

Research on the Impact of Digital Participation on the Quality of Life of the Elderly in China

Yangyang Lu*, Songyan Zhang

School of Economics, Zhejiang University of Science and Technology, Hangzhou 310023, Zhejiang, China

**Corresponding author: Yangyang Lu, 1195256044@qq.com*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: Objective: This study aims to explore the impact of digital participation on the quality of life of the elderly in China. Methods: Data processing and analysis were conducted using STATA software. The ordinary least squares (OLS) method and propensity score matching (PSM) method were employed to analyze the impact of digital participation on the subjective and objective quality of life of the elderly, respectively. Robustness tests were performed, and finally, the mediating effect of family intergenerational support between digital participation and the quality of life of the elderly was examined. Results: Digital participation has a positive impact on the quality of life of the elderly. After accounting for selection bias, digital participation can still effectively enhance the quality of life of the elderly. Digital participation has a significantly positive impact on emotional comfort, financial support, and residential Care for the elderly. However, emotional comfort does not significantly affect the overall and objective quality of life of the elderly, while it has a significant impact on their subjective quality of life. Family financial support and residential Care significantly affect both the subjective and objective quality of life of the elderly. Conclusion: The positive impact of digital participation by the elderly on their quality of life is significant. Family intergenerational support (including emotional comfort, financial support, and residential Care) plays a mediating role between digital participation and the quality of life of the elderly. This study provides a reference for improving the quality of life of the elderly and achieving healthy aging.

Keywords: the elderly; digital participation; quality of life

Online publication: August 26, 2025

1. Introduction

China's population aging continues to intensify. Research by Ma Li and Qiao Guojiao (2025)^[1] indicates that by the end of 2023, the elderly population aged 65 and above in China had reached 210 million, highlighting the increasingly prominent phenomenon of aging. Du Peng et al. (2005)^[2] projected that by 2050, the elderly population would exceed 400 million, accounting for over 30% of the total population. Meanwhile, the quality of life for the elderly faces multidimensional challenges. In terms of health, Liu Xiaojun et al.^[3] (2022) pointed out that approximately 78% of the elderly suffer from one or more chronic diseases, with the disabled and semi-disabled population exceeding 40 million. Psychologically and socially, the proportion of empty-nest elderly has reached 56%. Research by Katon WJ et al. (2003)^[4] found a significant increase in the risks of social isolation and depression, making it difficult for traditional elderly care models to meet

current needs. Digital technology offers new possibilities for addressing aging issues. Pu Wenling (2021)^[5] discovered that currently, there are over 110 million internet users aged 60 and above, with the internet increasingly integrating into the lives of the elderly. Braun M.T. (2013)^[6] demonstrated that reasonable digital participation can effectively delay cognitive decline, enhance social connections, and improve the autonomy and happiness of the elderly. Shapira N et al. (2007)^[7] noted that specifically, smartphones and social applications help maintain contact with relatives and friends, reducing the risk of depression; online medical platforms facilitate chronic disease management and alleviate the burden of medical care. Sims et al. (2017)^[8] found that short videos and online courses enrich spiritual and cultural lives and promote cognitive health. These applications significantly improve the quality of life for the elderly in psychological and objective aspects. Therefore, Hypothesis 1 is proposed: Internet use has a positive impact on the quality of life of the elderly.

When exploring the impact mechanism of digital participation on the quality of life of the elderly, the potential crucial role of the family system cannot be overlooked. Sun Jinming (2017)^[9] suggested that intergenerational family support can influence attitudes toward aging. Wang Ping and Li Shuzhuo (2011)^[10] pointed out that family intergenerational support can enhance life satisfaction. Wu Qian and Yao Leye (2020)^[11] indicated that family intergenerational support reduces multidimensional poverty among the elderly. Cong Z and Silverstein M (2008)^[12] demonstrated that family intergenerational support, as a core variable encompassing multiple dimensions such as emotional comfort, financial support, and residential Care, not only reflects the care and feedback from offspring to parents but may also serve as an important bridge connecting digital technology and elderly well-being. It can be inferred that digital participation behavior may not only directly affect the quality of life but may also indirectly influence the quality of life of the elderly by promoting or regulating the flow and quality of family intergenerational support. Therefore, Hypothesis 2 is proposed: Family intergenerational support (including emotional comfort, financial support, and residential Care) plays a mediating role between digital participation and the quality of life of the elderly.

2. Construction of the Indicator System and Data Sources

2.1. Data Sources

The data are sourced from the China Health and Retirement Longitudinal Study (CHARLS) database. This paper utilizes CHARLS data from 2020 and, based on the actual research needs, conducts the following data cleaning procedures: selecting elderly individuals aged 60 and above, excluding samples with missing, incorrectly filled, or non-compliant data for key variables, ultimately resulting in 7,433 valid samples.

2.2. Variable Selection

2.2.1. Explanatory Variable

Digital participation: respondents were asked whether they had used the internet in the past month, with “1” indicating usage and “0” indicating non-usage.

2.2.2. Explained Variable

The explained variable in this paper is the quality of life for the elderly, which is divided into subjective and objective quality of life for the elderly, as shown in **Table 1**.

Table 1. Quality of Life Indicator System for the Elderly

Indicator System	Indicator	Explanation and Assignment
Subjective Quality of Life	Life Satisfaction	Five response options, assigned values 1–5 according to the degree of satisfaction
	Self-Rated Health Status	Four response options, assigned values 1–5 according to the self-rated health condition
	Depression Status	Weighted score from the depression scale (0–30)
Objective Quality of Life	Expenditure	Food Expenditure: Per capita household food expenditure in the most recent week Living Expenditure: Various household expenditures over the past month
	Social Interaction	Social Activities: Sum of the types of social activities the respondent engages in
	Chronic Diseases	Chronic Diseases: Sum of the types of chronic diseases the respondent has
	Living Environment	Access to Tap Water: Assigned a value of 1 if the household has tap water, 0 otherwise
		Access to Bathing Facilities: Assigned a value of 1 if the household has bathing facilities, 0 otherwise Indoor Cleanliness: Assigned a value of 1–5 based on the investigator’s assessment of the level of cleanliness

2.2.3. Control Variables

Table 2. Control Variables Indicator System

Indicator System	Indicator Explanation and Assignment
Age	Range: 60–120 years
Gender	1 = Male, 0 = Female
Residence	1 = Rural, 0 = Urban
Education Level	1 = Below primary school, 2 = Primary school, 3 = Secondary school, 4 = High school or above
Marital Status	1 = Married and living with spouse, 0 = Other
Social Pension Insurance	1 = Has pension insurance, 0 = No pension insurance
Physical Exercise	1 = Exercised in the past week, 0 = Did not exercise in the past week
Number of Children Alive	Weighted sum of Children Alive

2.2.4. Mediating Variable (Family Intergenerational Support)

Family intergenerational support refers to the interactive behaviors between parents and offspring within a family in terms of financial exchanges, mutual assistance in daily life, and emotional care. Drawing on previous literature, this paper selects the following specific indicators: (1) Emotional comfort: An elderly person is considered to have received emotional comfort, assigned a value of 1, if they maintain contact with at least one of their children at least once a week, indicating emotional intimacy; otherwise, a value of 0 is assigned. (2) Financial support: The total financial support provided by all children is summed up and then logarithmically transformed. (3) residential Care: Based on the questionnaire question, “If you need care in your daily life in the future, do you have any relatives or friends who can provide long-term assistance? What is their relationship to you?”, a value of 1 is assigned if the caregiver is a child, daughter-in-law/son-in-law, or grandchild, and a value of 0 is assigned for all other scenarios.

3. Model

3.1. OLS Model

To analyze the impact of digital participation on the quality of life of the elderly, this paper constructs the following OLS model:

$$Y_i = \beta_0 + \beta_1 \text{Inter}_i + \beta_2 \text{Control}_i + \varepsilon_i \quad (1)$$

Equation (1) is used to analyze the impact of digital participation on the quality of life of the elderly. Y_i represents the quality of life level of the i -th elderly individual. The core explanatory variable indicates whether the elderly engage in digital participation, and β_1 is the corresponding parameter to be estimated. Control_i represents control variables, and ε_i is the random disturbance term.

3.2. Mediation Effect Analysis

The econometric model for mediation effect analysis is set up as follows:

$$\text{Quality}_i = a_0 + a_1 \text{Inter}_i + a_n \text{Control}_i + \varepsilon_i \quad (2)$$

$$\text{Mid}_i = b_0 + b_1 \text{Control}_i + \varepsilon_i \quad (3)$$

$$\text{Quality}_i = c_0 + c_1 \text{Inter}_i + c_2 \text{Mid}_i + c_n \text{Control}_i + \varepsilon_i \quad (4)$$

Here, Quality_i represents the quality of life of the elderly, Inter_i is the digital participation variable, Mid_i is the mediating variable related to family intergenerational support, a , b , and c are the regression coefficients corresponding to each variable, Control_i represents the set of control variables, ε_i is the random error term, and **Figure 1** illustrates the mediation effect model diagram in this paper.

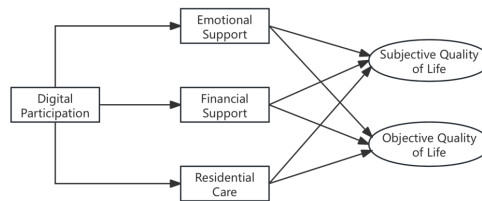


Figure 1. Mediation Effect Model Diagram

4. Empirical Analysis

4.1. Descriptive Analysis

Table 3 presents the descriptive statistics for grouped samples based on internet usage. Through comparative analysis, significant differences were observed between the two groups of elderly individuals across multiple dimensions. Those who used the internet not only enjoyed superior material living conditions but also demonstrated better health status, social participation, and psychological adaptation.

4.2. Benchmark Regression Analysis

Table 4 reports the impact of digital participation on the quality of life among the elderly. Digital participation consistently exhibited a highly significant positive effect across all three models, indicating its general enhancing effect on the quality of life for the elderly. In Model 1, the comprehensive quality of life score for elderly internet users was significantly higher by 0.055 units, with the coefficient being the largest among all variables. This suggests that digital participation is one of the most crucial factors in improving overall quality of life. In Model 2, the coefficient for digital participation was 0.014, indicating that digital participation significantly improved the actual living conditions of the elderly in terms of material conditions and access to public services. In Model 3, digital participation also led to a significant increase of 0.014 units, demonstrating its role in enhancing life satisfaction and self-rated health among the elderly.

Table 3. Univariate Analysis of Internet Usage

Variable	Internet Users (N=1857)		Non-Internet Users (N=5576)		t-value	sig
	Mean	Std. Dev.	Mean	Std. Dev.		
Life Satisfaction	3.279	0.694	3.292	0.797	0.62	
Self-Rated Health	3.058	0.951	2.922	1.032	-4.99	***
Depression Status	7.656	6.088	9.966	6.613	13.29	***
Weekly Per Capita Food Expenditure	180.114	181.848	108.158	123.725	-19.11	***
Monthly Living Expenditure	633.513	632.318	427.107	474.921	-14.85	***
Social Activity Variety	1.106	1.170	0.586	0.805	-21.32	***
Number of Chronic Diseases	0.666	0.993	0.624	0.977	-1.60	
Access to Tap Water	0.946	0.227	0.882	0.322	-7.84	***
Access to Bathing Facilities	0.819	0.386	0.619	0.486	-16.10	***
Indoor Cleanliness	3.487	1.031	2.984	1.064	-17.77	***
Age	66.358	5.035	70.284	6.495	23.78	***
Gender	0.561	0.496	0.477	0.500	-6.26	***
Residence	0.475	0.500	0.763	0.425	24.12	***
Marital Status	0.813	0.390	0.751	0.432	-5.42	***
Education Level	2.599	1.136	1.660	0.907	-36.16	***
Social Pension Insurance	0.896	0.305	0.867	0.339	-3.23	***
Physical Exercise	0.588	0.492	0.461	0.499	-9.52	***
Number of Children Alive	2.520	1.153	3.074	1.303	16.32	***
Emotional Support	0.848	0.359	0.758	0.428	-8.17	***
Financial Support	7.744	2.612	7.496	2.420	-3.75	***
residential care	0.522	0.500	0.461	0.499	-4.57	***

Table 4. The Impact of Digital Participation on the Quality of Life of the Elderly

Variable	Model 1	Model 2	Model 3
	Comprehensive QoL	Objective QoL	Subjective QoL
Digital Participation	0.055*** (0.003)	0.014*** (0.005)	0.014*** (0.005)
Age	-0.001*** (0.000)	0.000 (0.000)	0.000 (0.000)
Gender	-0.003 (0.003)	0.031*** (0.005)	0.031*** (0.005)
Residence	-0.059*** (0.003)	-0.033*** (0.005)	-0.033*** (0.005)
Marital Status	0.005* (0.003)	0.012** (0.005)	0.012** (0.005)
Education Level	0.014*** (0.001)	0.006** (0.002)	0.006** (0.002)
Social Pension Insurance	0.010*** (0.004)	0.005 (0.006)	0.005 (0.006)
Physical Exercise	0.017*** (0.003)	0.002 (0.004)	0.002 (0.004)
Number of Children Alive	-0.002 (0.001)	-0.002 (0.002)	-0.002 (0.002)
Constant	0.336*** (0.016)	0.528*** (0.028)	0.528*** (0.028)
N	7433	7433	7433

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; the same applies below.

4.3. Correcting for Selection Bias: Propensity Score Matching

To mitigate self-selection bias in digital participation among the elderly, this study employed the Propensity Score Matching (PSM) method to reprocess the samples. The results are shown in **Table 5**. The balance test revealed no significant differences in variables between the treatment and control groups after matching, with a reduction in bias exceeding 80%, indicating an ideal matching effect. The probability distribution graph in **Figure 2** further confirmed that the characteristic distributions of the two groups approached each other after matching, with an expanded common support region. The findings suggest that the PSM method effectively reduced selection bias, contributing to a more accurate assessment of the causal effect of digital participation on the quality of life among the elderly.

Table 5. Balance Test Results

Variable Name	Matching Type	Mean		Bias (%)	Bias Reduction (%)	t-value	P-value
		Digital Participation	No Digital Participation				
Age	Unmatched	66.329	70.017	-65.9	96.2	-23.37	0.000
	Matched	66.412	66.271	2.5		0.85	0.398
Gender	Unmatched	0.561	0.478	16.8	85.2	6.23	0.000
	Matched	0.565	0.577	-2.5		-0.75	0.451
Residence	Unmatched	0.476	0.762	-61.6	94.0	-23.88	0.000
	Matched	0.482	0.499	-3.7		-1.03	0.303
Marital Status	Unmatched	0.813	0.757	13.7	81.1	4.97	0.000
	Matched	0.811	0.800	2.6		0.81	0.419
Education Level	Unmatched	2.600	1.665	90.9	97.4	35.82	0.000
	Matched	2.582	2.558	2.3		0.64	0.521
Social Pension Insurance	Unmatched	0.897	0.868	8.9	87.9	3.22	0.001
	Matched	0.896	0.892	1.1		0.34	0.734
Physical Exercise	Unmatched	0.588	0.462	25.4	85.5	9.40	0.000
	Matched	0.583	0.564	3.7		1.12	0.264
Number of Children Alive	Unmatched	2.510	3.021	-43.6	90.9	-15.92	0.000
	Matched	2.526	2.573	-4.0		-1.30	0.195

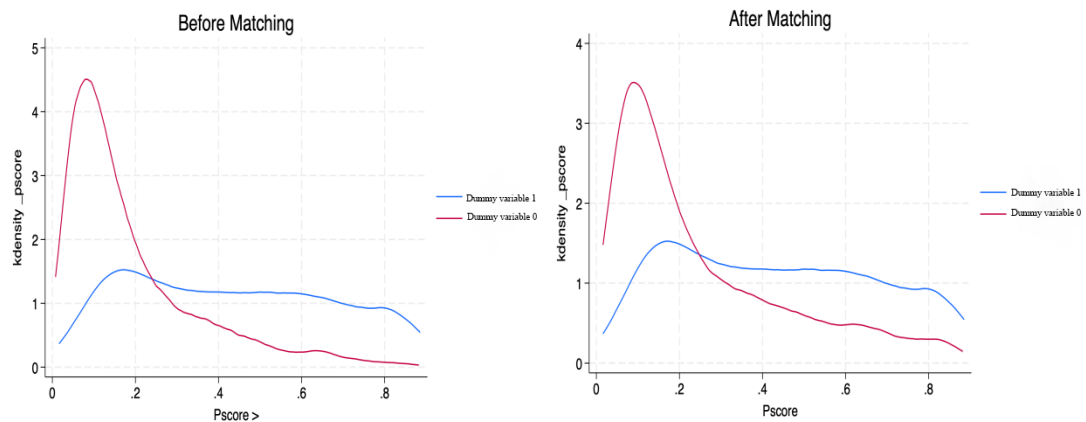


Figure 2. Kernel Density Plots Before and After Propensity Score Matching

4.4. Robustness Test: Excluding Extreme Samples

To verify the reliability of the model results, this study excluded samples of elderly individuals aged 80 and above for a robustness check.

Table 6. The Impact of Digital Participation on the Quality of Life of the Elderly

	Comprehensive Quality of Life	Objective Quality of Life	Subjective Quality of Life
Digital Participation	0.055*** (0.003)	0.060*** (0.004)	0.014*** (0.005)
Control Variables	Yes	Yes	Yes
Constant	0.360*** (0.019)	0.332*** (0.021)	0.589*** (0.033)
N	6980	6980	6980

Table 6 shows that after excluding the potential influence of the oldest-old group, internet use continues to exert a significant positive impact on both the comprehensive and subjective-objective quality of life among the elderly, with coefficients closely aligning with those from the benchmark regression results of the full sample. This further validates the robustness of the findings presented in this paper.

4.5. Mediation Effect Analysis

Table 7 shows the regression results of the mediating effect of family intergenerational support. It can be observed that digital participation significantly impacts emotional comfort, indicating that digital participation can significantly enhance emotional well-being. After incorporating emotional comfort as a mediating variable, digital participation continues to exhibit a significant positive correlation with both the subjective and objective quality of life of older adults. However, emotional comfort does not significantly affect the objective quality of life of older adults but does have a significant impact on their subjective quality of life. Thus, it can be concluded that emotional comfort plays a mediating role between digital participation and the subjective quality of life of older adults. Digital participation significantly increases the levels of economic support and life care provided by family intergenerational support. After introducing children's economic support and life care, digital participation still exhibits a significant positive effect on both the subjective and objective quality of life of older adults. Children's economic support and life care also have significant positive impacts on the subjective and objective quality of life of older adults, respectively. These results confirm that the mediating variables of economic support and life care within family intergenerational support play a mediating role between digital participation and the quality of life of older adults.

Table 7. Mediation Effect Analysis of Family Intergenerational Support

	Emotional Support	Subjective QoL	Objective QoL	Financial Support	Subjective QoL	Objective QoL	Instrumental Support	Subjective QoL	Objective QoL
Digital Participation	0.081*** (0.012)	0.012** (0.005)	0.047*** (0.003)	0.364*** (0.073)	0.013*** (0.005)	0.046*** (0.003)	0.039** (0.015)	0.011** (0.005)	0.047*** (0.003)
Emotional Support		0.027*** (0.005)	0.000 (0.003)						
Financial Support					0.003*** (0.001)	0.004*** (0.000)			
Instrumental Support								0.080*** (0.004)	0.013*** (0.002)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.412*** (0.064)	0.528*** (0.027)	0.335*** (0.015)	5.656*** (0.395)	0.521*** (0.027)	0.315*** (0.015)	0.737*** (0.078)	0.480*** (0.026)	0.326*** (0.015)
N	7433	7433	7433	7433	7433	7433	7433	7433	7433

5. Conclusions and Recommendations

5.1. Research Conclusions

Based on the findings of this study, the following conclusions can be drawn: Firstly, through group comparisons, significant differences were found among older adults in multiple dimensions. The group of older adults using the internet not only holds an advantageous position in terms of material living conditions but also exhibits better health status, social participation, and psychological adaptation. Secondly, digital participation has a positive impact on the quality of life of older adults. After accounting for selection bias, internet use can still effectively enhance the quality of life of older adults. Thirdly, digital participation has a significant positive impact on emotional comfort, economic support, and life care. However, emotional comfort does not significantly affect the comprehensive and objective quality of life of older adults but does have a significant impact on their subjective quality of life. Family economic support and life care have significant impacts on both the subjective and objective quality of life of older adults.

5.2. Policy Recommendations

Based on the above research findings and in conjunction with current social realities, the following policy recommendations are proposed.

Firstly, enhance the popularization of digital infrastructure for the elderly and implement age-friendly adaptations. Currently, many elderly individuals are unable to effectively access the Internet due to factors such as inconvenient device operation, insufficient network coverage, or high costs. It is recommended that enterprises promote the age-friendly design and promotion of smart terminals, developing dedicated devices with features such as large fonts, voice assistants, and one-touch operation. Simultaneously, the coverage of public Wi-Fi should be expanded, particularly providing free and stable Internet services in locations frequently visited by the elderly, such as community activity centers and elderly care institutions, to lower the barriers to use.

Secondly, establish a family-centered digital support and emotional companionship mechanism. Intergenerational family support (emotional comfort, financial support, and residential Care) plays a crucial mediating role in improving the quality of life through digital participation. The government should incentivize children to purchase smart devices or

provide financial support for the elderly through tax incentives or subsidies. Meanwhile, Zhou Yuqiong and Ding Haiqiong (2020) ^[13] proposed leveraging media campaigns to advocate for “digital reverse feeding,” encouraging the younger generation to actively assist their parents and grandparents in integrating into the digital world, providing not only tools but also emphasizing emotional companionship.

Thirdly, incorporate digital participation into the healthy aging strategy, conducting long-term tracking and evaluation. It is recommended that, within the frameworks of “Healthy China” and “Active Aging,” digital participation among the elderly be integrated into the public service evaluation system. Regular surveys should be conducted to track changes in digital behavior and quality of life across different groups, allowing for timely policy adjustments. Additionally, support should be provided to academic institutions and social organizations to conduct relevant research, with a particular focus on the digital inclusion challenges faced by vulnerable elderly groups such as those in rural areas, living alone, or with disabilities, to direct policies and resources towards these populations.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Ma L, Qiao G J, Cai R J, 2025, Research on the Impact of Population Aging on the Development of New Quality Productive Forces. *Northwest Population*, 46(02): 113-126. DOI:10.15884/j.cnki.issn.1007-0672.2025.02.009.
- [2] Du P, Zhai Z W, 2005, Chen W, A Century-Long Development Trend of Population Aging in China. *Population Research*, (06): 92-95. DOI:CNKI:SUN:RKYZ.0.2005-06-016.
- [3] Liu X J, Chen Y T, Meng L L, et al., 2022, The Relationship Between the Number of Chronic Diseases in the Elderly and Health-Related Quality of Life in China. *Medicine and Society*, 35(08): 73-77+83. DOI:10.13723/j.yxysh.2022.08.014.
- [4] Katon W J, Lin E, Russo J, et al., 2003, Increased Medical Costs of a Population-Based Sample of Depressed Elderly Patients. *Arch Gen Psychiatry*, 60(9): 897-903.
- [5] Piao W L, 2021, A Study on the Differences in the Digital Divide Among the Elderly Under the Basic National Conditions of Aging—Based on Data from the 2017 China Comprehensive Social Survey. *Journal of Nanning Normal University (Philosophy and Social Sciences Edition)*, 42(05): 68-81. DOI:10.16601/j.cnki.issn2096-7349.2021.05.007.
- [6] Braun M T, 2013, Obstacles to Social Networking Website Use among Older Adults. *Computers in Human Behavior*, 3: 673-680.
- [7] Shapira N, Barak A, Gal I, 2007, Promoting Older Adults’ Well-Being through Internet Training and Use. *Aging & Mental Health*, 11(5): 477-484.
- [8] Sims T, Andrew E R, Dawn C C, 2017, Information and Communication Technology Use Is Related to Higher Well-Being among the Oldest-Old. *The Journals of Gerontology: Series B*, 72(5): 761-770.
- [9] Sun J M, 2017, The Impact of Intergenerational Support from Children on the Self-Perception of Aging Among the Elderly—Based on Analysis of Data from the 2014 China Longitudinal Aging Social Survey. *Population and Development*, 23(04): 86-95. DOI:CNKI:SUN:SCRK.0.2017-04-010.
- [10] Wang P, Li S Z, 2011, A Longitudinal Analysis of the Impact of Intergenerational Support on Life Satisfaction Among Rural Elderly. *Population Research*, 35(01): 44-52. DOI:CNKI:SUN:RKYZ.0.2011-01-003.
- [11] Wu Q, Yao L Y, 2020, A Study on the Impact of Intergenerational Support from Children on Multidimensional Poverty Among Rural Elderly. *Rural Economy*, (04): 51-59. DOI:CNKI:SUN:NCJJ.0.2020-04-008.
- [12] Cong Z, Silverstein M, 2008, Intergenerational Time-for-Money Exchanges in Rural China: Does Reciprocity Reduce Depressive Symptoms of Older Grandparents? *Research in Human Development*, 5(1): 6-25.

- [13] Zhou Y Q, Ding H Q, 2020, A Study on the Current Situation and Influencing Factors of Digital Reverse Feeding Across Three Generations in Chinese Families. *Journal of International Communication*, 42(03): 6-31. DOI:10.13495/j.cnki.cjjc.2020.03.001.

Publisher's note

Whioce Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.