

Effect of Socioeconomic Status on the Physical and Mental Health of the Elderly: The Mediating Effect of Social Participation

Yunfan Zhang

Huazhong University of Science and Technology

Dai Su

Huazhong University of Science and Technology

Yingchun Chen (✉ chenyingchunhust@163.com)

Research Centre for Rural Health Service, Key Research Institute of Humanities & Social Sciences of Hubei Provincial Department of Education

Min Tan

First Affiliated Hospital of Guangzhou Medical University

Xinlin Chen

Huazhong University of Science and Technology

Research Article

Keywords: socioeconomic status, mediating effect, social participation, elderly health

Posted Date: September 20th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-832285/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

Version of Record: A version of this preprint was published at BMC Public Health on March 29th, 2022. See the published version at <https://doi.org/10.1186/s12889-022-13062-7>.

Abstract

Background: Many studies have shown that socioeconomic status and social participation are important factors affecting the health status of the elderly. However, the specific mechanism and path are unclear. This research aimed to investigate the mediating effect of social participation on the association between the socioeconomic status and the health status of the elderly.

Methods: A total of 2018 waves of the Chinese Longitudinal Healthy Longevity Survey were obtained, including 10 197 elderly people over 65 years old. Bootstrap method was adopted to examine the mediating effect of social participation on the relationship of the socioeconomic status with the physical and mental health of the elderly. Socioeconomic status included three dimensions: income, education level, and main occupation before retirement. The physical and mental health of the elderly were measured with the Instrumental Activities of Daily Living Scale (IADL) and the Minimum Mental State Examination (MMSE). The social participation of the elderly was the mediator variable, including group exercise and organised social activities.

Results: The average scores of IADL and MMSE were 17.98 and 23.04, respectively. Group-exercise participation had a mediating effect between socioeconomic status and physical health of the elderly, and the highest proportion of the mediating effect of each subdimension was 62.84% (95% CI = 0.165, 0.285). The highest proportion of the mediating effect of group-exercise participation on the mental-health status of the elderly was 16.70% (95% CI = 0.072, 0.153). The mediating effect of interacting with friends between the socioeconomic status and the physical health of the elderly was 30.69% (95% CI = 0.037, 0.196) in each subdimension and 15.46% (95% CI = 0.012, 0.169) in mental health. Participation in organised social activities had a mediating effect only between the socioeconomic status and the physical health of the elderly, and the highest proportion of the mediating effect in each dimension was 13.97% (95% CI = 0.014, 0.088).

Conclusion: The socioeconomic status of the elderly plays a mediating role in the process of influencing the physical and mental health of the elderly by participating in group exercise and organised social activities, as well as actively interacting with friends. It can significantly adjust the adverse effects of a disadvantaged socioeconomic status on improvements in physical and mental health to achieve better health outcomes.

1. Background

Ageing is an important issue that cannot be ignored in modern Chinese society. The population aged 60 and over exceeds 260 million, accounting for 18.70%. The elderly population in China is expected to exceed 300 million and step from mild ageing into moderate ageing before 2025. As an important basis for ensuring the daily life and social activities of this large group, improving the health status of the elderly is a very critical issue. Actively coping with population ageing and improving the health status of the elderly has become a national strategy for every country. Accordingly, the factors affecting the physical and mental health of the elderly have always been the focus of scholars' research. The theory of health production proposed by Grossman^[1] indicates that health may be affected by health care, income level, lifestyle,

education level, and living environment, amongst others. Amongst all these factors, socioeconomic status (SES) has received increased attention in recent years.

SES is defined as an individual or group's position within a hierarchical social structure, reflecting the social class and status of different groups^[2, 3]. It is a comprehensive indicator of income level, education level, occupational status, and wealth, and these resources may enable people to achieve certain goals^[4]. It is also an important indicator to measure and predict people's behaviour^[5]. Research on the relationship between SES and health could be traced back to the 1950s. Most early studies have focused on the role of structural factors, i.e., SES affects personal health through health literacy, accessibility of medical services, and living environment^[6]. In recent years, the influence of SES on health has been extended to lifestyle factors, social psychological factors, and other aspects. Marmot^[7] found that SES affects health through social gradient, income, social exclusion, education, psychological status, and other factors. People with lower SES have lower autonomy to work, corresponding to easier generation of pressure and negative emotions. Cristine et al.^[8] believed that people with adverse SES are more likely to fall into a negative environment, have negative emotions, and suffer from potential stress, all of which have a negative impact on health. SES also reportedly affects health through interaction across different factors^[9], including exposure to environmental toxins, air and water pollution, ambient noise, employment in jobs with a high risk for injury or disability, lack of health insurance or access to high quality and preventative health care, and poor nutrition, as well as adverse health behaviours such as smoking, excessive alcohol intake, sleeping patterns, and physical inactivity^[10-12]. Warr^[13] believed that SES often affects individual lifestyle and health status through the joint action of local culture, neighbourhood environment, or social and psychological factors. For example, people with high psychological stress and negative emotions are more likely to smoke and drink alcohol, thereby affecting their health. The research above has revealed the close relationship of the SES with the physical and mental health of the elderly, but the specific impact mechanism and path remain unclear.

The Anderson model^[14, 15] indicates that predisposing factors and enabling factors affect health outcomes through health behaviours. As an important element of predisposing factors, SES has also been shown to have a significant impact on health outcomes. Health behaviours include personal self-care and health service utilisation. In self-care behaviours, the social participation behaviours of the elderly are gradually receiving increased attention, which may play an important role in the process by which SES affects health outcomes. No clear and unified definition of social participation exists^[16]. The social participation of the elderly is generally believed to be primarily reflected in three aspects. First, from the perspective of role intervention, it emphasises that elderly people play a meaningful social role in leisure or productive activities^[17]. This definition reflects the identity and role attribution of the elderly in the process of social participation. Second, from the perspective of social interaction^[18], it emphasises interaction with people other than spouses in formal or informal occasions^[19]. This definition usually regards social communication and interaction as the core components of social participation of the elderly. Third, from the perspective of function exertion, social participation of the elderly is defined as their meaningful participation in social and productive activities^[20] or as engaging in activities involving personal actions and contributions to others. Many studies have shown that social participation can significantly affect the physical and mental health of the elderly, and that more social participation can significantly reduce the risk of death or disability^[21-24]. It is

believed to be a crucial component of positive ageing^[25]. Activities such as visiting relatives and friends or chatting with friends and relatives are related to longevity^[26]. Some studies have also revealed that social participation can effectively reduce the risk of depression in the elderly, and that active social participation can significantly prevent and alleviate depression and improve their mental health^[27-30]. Based on the activity theory, the elderly could find their identities and meaning through social roles, leading to vitality in their lives^[31]. At the same time, some scholars have found that factors such as income, occupation, and education can significantly affect the level of individual social participation^[32, 33].

Therefore, based on the Anderson model, this study aimed to determine the impact mechanism of SES on the physical and mental health of the elderly from the perspective of social participation of the elderly, as well as to explore the mediating effect of social participation. Based on existing research results, the hypotheses of this article are as follows.

Hypothesis 1

Higher SES of the elderly has a positive impact on their social participation.

Hypothesis 2

Greater social participation of the elderly has more positive effects on their physical and mental health.

Hypothesis 3

Higher SES of the elderly has more positive effects on their physical and mental health.

Hypothesis 4

The degree of social participation of the elderly exerts a mediating effect on the path through which the social and economic status of the elderly affects physical and mental health.

2. Materials And Methods

2.1. Sample

The data for this study were obtained from the cross-sectional data of the 'Chinese Longitudinal Healthy Longevity Survey (CLHLS)' co-developed by the Chinese Center for Disease Control and Prevention and the Research Center for Healthy Ageing and Development of the National Institutes of Development of Peking University in 2018. Since 1998, the research centre had randomly selected about half of the counties and cities in 23 provinces, cities, and autonomous regions in China for eight follow-up surveys, A total of 113 000 home visits were conducted, covering many research contents related to the family SES, daily living conditions, insurance, and health of the elderly aged over 65^[34, 35]. This study used the cross-sectional data from the latest seventh wave survey in 2018. Initially, 12 874 samples were included. After identifying and deleting duplicate values, missing values, and outliers with logical problems, 10 197 valid samples were obtained. The samples were well representative.

2.2. Variables and instruments

SES: The SES of the elderly was measured using three variables, namely, annual household income, education level, and main occupation before retirement. Most people aged over 65 no longer had a fixed salary but were supported by their children after retirement, so the annual family income served as an indicator to measure the economic level of the elderly. This indicator has also been proven to be well representative^[36]. Education level ranged from illiteracy to senior and above. The classification of occupations was based on International Standard Classification of OECD (ISCO-88). Government staff and professional technicians were white-collar workers, and those engaged in business and service industry were blue-collar workers. The sample size of respondents engaged in agricultural production was too large, so it was treated as a separate category in this study.

Health outcomes: Instrumental Activities of Daily Living Scale (IADL) was used to measure the physical health of the elderly. IADL included eight indicators, such as visiting neighbours, shopping, cooking, washing clothes, and walking 1 km. The options for each indicator were assigned to '1 = needs a lot of help', '2 = needs some help', and '3 = no need for help', with a higher score indicating better physical health. The mental-health status of the elderly was measured with the results of the Minimum Mental State Examination (MMSE), which was developed by Folstein^[37] in 1975. The cognitive scale used in this survey was slightly modified from the Li Ge scale for the elderly^[38] and were calculated based on the respondents' scores on all 24 questions, except C2-2 in section C (Competency test) of the questionnaire. The scale was modified as follows: (1) six time–place-oriented questions were reduced, and the elderly were not required to answer the name of their province (city), county (district), township/town (street), 'what floor are we on now', and other questions that were not closely related to their daily life; and (2) in the language test question, 'say a complete sentence' was changed to 'the number of food names spoken in one minute'. The maximum score of this question was 7 points: 1 point for one food name, 2 points for two food names, and 7 points for seven or more food names. Thus, the total score was still 30 points. Higher scale score indicated better cognitive function. The Cronbach coefficient of the modified scale was 0.984^[39]. When calculating the MMSE score, this study adopted the MMSE calculation method of published articles and the cognitive function algorithm of the Chinese Elderly Health and Longevity Survey with the same CLHLS survey data^[40].

Mediating variables: According to the definition of social participation by Bath and other scholars^[41], the social participation of the elderly was divided into group exercise (square dance, taichi, etc.), organised social activities (volunteer activities, outings, etc.) and interacting with friends (playing cards/mahjong, etc.). All three variables were continuous variables. A higher score meant more activities and deeper degree of social participation.

Control variables: These variables included sociodemographic characteristics (including age, sex, and marital status), district, urban and rural areas, distance to the nearest medical institution, and medical insurance status. The variable definition and assignment were shown in Table 1.

Table 1
Variable definition and assignment

Independent variable	Variable definition and assignment
Socioeconomic status	
Income	Annual household income. 0 = less than 10000 yuan (Very low-income); 1 = 10000–30000 yuan (low-income); 2 = 30000 – 90000 yuan (medium income); 3 = 90000 yuan of above (high income)
Education	The highest degree so far. 0 = illiteracy; 1 = primary; 2 = junior; 3 = senior and above
Occupation	Work before retirement. 0 = agriculture; 1 = governmental & professional; 2 = commercial & service
Health outcomes	
IADL	Value range: 8–24 points
MMSE	Value range: 0–30 points
Mediating variables	
Group exercise	Such as square dance/Taichi etc.; Value range: 0–15 points
Organized social activities	Such as volunteer etc.; Value range: 0–5 points
Interact with friends	Such as play cards/mah-jongg etc.; Value range: 0–10 points
Covariate	
Age	0 = under 74 years old; 1 = 75–84 years old; 2 = 85–94 years old; 3 = 95 years of age or older
Gender	0 = male; 1 = female
Residential address	0 = city; 1 = town; 2 = rural
Marital status	0 = married and living with spouse; 1 = separated (widowed or divorced)
District	0 = East ; 1 = Central; 2 = West;
Accessibility of health services	The distance of the nearest hospital from home . 0 = within 1 km; 1 = 1–3 km; 2 = up to 3 km;
Medical insurance	0 = no; 1 = yes;
Old insurance	0 = no; 1 = yes;

2.3. Data-analysis methods

Descriptive statistics were used to analyse the scores of the physical and mental health of the elderly in different income levels, education levels, and occupations, as well as to compare the differences of scores amongst different groups. At the same time, the quantity distribution of various activities participated in by the elderly with different SES was expounded. On this basis, multiple linear-regression model was used to analyse the effects of different types of social participation on the physical and mental health of the elderly (Fig .1).

On the choice of the test method for the mediating-effect parameter, based on the research results of Preacher and Hayes^[42, 43], combined with the data characteristics of the variables included in the present study, we used bootstrap method to test the mediating effect and set the dummy variable for multiclass independent variable. Bootstrap sampling was set as 5000. Confidence interval was 95%. The mediating effects of different social-participation behaviours on the SES and physical and mental health of the elderly were calculated. The indirect effect was significant when zero was not between the lower and upper confidence limit.

The data were analysed using SPSS 26.0 and Stata 15.0.

3. Results

3.1. Health status and social participation

In terms of physical health, the average IADL score was 17.98, and the physical health of the respondents was in the middle level. As shown in Table 2, from the perspective of different SES, the IADL scores of the elderly with a family income of less than 90 000 Yuan were slightly lower than the average, and no significant difference existed in IADL scores amongst the elderly with different income levels ($p = 0.203$). The scores of physical-health status of the elderly with primary education level and above were significantly higher than the average level. A significant difference existed in IADL score amongst the elderly with different education levels ($p < 0.001$). In terms of occupation, the IADL scores of the elderly who were engaged in agricultural production activities before retirement were slightly lower than the average level. Significant differences existed in IADL scores amongst the three categories of the elderly who were engaged in administrative or professional technical work ($p < 0.001$).

Table 2
Health status of the elderly with different socioeconomic status

SES	N	IADL			MMSE		
		Mean	Std. Dev.	p value	Mean	Std. Dev.	p value
income(I)							
< 10000	3134	17.91	6.21	0.203	22.34	8.61	< 0.001
10000–30000	1921	17.82	6.37		22.25	9.04	
30000–90000	2700	17.97	6.43		23.47	8.39	
> 90000	2422	18.20	6.27		24.09	7.94	
education							
illiteracy	5040	15.68	6.27	< 0.001	19.66	9.21	< 0.001
primary	3168	19.82	5.60		25.67	6.66	
junior	993	21.25	4.95		27.65	4.70	
senior and above	996	20.46	5.58		27.69	5.70	
occupation							
agriculture	6981	17.65	6.27	< 0.001	22.11	8.76	< 0.001
governmental & professional	1275	19.33	6.15		26.27	6.63	
commercial & service	1941	18.26	6.44		24.24	8.04	
Total	10197	17.98	6.32		23.04	8.52	

In terms of mental-health status, the 10 197 seniors included in the study had a mean MMSE score of 23.04, indicating good overall mental health. From the perspective of different SES, the MMSE scores of the elderly with different income levels, different education levels, and different occupations were significantly different ($p < 0.001$). Higher income levels and higher education levels corresponded with higher MMSE scores. The MMSE scores of older adults in administrative or professional technical jobs were also significantly higher than those of the other two occupational groups ($P < 0.001$).

Social participation of the elderly with different socioeconomic status was shown in Table 3. In terms of social participation, the level of social participation of the aged group was not high, and the average scores of the three social-participation activities were 4.20, 1.29, and 4.13, respectively. Significant differences existed in the level of group exercise and organised social activities amongst different income groups ($p < 0.001$). Pair comparison showed that the level of activity participation of the high-income group was significantly higher than that of the low-income group ($p < 0.001$), and no significant difference existed amongst the elderly with different income levels ($p < 0.001$). Significant differences existed in group exercise, organised social activities, and interacting with friends amongst the elderly with different education levels ($p < 0.001$). The level of the former two activities increased with increased education level. From the perspective

of the respondents' occupations, significant differences existed in the two types of social participation (group exercise and organised social activities) amongst the groups with different occupations ($p < 0.001$). Administrative and professional and technical personnel continued to have higher levels of social participation than older persons in the other two categories of occupations.

Table 3
Social participation of the elderly with different socioeconomic status

SES	N	Group exercise			Organized social activities			Interact with friends		
		Mean	Std. Dev.	p value	Mean	Std. Dev.	p value	Mean	Std. Dev.	p value
income(¤)										
< 10000	3134	3.89	1.77	< 0.001	1.19	0.740	< 0.001	4.1	2.223	0.649
10000–30000	1921	4.02	1.798		1.17	0.660		4.12	2.251	
30000–90000	2700	4.37	2.042		1.35	0.932		4.18	2.343	
> 90000	2422	4.58	2.174		1.45	1.053		4.12	2.251	
education										
illiteracy	5040	3.72	1.564	< 0.001	1.11	0.585	< 0.001	3.67	2.072	< 0.001
primary	3168	4.33	1.995		1.27	0.832		4.56	2.364	
junior	993	5.05	2.394		1.64	1.239		4.85	2.39	
senior and above	996	5.42	2.365		1.89	1.293		4.36	2.284	
occupation										
agriculture	6981	3.92	1.752	< 0.001	1.15	0.652	< 0.001	4.12	2.255	0.822
governmental & professional	1275	5.00	2.317		1.71	1.245		4.14	2.285	
commercial & service	1941	5.00	2.317		1.52	1.096		4.16	2.299	
Total	10197	4.20	1.971		1.29	0.871		4.13	2.267	

3.2. Test of correlation of variables

As shown in Table 4, the correlation test revealed that except for interacting with friends, other variables showed significant correlation ($p < 0.001$).

Table 4
:Test the correlation of variables

Variable	a	b	c	d	e	f	g	h
Income (a)	1							
Education (b)	0.274***	1						
Occupation (c)	0.346***	0.409***	1					
Group exercise (d)	0.140***	0.293***	0.185***	1				
Organized social activities (e)	0.124***	0.282***	0.203***	0.360***	1			
Interact with friends (f)	0.006	0.155***	0.006	0.336***	0.227***	1		
IADL (g)	0.017**	0.316***	0.056***	0.349***	0.232***	0.517***	1	
MMSE (h)	0.085***	0.355***	0.127***	0.282***	0.195***	0.404***	0.691***	1
*** $p < .01$, ** $p < .05$, * $p < .1$								

3.3. Analysis results of mediating-effect test

3.3.1. Test of the mediating effect of participation in group exercise

Compared with the very low-income group, older people with higher income levels were more likely to have better health outcomes by participating in group exercise (Table 5). The intermediary effect accounted for 37.23% of the total effect. Group exercise had no significant mediating effect on the IADL scores of the elderly at other income levels. Compared with illiteracy, older people with a certain level of education were more likely to benefit from their physical health by participating in collective activities. The mediating effect of participating in collective activities also increased with an increase in their academic qualifications; the mediating effect of group activities on IADL score was 0.372, and the proportion of mediating effect was 33.88%. In occupation, compared with farmers, the effect of participating in collective activities on the health of the elderly engaged in administrative work or professional and technical work was more obvious. The proportion of the intermediary effect was 62.84%, the mediating effect was very obvious.

In terms of mental health, middle- and high-income seniors can improve their mental health by participating in group activities because participation in group activities accounted for 11.65% of the mediating effect of family annual income on mental health and 9.70% for high-income groups. Similar to IADL scores, older adults with primary school or higher education levels had better mental health than illiterate ones. A higher education level corresponded with a higher MMSE score, and participation in group activities played a mediating role in the influence of education level on mental health. The proportion of mediating effect was between 3.01% and 9.70%. Higher education level corresponded with higher proportion of mediating effect.

As for occupation, compared with farmers, the MMSE score of the elderly engaged in administrative or professional occupation, business, or service industry was higher. Participation in collective activity exerted a mediating effect in the path of the occupation's influence on the mental health of the elderly, and the proportions of the intermediary effect were 9.58% and 16.70%, respectively.

Table 5

Mediating effect of group exercise on the relationship between physical and mental health of the elderly affected by SES*

path/effect	c	a*b	SE	95%CI	ab/c
income-high →GE→IADL	0.379	0.141	0.022	0.098 0.186	37.23%
education-primary→GE→IADL	0.975	0.102	0.018	0.069 0.138	10.48%
education-junior →GE→IADL	0.855	0.259	0.034	0.195 0.329	30.29%
education-senior & above →GE→IADL	1.098	0.372	0.039	0.297 0.450	33.88%
occupation-governmental & professional →GE→IADL	0.354	0.223	0.031	0.165 0.285	62.84%
income-medium →GE→MMSE	0.573	0.067	0.016	0.037 0.100	11.65%
income-high →GE→MMSE	1.174	0.114	0.020	0.077 0.155	9.70%
education- primary→ GE→MMSE	2.492	0.075	0.015	0.048 0.107	3.01%
education-junior →GE→MMSE	2.506	0.190	0.031	0.133 0.255	7.60%
education-senior & above →GE→MMSE	2.809	0.274	0.040	0.200 0.357	9.74%
occupation-governmental & professional→GE→MMSE	1.831	0.175	0.028	0.123 0.234	9.58%
occupation-commercial & service →GE→MMSE	0.659	0.110	0.021	0.072 0.153	16.70%
* Due to space limitations, this paper shows only the significant cases of C and A * B (p < 0.05), the same as below.					
c means total effect, a*b means mediation effect, ab/c means ratio of the mediating effect. SE, standard error; CI, confidence interval; GE, Group exercise.					

3.3.2. Testing the mediating effect of participation in social activities

As shown in Table 6, in terms of physical health, amongst the elderly with high-income level, participation in social activities such as playing cards and mahjong, visiting relatives and friends, and so on plays a mediating role in the impact of household annual income on physical health, accounting for 30.69%. Higher education level can have a more positive impact on the physical health of the elderly, and participation in social activities plays a mediating role in this influencing path. Specifically, primary school or junior high-school education was more able to improve physical health through participation in social activities, with mediating effects of 21.38% and 29.93%, respectively.

In terms of mental health, participation in social activities plays a mediating role in the process of family annual income affecting the mental-health status of the elderly. Compared with the very low-income group, the elderly with middle-income level and the elderly with high-income level have better mental-health status. The mediating effects of participation in social interaction were 0.089 and 0.119, respectively, and the mediating effects accounted for 15.46% and 10.12%, respectively. In terms of the influence of education level on mental health, primary school or junior high-school education was more able to improve mental health through participation in social activities, and the mediating effects accounted for 8.47% and 10.34%, respectively. Participation in social activities did not play a mediating role in the path of occupational influence on the physical and mental health of the elderly.

Table 6

The mediating effect of interacting with friends on the relationship between SES and physical and mental health in the elderly

path/effect	c	a*b	SE	95%CI	ab/c
income-high →IF→IADL	0.379	0.116	0.041	0.037 0.196	30.69%
education-primary→IF→IADL	0.975	0.208	0.037	0.137 0.281	21.38%
education-junior →IF→IADL	0.855	0.256	0.058	0.141 0.369	29.93%
income-medium →IF→MMSE	0.573	0.089	0.041	0.012 0.169	15.46%
income-high →IF→MMSE	1.174	0.119	0.042	0.037 0.201	10.12%
education-primary→IF→MMSE	2.492	0.211	0.038	0.137 0.283	8.47%
education-junior →IF→MMSE	2.506	0.259	0.061	0.139 0.378	10.34%
c means total effect, a*b means mediation effect, ab/c means ratio of the mediating effect. SE, standard error; CI, confidence interval; IF, Interact with friends.					

3.3.3. Test of mediating effect of participation in organised social activities

As shown in Table 7, in terms of physical health, compared with the very low-income group, the high-income group was more able to improve physical-health status through participation in organised social activities, and the mediating effect accounted for 3.90%. Similarly, compared with illiterates, the elderly with a junior high-school education or above were more able to improve their health through participation in organised social activities, with mediating effects of 4.33% and 5.99%, respectively. Compared with farmers, administrative and professional technicians were more able to improve IADL score by participating in organised social activities, and the mediating effect accounted for 13.97%.

Table 7

The mediating effect of organized social activities on the relationship between SES and physical and mental health in the elderly

path/effect	c	a*b	SE	95%CI	ab/c
income-high →OSA→IADL	0.379	0.015	0.006	0.004 0.028	3.90%
education-junior →OSA→IADL	0.855	0.037	0.014	0.010 0.067	4.33%
education-senior & above →OSA→IADL	1.098	0.066	0.025	0.018 0.115	5.99%
occupation-governmental & professional →OSA→IADL	0.354	0.050	0.019	0.014 0.088	13.97%
c means total effect, a*b means mediation effect, ab/c means ratio of the mediating effect. SE, standard error; CI, confidence interval; OSA, organized social activities.					

4. Discussion

Based on the cross-sectional data of CLHLS in 2018, this paper discussed the effects of SES on the physical and mental health of the elderly from three aspects: economic income, educational level, and occupation before retirement. Bootstrap test was used to study the mediating effects of three types of social participation in group exercise, playing cards, and playing mahjong; visiting relatives and friends; and participating in organised social activities.

This study first validated hypotheses 1 and 2 that higher SES of older adults can have a positive impact on social participation, and more social-participation activities can achieve better physical and mental-health status. Data analysis showed a significant positive correlation between the level of participation in the activities of group exercise and organised social activities and the level of economic income and education. The level of social participation of the elderly in administrative and professional technical jobs and in business services was significantly higher than that of farmers. Scholars have found that older persons with higher SES, living conditions, and support facilities of public places in the community are healthier because more opportunities are available to participate in social-interaction activities^[23]. Regardless of the type of social participation, the degree of activity participation has a significant positive correlation with the physical and mental health of the elderly, indicating that social participation can significantly improve their physical and mental health^[27, 44]. A series of studies has shown that good social connections of the elderly are important in protecting against cognitive decline^[45, 46], dementia, and memory loss^[47]. Activity theory holds that social participation can buffer the negative effects of ageing on mental health by meeting the psychological and social needs of the elderly^[48]. According to this theory, older persons find their identity and meaning through their social roles, thereby energising their lives. Based on the social capital theory, community participation leads to higher perceived social cohesion and more effective social support, leading to better health outcomes^[18].

The present study further validated hypothesis 3, stating that higher SES of the elderly can have a positive impact on their physical and mental health. Specifically, different dimensions of SES have different effects on physical and mental health. In the dimension of economic income, differences in physical health were

observed only when the high-income group was compared with the other income-level groups. The difference in physical health amongst the other income groups was not significant. By contrast, the impact of economic income on the mental health of the elderly was more obvious, i.e., a higher income level of the elderly corresponded with better mental-health status. Higher incomes were often associated with better nutrition, housing, and medical care, as well as greater health awareness, leading to better health outcomes^[49]. In the dimension of education level, significant differences existed in physical and mental health amongst the elderly with different education levels. The physical and mental-health status of the group with a certain degree of education was better than that of the group without any education. Psychologists believe that people with higher education levels may have greater competence and control over their lives, which in turn improve their social integration and the quality of networks^[50]. Jiang et al.^[51] found that the education level of the elderly is highly correlated with the prevalence of chronic diseases. Thus, their physical and mental health are better than those with lower education level. Based on the diversity of impact paths, we could find that education more significantly affects the health of the elderly than income and occupation. Kawachi et al.^[52] conducted a review on the potential causal mechanisms linking schooling and income to health. They also stressed that a causal relationship exists between school education and the improvement in health outcomes, and that increasing the income of the poor leads to an improvement in their health outcomes. Compared with farmers, the elderly engaged in administrative or professional and technical occupation had better physical and mental-health status. This result may be related to their safer and healthier working environment, less exposure to harmful substances, and stronger awareness of health service utilisation^[53, 54]. Conversely, influenced by economic stress, low job satisfaction, threat of unemployment, and lack of control over life, an individual is more likely to adopt a passive lifestyle, thereby leading to unhealthy behaviours and depression symptoms^[3].

Finally, this paper validated research hypothesis 4, which stated that social participation played an intermediary role in the impact process of SES on the physical and mental health of the elderly. The mediation test led to three main discoveries. First, amongst the three types of social participation of the elderly, group exercise had the most significant mediating effect between SES and health status. Second, when studying the relationship of the three different dimensions of SES with the health status of the elderly, the mediating effect of social participation on the dimension of education and health status was stronger than that of the other two dimensions. Third, compared with the mediating effect of social participation on SES and mental health, the mediating effect on SES and physical health accounted for a higher proportion and had a greater indirect impact. This finding suggested that to change the negative effects of lower SES on the physical and mental health of the elderly, we can start with encouraging the elderly to participate in more social activities and we can pay special attention to the social participation of low-income and low-educated people and farmers. By improving infrastructure in public areas and building social platforms for the elderly, more of them can be guided to interact with the environment outside their families, thereby reducing the risk for disease and attaining better quality of life.

5. Conclusion

Through the bootstrap mediator-effect test, this study verified that social participation played a mediating role in the process of the elderly's SES affecting their physical and mental health. Different types of social

participation were found to have different levels of mediating effect. The elderly can effectively improve the negative effects of low SES on physical and mental health by participating in group exercise activities, social-communication activities such as visiting friends and playing cards, and volunteer activities.

Abbreviations

CLHLS: Chinese Longitudinal Healthy Longevity Survey

IADL: Instrumental Activities of Daily Living Scale

MMSE: Minimum Mental State Examination

GE: Group exercise

IF: Interact with friends

OSA: organized social activities

SE: standard error;

CI: confidence interval;

Declarations

Ethics approval and consent to participate

“Not applicable”

Consent for publication

“Not applicable”

Availability of data and materials

The CLHLS datasets are publicly available at the National Archive of Computerized Data on Aging, University of Michigan (<http://www.icpsr.umich.edu/icpsrweb/NACDA/studies/36179>). Researchers can obtain these data after submitting a data use agreement to the CLHLS team.

Competing interests

The authors declare that they have no competing interests

Funding

The authors declare that they have no financial support for this study.

Authors' contributions

YZ and YC designed, drafted, and revised the text and are responsible for the accuracy of the results. YZ, DS & MT drafted the literature review, drafted parts of the methods, and interpreted the results. DS, XC prepared the data and performed the analyses. All authors read and approved the final version of the manuscript.

Acknowledgements

We would like to thank the CLHLS team for providing the data, and we thank every respondent in the study for their contributions.

Author information

Affiliations

Huazhong University of Science and Technology, Wuhan, China

Yunfan Zhang, Dai Su, Xinlin Chen & Yingchun Chen

Research Centre for Rural Health Service, Key Research Institute of Humanities & Social Sciences of Hubei Provincial Department of Education, Wuhan, 430030, China

Yingchun Chen

The First Affiliate Hospital of GUANGZHOU Medical University

Min Tan

References

1. Grossman M. 1. On the Concept of Health Capital and the Demand for Health[M] // Grossman, M. Determinants of health: An economic perspective / Michael Grossman. New York: Columbia University Press, 2017: 6–41. DOI: 10.7312/gros17812-004.
2. Adler N E, Rehkopf D H. U.S. disparities in health: descriptions, causes, and mechanisms[J]. Annual Review of Public Health, 2008, 29(1):235–252. DOI: 10.1146/annurev.publhealth.29.020907.090852.
3. Calixto O-J, Anaya J-M. Socioeconomic status. The relationship with health and autoimmune diseases[J]. Autoimmunity reviews, 2014, 13(6):641–654. DOI: 10.1016/j.autrev.2013.12.002.
4. Gorman B K, Sivaganesan A. The role of social support and integration for understanding socioeconomic disparities in self-rated health and hypertension[J]. Social Science & Medicine, 2007, 65(5):958–975. <https://www.sciencedirect.com/science/article/pii/S0277953607002079>. DOI: 10.1016/j.socscimed.2007.04.017.
5. Adler N E. Socioeconomic inequalities in health. No easy solution[J]. JAMA: The Journal of the American Medical Association, 1993, 269(24):3140–3145. DOI: 10.1001/jama.269.24.3140.
6. Thirumurthy H, Jafri A, Srinivas G, et al. Two-year impacts on employment and income among adults receiving antiretroviral therapy in Tamil Nadu, India: a cohort study[J]. AIDS (London, England), 2011, 25(2):239–246. DOI: 10.1097/QAD.0b013e328341b928.

7. Marmot M. The influence of income on health: views of an epidemiologist[J]. *Health affairs (Project Hope)*, 2002, 21(2):31–46. DOI: 10.1377/hlthaff.21.2.31.
8. Dunkel Schetter C, Schafer P, Lanzi R G, et al. Shedding Light on the Mechanisms Underlying Health Disparities Through Community Participatory Methods: The Stress Pathway[J]. *Perspectives on psychological science : a journal of the Association for Psychological Science*, 2013, 8(6):613–633. DOI: 10.1177/1745691613506016.
9. Stewart J C, Adler N E. *The biology of disadvantage: Socioeconomic status and health* / edited by Judith Stewart, Nancy Adler[M]. New York: New York Academy of Sciences; Boston, 2010.
10. Matthews K A, Gallo L C, Taylor S E. Are psychosocial factors mediators of socioeconomic status and health connections? A progress report and blueprint for the future[J]. *Annals of the New York Academy of Sciences*, 2010, 1186(1):146–173. DOI: 10.1111/j.1749-6632.2009.05332.x.
11. Pampel F C, Krueger P M, Denney J T. Socioeconomic Disparities in Health Behaviors[J]. *Annual Review of Sociology*, 2010, 36(1):349–370. DOI: 10.1146/annurev.soc.012809.102529.
12. Mulatu M S, Schooler C. Causal Connections between Socio-Economic Status and Health: Reciprocal Effects and Mediating Mechanisms[J]. *Journal of Health and Social Behavior*, 2002, 43(1):22. DOI: 10.2307/3090243.
13. Warr D, Feldman P, Tacticos T, et al. Sources of stress in impoverished neighbourhoods: insights into links between neighbourhood environments and health[J]. *Australian and New Zealand journal of public health*, 2009, 33(1):25–33. DOI: 10.1111/j.1753-6405.2009.00334.x.
14. Andersen R M, Davidson P L. Ethnicity, aging, and oral health outcomes: a conceptual framework[J]. *Advances in dental research*, 1997, 11(2):203–209. DOI: 10.1177/08959374970110020201.
15. Access of vulnerable groups to antiretroviral therapy among persons in care for HIV disease in the United States. HCSUS Consortium. HIV Cost and Services Utilization Study[J].
16. Piškur B, Daniëls R, Jongmans M J, et al. Participation and social participation: are they distinct concepts?[J]. *Clinical rehabilitation*, 2014, 28(3):211–220. DOI: 10.1177/0269215513499029.
17. Howrey B T, Hand C L. Measuring Social Participation in the Health and Retirement Study[J]. *The Gerontologist*, 2019, 59(5):e415-e423. DOI: 10.1093/geront/gny094.
18. Douglas H, Georgiou A, Westbrook J. Social participation as an indicator of successful aging: an overview of concepts and their associations with health[J]. *Australian health review : a publication of the Australian Hospital Association*, 2017, 41(4):455–462. DOI: 10.1071/AH16038.
19. Wang R, Feng Z, Liu Y, et al. Relationship between neighbourhood social participation and depression among older adults: A longitudinal study in China[J]. *Health & social care in the community*, 2020, 28(1):247–259. DOI: 10.1111/hsc.12859.
20. Mendes de Leon C F, Glass T A, Berkman L F. Social engagement and disability in a community population of older adults: the New Haven EPESE[J]. *American journal of epidemiology*, 2003, 157(7):633–642. DOI: 10.1093/aje/kwg028.
21. Gao M, Sa Z, Li Y, et al. Does social participation reduce the risk of functional disability among older adults in China? A survival analysis using the 2005-2011 waves of the CLHLS data[J]. *BMC geriatrics*, 2018, 18(1):224. DOI: 10.1186/s12877-018-0903-3.

22. Ide K, Tsuji T, Kanamori S, et al. Social Participation and Functional Decline: A Comparative Study of Rural and Urban Older People, Using Japan Gerontological Evaluation Study Longitudinal Data[J]. *International journal of environmental research and public health*, 2020, 17(2). DOI: 10.3390/ijerph17020617.
23. Duppen D, Lambotte D, Dury S, et al. Social Participation in the Daily Lives of Frail Older Adults: Types of Participation and Influencing Factors[J]. *The journals of gerontology. Series B, Psychological sciences and social sciences*, 2020, 75(9):2062–2071. DOI: 10.1093/geronb/gbz045.
24. Van Hees S G M, van den Borne B H P, Menting J, et al. Patterns of social participation among older adults with disabilities and the relationship with well-being: A latent class analysis[J]. *Archives of gerontology and geriatrics*, 2020, 86:103933. DOI: 10.1016/j.archger.2019.103933.
25. Johnson K J, Mutchler J E. The emergence of a positive gerontology: from disengagement to social involvement[J]. *The Gerontologist*, 2014, 54(1):93–100. DOI: 10.1093/geront/gnt099.
26. Menec V H. The relation between everyday activities and successful aging: a 6-year longitudinal study[J]. *The journals of gerontology. Series B, Psychological sciences and social sciences*, 2003, 58(2):S74-82. DOI: 10.1093/geronb/58.2.s74.
27. Sun J, Lyu S. Social participation and urban-rural disparity in mental health among older adults in China[J]. *Journal of affective disorders*, 2020, 274:399–404. DOI: 10.1016/j.jad.2020.05.091.
28. Sibalija J, Savundranayagam M Y, Orange J B, et al. Social support, social participation, & depression among caregivers and non-caregivers in Canada: a population health perspective[J]. *Aging & mental health*, 2020, 24(5):765–773. DOI: 10.1080/13607863.2018.1544223.
29. Ejiri M, Kawai H, Fujiwara Y, et al. Social participation reduces isolation among Japanese older people in urban area: A 3-year longitudinal study[J]. *PloS one*, 2019, 14(9):e0222887. DOI: 10.1371/journal.pone.0222887.
30. Choi E, Han K-M, Chang J, et al. Social participation and depressive symptoms in community-dwelling older adults: Emotional social support as a mediator[J]. *Journal of psychiatric research*, 2021, 137:589–596. DOI: 10.1016/j.jpsychires.2020.10.043.
31. Aartsen M, Veenstra M, Hansen T. Social pathways to health: On the mediating role of the social network in the relation between socio-economic position and health[J]. *SSM - Population Health*, 2017, 3:419–426. DOI: 10.1016/j.ssmph.2017.05.006.
32. Wolf T J, Chuh A, Floyd T, et al. Effectiveness of occupation-based interventions to improve areas of occupation and social participation after stroke: an evidence-based review[J]. *The American journal of occupational therapy : official publication of the American Occupational Therapy Association*, 2015, 69(1):6901180060p1-11. DOI: 10.5014/ajot.2015.012195.
33. Lancee B, van de Werfhorst H G. Income inequality and participation: A comparison of 24 European countries[J]. *Social science research*, 2012, 41(5):1166–1178. DOI: 10.1016/j.ssresearch.2012.04.005.
34. Gu D, Dupre M E. Assessment of Reliability of Mortality and Morbidity in the 1998–2002 CLHLS Waves[M] // Zeng, Y. *Healthy longevity in China: Demographic, socioeconomic, and psychological dimensions* / edited by Zeng Yi .. [et al.]. Dordrecht : Springer, 2008: 99–116. DOI: 10.1007/978-1-4020-6752-5_6.

35. Zeng Y, editor (2008). Healthy longevity in China: Demographic, socioeconomic, and psychological dimensions / edited by Zeng Yi .. [et al.][M]. . The Springer series on demographic methods and population 20Dordrecht ?: Springer.
36. Pai C-Y, Jien M-C, Li L-H, et al. Application of Forensic Entomology to Postmortem Interval Determination of a Burned Human Corpse: A Homicide Case Report from Southern Taiwan[J]. Journal of the Formosan Medical Association, 2007, 106(9):792–798. DOI: 10.1016/S0929-6646(08)60043-1.
37. Folstein M F, Folstein S E, McHugh P R. "Mini-mental state": A practical method for grading the cognitive state of patients for the clinician[J]. Journal of psychiatric research, 1975, 12(3):189–198. DOI: 10.1016/0022-3956(75)90026-6.
38. Luo Y N, Ping H E, Guo C. Association of religious participation with cognitive impairment among the elderly in China[J]. Chinese Journal of Public Health, 2017.
39. ZHANG X. Children's Relationships with Mothers and Teachers: Linkages to Problem Behavior in Their First Preschool Years[J]. Acta Psychologica Sinica, 2008, 40(4):418–426. DOI: 10.3724/SP.J.1041.2008.00418.
40. Weining Y I, KANG XiaoPing. A Multilevel Analysis on Influential Factors of Cognitive Change among Chinese Oldest-old[J]. Chinese Mental Health Journal, 2008.
41. Deeg D J H, Bath P A. Self-rated health, gender, and mortality in older persons: introduction to a special section[J]. The Gerontologist, 2003, 43(3):369–371. DOI: 10.1093/geront/43.3.369.
42. Preacher K J, Hayes A F. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models[J]. Behavior research methods, 2008, 40(3):879–891. DOI: 10.3758/brm.40.3.879.
43. Preacher K J, Hayes A F. SPSS and SAS procedures for estimating indirect effects in simple mediation models[J]. Behavior research methods, instruments, & computers : a journal of the Psychonomic Society, Inc, 2004, 36(4):717–731. DOI: 10.3758/bf03206553.
44. Zhang W, Feng Q, Liu L, et al. Social Engagement and Health: Findings From the 2013 Survey of the Shanghai Elderly Life and Opinion[J]. International journal of aging & human development, 2015, 80(4):332–356. DOI: 10.1177/0091415015603173.
45. Holtzman R E, Rebok G W, Saczynski J S, et al. Social network characteristics and cognition in middle-aged and older adults[J]. The journals of gerontology. Series B, Psychological sciences and social sciences, 2004, 59(6):P278-84. DOI: 10.1093/geronb/59.6.p278.
46. Béland F, Zunzunegui M-V, Alvarado B, et al. Trajectories of cognitive decline and social relations[J]. The journals of gerontology. Series B, Psychological sciences and social sciences, 2005, 60(6):P320-P330. DOI: 10.1093/geronb/60.6.p320.
47. Crooks V C, Lubben J, Petitti D B, et al. Social network, cognitive function, and dementia incidence among elderly women[J]. American journal of public health, 2008, 98(7):1221–1227. DOI: 10.2105/AJPH.2007.115923.
48. Ryff C D. Successful aging: a developmental approach[J]. The Gerontologist, 1982, 22(2):209–214. DOI: 10.1093/geront/22.2.209.

49. Wang J, Geng L. Effects of Socioeconomic Status on Physical and Psychological Health: Lifestyle as a Mediator[J]. International journal of environmental research and public health, 2019, 16(2). DOI: 10.3390/ijerph16020281.
50. Mirowsky J, Ross C E. Life Course Trajectories of Perceived Control and Their Relationship to Education[J]. American Journal of Sociology, 2007, 112(5):1339–1382. DOI: 10.1086/511800.
51. Jiang Y, Zheng H, Zhao T. Socioeconomic Status and Morbidity Rate Inequality in China: Based on NHSS and CHARLS Data[J]. International journal of environmental research and public health, 2019, 16(2). DOI: 10.3390/ijerph16020215.
52. Kawachi I, Adler N E, Dow W H. Money, schooling, and health: Mechanisms and causal evidence[J]. Annals of the New York Academy of Sciences, 2010, 1186(1):56–68. DOI: 10.1111/j.1749-6632.2009.05340.x.
53. Nguyen D N, Nguyen L H, Nguyen C T, et al. Health Status and Health Service Utilization among Vietnamese Farmers in a Mountainous Province[J]. International journal of environmental research and public health, 2019, 16(23):4768. DOI: 10.3390/ijerph16234768.
54. Buralli R J, Ribeiro H, Iglesias V, et al. Occupational exposure to pesticides and health symptoms among family farmers in Brazil[J]. Revista de Saúde Pública, 2020, 54:133. DOI: 10.11606/s1518-8787.2020054002263.

Figures

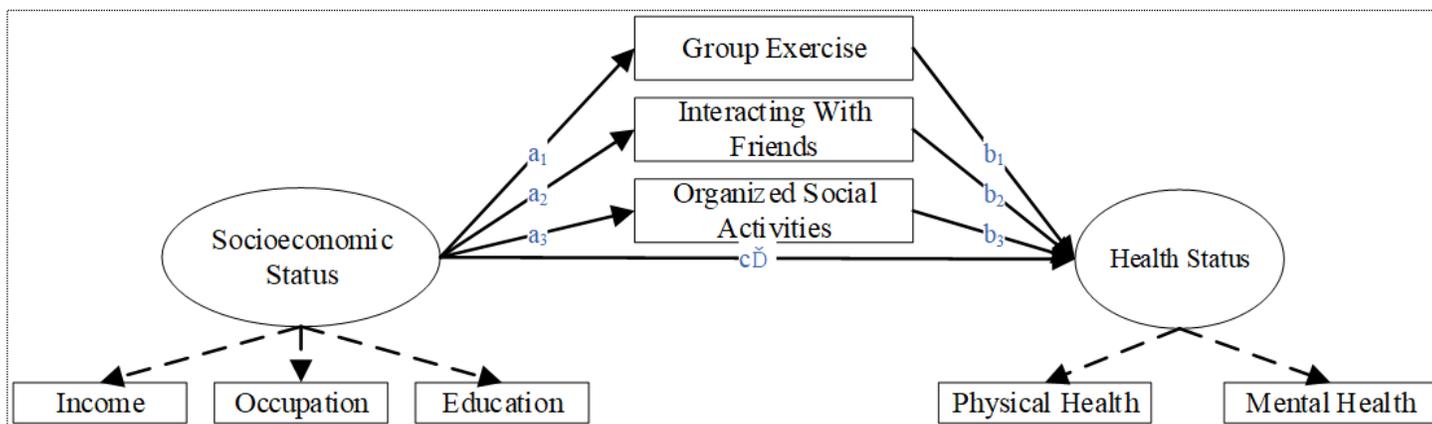


Figure 1

Mediation model of the relation between socioeconomic status and health status, mediated by three types of social participation (a_n : the effect of socioeconomic status on intermediate variable; b_n : the effect of intermediate variable on health status; c' : after controlling the influence of intermediate variable, the direct effect of socioeconomic status on health status)