. And some other studies found that loneliness and self-esteem were significantly associated with life satisfaction[40, 41, 46, 48]. In China, due to the influence of traditional family values, grandparents always think that grandparenting is a path to realize their self-worth[54]. And people with higher levels of self-esteem are more adaptable and flexible to the external environment and tend to be more accepting in the face of life's upsets or setbacks[65]. This may be why the single mediating effect of self-esteem is significantly higher than the others (all the bootstrap 95% CIs not contain zero). So grandparenting can reduce loneliness and improve self-esteem. And further enhance their life satisfaction.

As in hypothesis 4, loneliness and self-esteem co-play a serial mediating role between grandparenting and life satisfaction among elderly migrants, with an effect of 5.7%. It means that grandparenting first has a negative correlation with loneliness and then improves self-esteem, which in turn enhance life satisfaction. Several studies have shown that elderly people who participating in the care of grandchildren tend to have a low level of loneliness[4, 43]. In addition, researchers have found that a low level of loneliness predicts a high level of self-esteem among elderly people[47, 66]. Finally, recent studies have shown that self-esteem is positively associated with life satisfaction[46, 47]. Therefore, it is understandable that grandparenting may boost self-esteem by reducing loneliness and ultimately enhance life satisfaction. With this, all four of our hypotheses have been confirmed. This is a contribution to the literature on life satisfaction for elderly migrants that has not been demonstrated previously.

5. Limitations

The cross-sectional research design is one of the main limitations of this study, making it unable to determine causal relationships between variables. In addition, in this study we only considered the effect of grandparenting or not and did not consider the intensity of grandparenting, which may have influenced our results as some studies have reported it as an important factor. Another main limitation is that the key variables in this study were all collected by a self-report method, which may influence the validity.

6. Conclusion

In short, this paper indicates that grandparenting is a common phenomenon among Chinese elderly migrants, and it can positively predict elderly migrants' life satisfaction. Besides, grandparenting can improve the feeling of loneliness and self-esteem, which in turn leads to a higher level of life satisfaction. Although there are some limitations in this study, it also has certain guiding significance for the problems of population migration existing in modern life. The Government should formulate relevant policies to ensure that elderly migrants have equitable access to public health care resources. Communities should take measures to facilitate elderly migrants to step out of their homes and reconstruct their social networks. Children should enhance their care and concern for their elderly parents.

Declarations

Ethics Approval and Consent to Participate

The necessary permission to conduct this study was obtained from the ethics committee of Nanjing Medical University. all methods were carried out in accordance with relevant guidelines and regulations. Moreover, before the individuals fulfilled the questionnaires, we introduced them the study objectives, provided them the necessary explanations about the participants' privacy and confidentiality of their personal information, and obtained their informed consent to participate in the study.

Consent for Publication

Not applicable. The manuscript contains no individual person's identifiable data.

Availability of data and materials

The datasets used during the current study available from the corresponding author on reasonable request.

Competing interests

None.

Funding

This study is supported by the Social Science Foundation Project of People's Republic of China (18BRK026).

Acknowledgement

We thank all investigators and community managers who participated in this work, as well as all elderly migrants who participate in this study.

Authors' Contribution

Hao Wang: Conceptualization, Investigation, Data curation, Formal analysis, Writing– original draft. Man Yang: Formal analysis, Writing– original draft. Xiaoya Fang: Supervision, Writing – review & editing. Yanjie Hou: Investigation, Data curation. Lin Zhang: Investigation, Data curation. Jun Yao: Conceptualization, Supervision, Writing – review & editing, Project administration, Funding acquisition.

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Figures

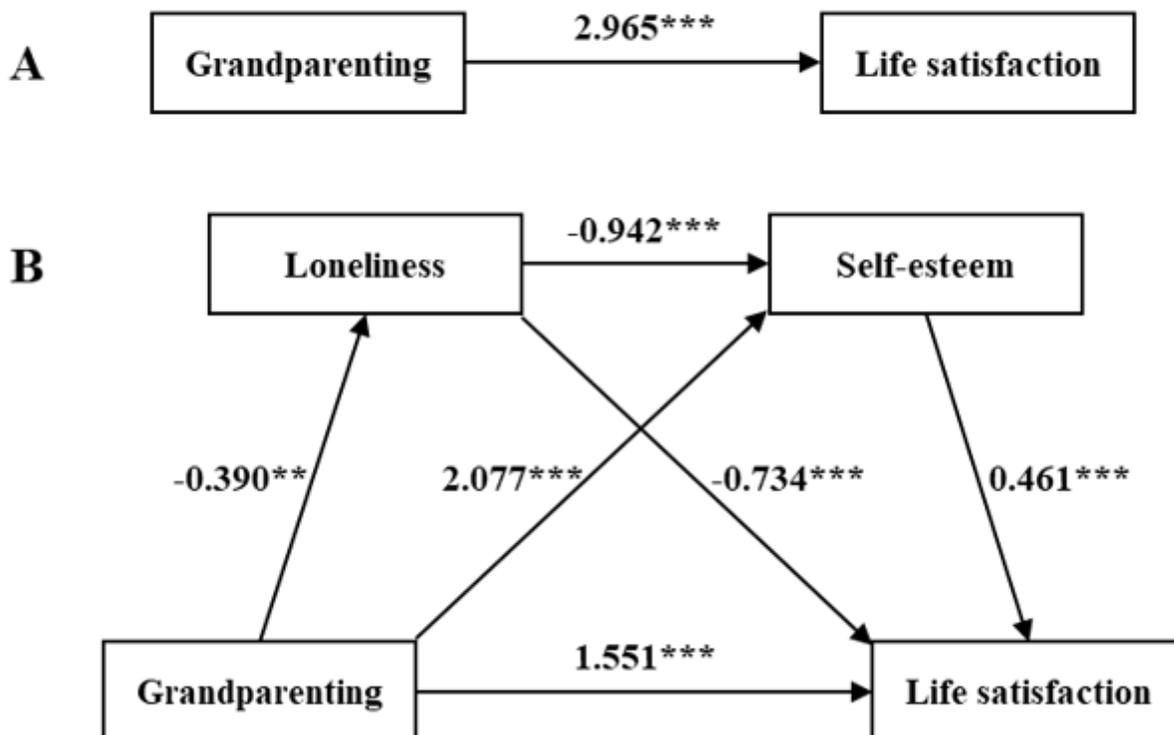


Figure 1

A serial mediation model of the association between grandparenting and life satisfaction through loneliness and self-esteem. Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed).