

How Perceived Ageism Affects Cognitive Function in Chinese Older Adults: The Mediating Roles of Social Participation and Depression

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Abstract

Background

Perceived ageism has been increasingly identified as a critical psychosocial risk factor negatively affecting cognitive health among older adults. However, the psychosocial pathways linking perceived ageism to cognitive function remain insufficiently explored. In particular, how social participation and depressive symptoms jointly mediate this relationship in the Chinese cultural context has yet to be clarified.

Methods

A survey was conducted among 501 Chinese adults aged 60 years and older in Wuhan communities. First, we present the basic sociodemographic characteristics of the study sample. Second, Spearman correlation analysis was employed to examine the associations between perceived ageism, social participation, depression, and cognitive function among Chinese older adults. Finally, a sequential multiple mediation analysis was performed using the SPSS macro process.

Results

A chain mediation model revealed that perceived ageism exerted both direct and indirect effects on cognitive function in older adults. It directly impaired cognitive performance while also operating through the mediating roles of social participation and depressive symptoms. Bootstrap analysis confirmed a significant total indirect effect, identifying three specific pathways: through reduced social participation, through increased depressive symptoms, and through the sequential pathway of reduced social participation leading to increased depressive symptoms. The findings underscore that perceived ageism harms cognitive function not only directly but also by diminishing social engagement and exacerbating depressive symptoms.

Limitations

This study has several limitations. First, all measures were based on self-reported data, which may be subject to reporting biases. Second, the sample size was relatively small and drawn from a limited geographical distribution, which may affect the generalizability of the findings and could introduce potential biases in some results. Future research should employ larger, more nationally representative samples to validate these findings. Furthermore, subsequent investigations would benefit from exploring more detailed and specific mechanisms through which perceived ageism affects cognitive function in older adults.

Conclusions

Our findings indicate that reduced perceived ageism may enhance cognitive function among older adults in Chinese communities through increased social participation and decreased depression. These results suggest that interventions aimed at reducing perceived ageism could yield significant benefits for both mental health and cognitive functioning in this population.

Highlights

- Ageism refers to stereotypes (how we think), prejudice (how we feel), and discrimination (how we act) toward others or ourselves based on age (American Society on Ageing).

- Perceived ageism not only directly affects cognitive function but also exerts indirect effects through the pathways of social participation and depression.
- Specifically, social participation and depression demonstrate sequential mediating effects in the relationship between perceived ageism and cognitive function.

Introduction

Global increases in life expectancy are driving a rapid demographic transition toward aging populations. China represents a particularly notable example of this trend: in 2024, adults aged 65 and above reached 220 million, constituting 15.6% of the total population, with this proportion projected to increase to 26% by 2050^[1]. Concurrently with population aging is a substantial rise in the prevalence of cognitive impairment. Worldwide, more than 50 million people currently live with dementia, a number expected to reach 152.8 million by 2050^[2]. In China, dementia and mild cognitive impairment (MCI) affect 6.0% and 15.5%, respectively, of adults aged 60 and above^[3]. Cognitive decline significantly impairs patients' ability to perform daily activities and imposes substantial burdens on both quality of life and family caregivers. Given the current absence of effective curative treatments, the early identification of modifiable risk factors is essential for implementing timely interventions to delay cognitive deterioration. Existing research has established several relevant factors, including physical inactivity^[4], obesity^[5], sleep disorders^[6], and depression^[7]. However, psychosocial factors such as perceived age discrimination remain insufficiently explored. More critically, the underlying psychological and biological mechanisms through which age discrimination might impair cognition are still largely unknown, limiting the development of targeted interventions. To address this gap, we propose a serial mediation model positing that perceived age discrimination impedes cognitive function through a sequential pathway involving both behavioral and affective mechanisms. Specifically, we hypothesize that the internalization of age stereotypes (perceived age discrimination) first leads to behavioral withdrawal from social activities, which constitutes a loss of cognitively stimulating and emotionally rewarding experiences. This reduction in social participation, in turn, fosters feelings of loneliness and isolation, thereby increasing the risk of depression. Finally, depression, through its associated biological sequelae such as chronic stress and neuroinflammation, directly damages brain structures and functions critical for cognitive performance. Within this context, this study aims to investigate the relationship between perceived age discrimination and cognitive function among older adults in China and to examine the serial mediating roles of social participation and depression in this relationship, thereby contributing novel mechanistic insights for developing multi-targeted interventions.

Perceived age discrimination (Ageism) and cognitive function

Research has demonstrated that ageism can significantly compromise both physical and mental health in older adults. According to American Society on Ageing, "Ageism refers to stereotypes (how we think), prejudice (how we feel), and discrimination (how we act) toward others or ourselves based on age"^[8]. A substantial body of research indicates a close association between perceived ageism and the physical and mental health of older adults. It is not only significantly correlated with adverse psychological states such as depression and anxiety^[9] but also negatively impacts physical health both directly and indirectly by reinforcing self-stigma and reducing quality of life and social participation among older adults^[10].

Regarding the underlying mechanisms, the potential detrimental impact of perceived ageism on cognitive function warrants particular attention. On the one hand, psychological distress induced by discrimination, such as depression, is considered a significant pathway to cognitive impairment^[11]. On the other hand, perceived ageism is regarded as a potential risk factor for frailty progression in older adults^[12] with effects potentially extending beyond mental health to encompass impaired immune function and direct cognitive decline. Longitudinal studies provide robust support for this; for instance, Robertson et al., utilizing data from The Irish Longitudinal Study on Ageing (TILDA), demonstrated that changes in perceived ageism significantly predict subsequent cognitive performance^[13]. Collectively, these findings point to a scientific consensus: perceived ageism is an important risk factor for cognitive decline. Compared to the relatively mature body of research in

other countries, investigations into perceived ageism among older adults in China are still in their nascent stages. The ageism perceived by Chinese older adults manifests concretely in multiple domains, including employment, access to healthcare services, and social participation^[14]. Pervasive negative stereotypes regarding the work capability, learning ability, and social adaptability of older adults not only create obstacles to employment but may also significantly reduce their engagement in health-promoting behaviors and exert profound negative effects on memory function, willingness to live, and even overall survival^[15, 16].

However, current domestic research exploring the intrinsic relationship between perceived ageism and cognitive function remains insufficient, and the pathways underlying this association require further in-depth investigation. Therefore, conducting an in-depth investigation into the relationship between perceived ageism and cognitive function among community-dwelling older adults within the Chinese socio-cultural context holds significant theoretical importance. Furthermore, it can provide an empirical basis for developing targeted interventions to mitigate the challenges of ageism and ultimately promote cognitive health in this population. This study aims to address this gap by seeking to elucidate the impact of perceived ageism on cognitive function among Chinese older adults and its underlying mechanisms.

Perceived ageism, cognitive functioning, social participation, and depression

Previous research indicates that a high level of perceived ageism not only directly exacerbates depressive symptoms in older adults^[17] but also significantly reduces their social participation by fostering feelings of loneliness and diminishing self-esteem^[18], thereby creating a vicious cycle where psychological and social behaviors are intertwined. This cycle poses a multifaceted threat to cognitive functioning. First, depression, as a critical component of this pathway, has been demonstrated to directly impair neurological function and lower cognitive performance^[7]. Second, social participation, recognized as a potential protective factor for maintaining cognitive health^[19, 20], sees its positive cognitive stimulation diminished when its levels decline. Furthermore, depression is a predictor of social participation, with individuals experiencing depression typically exhibiting lower levels of social engagement^[21]. Conversely, low social participation is a high-risk factor for depression in older adults^[22], perpetuating a cycle that continuously exacerbates cognitive risk. However, existing research has largely focused on bivariate relationships between these variables. It remains unclear whether enhancing social participation or alleviating depression can serve as an effective pathway to improve cognitive function among community-dwelling older adults with high levels of perceived ageism. Therefore, this study aims to systematically investigate the interplay between perceived ageism, social participation, depression, and cognitive functioning. Elucidating this mechanism will not only provide a novel perspective on the etiology of cognitive decline in older adults but will also offer a scientific basis for developing targeted interventions designed to enhance social participation and mental health, thereby mitigating cognitive decline.

Current study

As existing literature indicated that perceived ageism, social participation, depressive symptoms, and cognitive function appear to interrelated in both direct and indirect paths, this study aimed to examine the potential multiple mediating roles of social participation and depressive symptoms in the relationship between perceived ageism and cognitive function among older adults in China.

Methods

Participants

This cross-sectional study utilized a random sampling between May and August 2025 across community health centers in Wuhan, China. The survey was administered to residents aged 60 years or older, with the following predetermined inclusion and exclusion criteria to ensure participant eligibility.

Inclusion criteria consisted of: (1) age ≥ 60 years; (2) permanent community residency (≥ 6 months); (3) preserved cognitive and communicative abilities with adequate sensory function to complete the questionnaire; and (4) provision of informed consent.

Exclusion criteria were established to minimize the influence of medical conditions on cognitive assessment and included: (1) diagnosed dementia, Parkinson's disease, epilepsy, stroke, or history of stroke; (2) severe cardiac, hepatic, or renal impairment, or malignant tumors; (3) substance abuse or dependence in the preceding two years; (4) current psychiatric disorders; or (5) severe chronic conditions with significant complications (e.g., hypertension or diabetes with end-organ damage; well-controlled cases were eligible).

To ensure data quality, questionnaires that met the following criteria were excluded: (1) incomplete or unintelligible responses; (2) patterned or invariant response patterns; or (3) suspected Alzheimer's disease based on screening. After the exclusion of 26 invalid questionnaires, a total of 501 valid questionnaires were retained for final analysis.

Measurements

Perceived ageism

Perceived ageism was assessed using the Chinese version of the Perceived Ageism Scale, originally developed for the European Prevalence Study of Ageism^[23] and subsequently translated and culturally adapted by Ye et al.^[24] The scale comprises three items: (1) "In the past year, has anyone treated you with prejudice or unfairness because of your age?"; (2) "In the past year, has anyone shown you a lack of respect, such as ignoring or looking down on you, because of your age?"; and (3) "In the past year, has anyone treated you badly—for example, by insulting, mistreating, or denying you services—because of your age?". Responses were rated on a 5-point frequency scale ranging from 0 (never) to 4 (always). Total scores range from 0 to 12, with scores ≥ 1 indicating the presence of perceived ageism. Higher scores reflect more severe perceptions of age-based discrimination. The scale demonstrated excellent internal consistency in the present sample, with a McDonald's Omega (ω) of 0.886.

Cognitive function

Cognitive function was assessed using the Beijing version of the Montreal Cognitive Assessment (MoCA-BJ), which consists of 10 subtests with a maximum total score of 30 points. The subtest score distribution is as follows: executive function (1 point), verbal fluency (2 points), orientation (6 points), calculation (3 points), abstraction (3 points), delayed recall (5 points), visuoperception (3 points), naming (4 points), and attention (3 points). (Note: Immediate recall is not scored). To address education-related bias, established cutoff scores were applied for mild cognitive impairment (MCI) screening: ≤ 19 for individuals with ≤ 6 years of education, ≤ 22 for those with 7-12 years of education, and ≤ 24 for those with more than 12 years of education^[25]. The scale demonstrated good internal consistency in the present sample, with a McDonald's Omega (ω) of 0.814.

Social participation

Social participation was measured using the Social Participation Scale^[26] which contains 22 items across six dimensions: interactions with relatives and friends, group recreational activities, volunteering and public service, household activities, leisure activities, and online participation. Responses were recorded on a 5-point Likert scale ranging from 1 ("never") to 5 ("always"). Total scores range from 22 to 110, with higher scores indicating greater levels of social participation. In the present study, the scale demonstrated good internal consistency, with a McDonald's Omega (ω) of 0.830.

Depression

Depressive symptoms were assessed using the Patient Health Questionnaire-9 (PHQ-9)^[27], which consists of nine items. Each item was rated on a 4-point Likert scale ranging from 0 ("not at all") to 3 ("nearly every day"), yielding total scores

ranging from 0 to 27. According to established cutoff criteria, scores of 0-4 indicate no depression, 5-9 mild depression, 10-14 moderate depression, 15-19 moderately severe depression, and 20-27 severe depression. Higher total scores indicate more severe depressive symptoms. In the present sample, the scale's internal consistency was assessed using McDonald's Omega (ω) of 0.658.

Statistical analysis

All statistical analyses were performed using SPSS Statistics (Version 27.0). First, descriptive statistics were computed to characterize the demographic and clinical characteristics of the study population. Second, Spearman correlation analysis was employed to examine bivariate associations among perceived age discrimination, social participation, depressive symptoms, and cognitive function, as the continuous variables violated the normality assumption. Finally, to examine the mediating roles of social participation and depressive symptoms in the relationship between perceived age discrimination and cognitive function, we conducted mediation analyses using both Model 4 (parallel mediation) and Model 6 (serial mediation) of the PROCESS macro developed by Hayes^[28]. After comparing the model fit, the serial mediation pathway (where perceived age discrimination influences cognitive function through social participation followed by depressive symptoms) was found to best align with our theoretical framework. The analyses utilized 5,000 bootstrap samples with 95% confidence intervals (*CI*). Statistical significance was set at $p < 0.05$, with mediation effects considered significant when the 95% bootstrap *CI* excluded zero.

Results

Demographic Characteristics

Table 1 presents the sociodemographic characteristics of the community-dwelling older adults in this study ($N = 501$). The sample consisted predominantly of women (63.3%) and individuals of Han Chinese ethnicity (99.2%). Regarding age distribution, the largest proportion of participants was aged 70–79 years (44.9%), followed by those aged 60–69 years (42.5%), indicating that the sample primarily comprised young-old and old-old adults. Most participants resided in urban areas (73.5%), were married (75.6%), and cohabited with their spouse or with both their spouse and children (70.3%). Economically, the majority reported stable income, with less than half (48.5%) earning between RMB 0 and 3,999 monthly, and retirement pensions serving as the primary income source for 78.8% of respondents. Regarding health behaviors, most participants reported neither smoking (90.6%) nor consuming alcohol (87.8%). However, sleep problems were prevalent: 86.0% reported sleeping fewer than 7 hours per night, and 62.7% experienced occasional or frequent insomnia. Key health outcomes revealed that more than half of the participants (52.7%) had cognitive impairment, while nearly half (47.5%) exhibited mild to moderate depressive symptoms.

Table 1
The characteristics of the sample (N = 501)

<i>Variables</i>	<i>Frequency(n)</i>	<i>N(%)</i>
Gender		
Male	184	36.7
Female	317	63.3
Ethnicity		
Han Chinese	497	99.2
Ethnic minority	4	0.8
Religious belief		
No	483	96.4
Yes	18	3.6
Age group		
60 ~ 69years	213	42.5
70 ~ 79years	225	44.9
80 ~ 89years	56	11.2
≥ 90years	7	1.4
Current residence		
City	368	73.5
Town	42	8.4
Rural	91	18.2
Marital status		
Married	379	75.6
never married	4	0.8
Remarried	3	0.6
Divorced	6	1.2
Widowed	97	19.4
Not specified	12	2.4
Co-residence of respondent		
Alone	82	16.4
With spouse only	237	47.3
With spouse and children	115	23.0
With children only	64	12.8
Other	3	0.6
Note: Percentages may not sum to 100 due to rounding.		

<i>Variables</i>	<i>Frequency(n)</i>	<i>N(%)</i>
Years of schooling		
Primary school or below	113	22.6
Junior high school	138	27.5
High school / Vocational school / Technical secondary school	150	29.9
College / Bachelor's degree or above	100	20.0
Pre-retirement occupation		
Mental labor (Non-manual)	305	60.9
Physical labor (Manual)	173	34.5
Other	23	4.6
Health insurance		
Urban Employee Basic Medical Insurance	331	66.1
Urban Resident Basic Medical Insurance	65	13.0
New Rural Cooperative Medical Scheme	88	17.6
Government Medical Insurance	3	0.6
Commercial Health Insurance	2	0.4
Other Social Medical Insurance	3	0.6
Uninsured	3	0.6
Enrolled in two or more types	6	1.2
Monthly income (RMB)		
0-3999	243	48.5
4000-5999	149	29.7
6000-7999	66	13.2
≥ 8000	43	8.6
Source of income		
Retirement pension	395	78.8
Financial support from children	52	10.4
Government subsidies	11	2.2
Labor income	43	8.6
Sleep duration (hours/night)		
<6	202	40.3
6-7(excluding7)	229	45.7
7-8(excluding8)	40	8.0
Note: Percentages may not sum to 100 due to rounding.		

<i>Variables</i>	<i>Frequency(n)</i>	<i>N(%)</i>
≥ 8	30	6.0
Sleep quality		
Frequent insomnia	99	19.8
Occasional insomnia	215	42.9
Normal	187	37.3
Self-rated health		
Very poor	9	1.8
Poor	78	15.6
Fair	317	63.3
Good	90	18.0
Very good	7	1.4
Alcohol consumption		
Non-drinker	440	87.8
Hazardous drinking	45	9.0
Heavy drinking	16	3.2
Smoking status		
No	454	90.6
Yes	47	9.4
Exercise frequency		
Never	28	5.6
Rarely (1–2 times/month)	52	10.4
Sometimes (1–2 times/week)	73	14.6
Often (3–5 times/week)	155	30.9
Always (daily)	193	38.5
Contact with children		
Close contact	492	98.2
Lack of contact	9	1.8
Emotional support		
Lack of support	76	15.2
Adequate support	425	84.8
Number of chronic diseases		
0	102	20.4
Note: Percentages may not sum to 100 due to rounding.		

<i>Variables</i>	<i>Frequency(n)</i>	<i>N(%)</i>
1	189	37.7
2–3	184	36.7
≥ 4	26	5.2
Cognitive function		
Normal	237	47.3
Impaired	264	52.7
Depression severity		
No depression	263	52.5
Mild depression	220	43.9
Moderate depression	18	3.6
Note: Percentages may not sum to 100 due to rounding.		

Correlations among perceived ageism, Cognitive function, Social participation, and Depression

Table 2 presents the correlations among the examined variables. The correlation analysis yielded results consistent with our hypothesized relationships, with all correlations being statistically significant at the $p < 0.01$ level (two-tailed). Specifically, perceived ageism was negatively correlated with cognitive function ($r = -0.508$) and positively correlated with depressive symptoms ($r = 0.439$). Conversely, perceived ageism was negatively associated with social participation ($r = -0.470$), indicating that higher levels of perceived ageism were related to lower social engagement. Furthermore, cognitive function was positively correlated with social participation ($r = 0.598$) and negatively correlated with depressive symptoms ($r = -0.506$), suggesting that better cognitive performance is associated with greater social participation and lower levels of depression. Finally, social participation showed a significant negative correlation with depressive symptoms ($r = -0.415$).

Table 2
Correlation analysis of cognitive function, perceived ageism, social participation and depressive symptoms in elderly patients

<i>Variables</i>	1	2	3	4
1. Cognitive function	1			
2. Perceived ageism	-0.508**	1		
3. Social participation	0.598**	-0.470**	1	
4. Depressive symptoms	-0.506**	0.439**	-0.415**	1

**Note: ** Correlation is significant at the 0.01 level (2-tailed). N = 501.

Multiple linear regression analysis of cognitive function in older people

A multiple linear regression analysis was conducted to identify factors associated with cognitive function. Prior to analysis, variables exhibiting no variability (e.g., categories with zero frequency) or perfect multicollinearity were automatically excluded by the statistical software to ensure model stability. The final model retained predictors that demonstrated sufficient variation for reliable estimation. To identify factors associated with cognitive function in older adults, a multiple linear regression analysis was performed with various demographic and psychosocial variables as independent predictors.

A hierarchical multiple linear regression was performed to examine the factors associated with cognitive function among community-dwelling older adults (see Table 3). After adjusting for sociodemographic variables, the results indicated that perceived ageism, social participation, depressive symptoms, education level, age, marital status, living arrangements, occupation type, monthly income, primary source of income, and self-rated health were significant predictors of cognitive function (all $p < 0.05$).

Specifically:

- Psychosocial Factors: Social participation ($\beta = 0.278, p < 0.001$) was the strongest protective factor for cognitive function, whereas perceived ageism ($\beta = -0.190, p < 0.001$) and depressive symptoms ($\beta = -0.114, p = 0.005$) were significant risk factors.
- Socioeconomic Factors: A higher education level was associated with better cognitive function ($\beta = 0.197, p < 0.001$). Compared to the lowest income group (0-3999 RMB), older adults with a monthly income of 4000–5999 RMB ($\beta = 0.129, p = 0.001$) had significantly better cognitive performance. Furthermore, having financial support from children as the primary income source was a risk factor for cognitive function ($\beta = -0.103, p = 0.027$).
- Demographic and Health Factors: Increasing age was a risk factor for cognitive function ($\beta = -0.113, p = 0.002$). Regarding marital status, both divorced ($\beta = 0.129, p < 0.001$) and never married ($\beta = 0.072, p = 0.025$) older adults had higher cognitive function scores compared to their married counterparts. Engaging in manual labor before retirement was associated with poorer cognitive function compared to mental labor ($\beta = -0.099, p = 0.016$). In terms of self-rated health, reporting "Good" health was a protective factor for cognitive function compared to reporting "Poor" health ($\beta = 0.067, p = 0.047$).

Table 3
Multiple linear regression analysis of cognitive function in older people

<i>Variables B SE Standardized t P Tolerance VIF</i>							
<i>Coefficient β</i>							
Constant	14.327	1.645		8.710	0.000		
Core Variables							
Perceived ageism	-0.525	0.102	-0.190	-5.124	0.000	0.644	1.553
Social Participation	0.130	0.018	0.278	7.143	0.000	0.583	1.715
Depressive Symptoms	-0.205	0.072	-0.114	-2.844	0.005	0.550	1.818
Sociodemographic Characteristics							
Education Level	0.916	0.194	0.197	4.727	0.000	0.508	1.970
Age	-0.773	0.249	-0.113	-3.100	0.002	0.660	1.516
Gender	0.376	0.342	0.037	1.101	0.271	0.772	1.295
Emotional support	-0.007	0.448	-0.001	-0.016	0.987	0.813	1.230
Never Married	3.934	1.754	0.072	2.243	0.025	0.861	1.162
Remarried	-0.612	1.943	-0.010	-0.315	0.753	0.934	1.071
Divorced	5.776	1.528	0.129	3.781	0.000	0.759	1.317
Widowed	0.345	0.674	0.028	0.512	0.609	0.296	3.379
Unspecified Marital Status	0.390	1.133	0.012	0.344	0.731	0.698	1.432
Town	0.283	0.592	0.016	0.478	0.633	0.780	1.283
Rural	-0.902	0.794	-0.071	-1.136	0.257	0.224	4.473
With Spouse Only	0.867	0.697	0.089	1.245	0.214	0.173	5.767
With Spouse and Children	1.847	0.722	0.159	2.560	0.011	0.228	4.390
With Children Only	0.550	0.583	0.038	0.944	0.345	0.554	1.804
Other	-3.390	2.130	-0.054	-1.592	0.112	0.777	1.288
Manual Labor	-1.013	0.421	-0.099	-2.409	0.016	0.524	1.907
Other Occupation	0.426	0.836	0.018	0.510	0.611	0.685	1.460
Urban Resident Basic Medical Insurance	0.881	0.524	0.061	1.682	0.093	0.677	1.476

New Rural Cooperative Medical Scheme	1.131	0.856	0.088	1.320	0.187	0.197	5.065
Government Medical Insurance	-1.167	1.942	-0.018	-0.601	0.548	0.934	1.070
Commercial Health Insurance	3.070	2.402	0.040	1.278	0.202	0.914	1.094
Other Social Medical Insurance	1.638	1.996	0.026	0.821	0.412	0.884	1.131
Uninsured	2.967	2.036	0.047	1.457	0.146	0.850	1.177
Enrolled in Two or More Types of Health Insurance	-0.208	1.387	-0.005	-0.150	0.881	0.922	1.085
Financial support from children	-1.644	0.740	-0.103	-2.220	0.027	0.411	2.431
Government Subsidies	-1.702	1.138	-0.051	-1.496	0.135	0.754	1.326
Labor Income	-0.507	0.744	-0.029	-0.681	0.496	0.482	2.073
4000–5999	1.374	0.419	0.129	3.280	0.001	0.572	1.749
6000–7999	1.026	0.564	0.071	1.821	0.069	0.577	1.733
≥ 8000	0.902	0.675	0.052	1.336	0.182	0.586	1.705
6–7(excluding7)	0.292	0.377	0.030	0.775	0.439	0.595	1.682
7–8(excluding8)	-0.598	0.640	-0.033	-0.935	0.350	0.697	1.435
≥ 8	-0.914	0.727	-0.045	-1.257	0.209	0.705	1.419
Occasional insomnia	0.394	0.452	0.040	0.871	0.384	0.419	2.388
Normal	0.253	0.548	0.025	0.462	0.644	0.298	3.353
Rarely (1–2 times/month)	-0.665	0.806	-0.042	-0.824	0.410	0.347	2.884
Sometimes (1–2 times/week)	-0.236	0.761	-0.017	-0.311	0.756	0.291	3.435
Often (3–5 times/week)	-0.142	0.716	-0.013	-0.198	0.843	0.192	5.216
Always (daily)	-1.009	0.706	-0.101	-1.429	0.154	0.178	5.631
Fair	-0.102	0.437	-0.008	-0.234	0.815	0.721	1.387
Good	2.767	1.389	0.067	1.993	0.047	0.789	1.267

Note.

1. B = unstandardized coefficient; SE = standard error; β = standardized coefficient; VIF = variance inflation factor.
Dependent variable: Cognitive function total score.

2. Model Summary: $R^2 = 0.597$, Adjusted $R^2 = 0.558$, $F = 15.352$, $p < 0.001$.

3. Reference groups for categorical variables: Gender (Male); Emotional support (Deficient); Marital Status (Married); Residence (Urban); Living arrangement (Living alone); Occupation before retirement (Mental labor); Health Insurance (Urban Employee Basic Medical Insurance); Sources of financial support (Pension); Monthly income (0-3999 RMB); Sleep duration (< 6 hours); Sleep quality (Often insomnia); Exercise frequency (Never); Self-rated health (Poor).

4. The self-rated health variable was recategorized for analysis: The original categories 'Very poor' and 'Poor' were merged to form the reference group 'Poor'. 'Fair' and 'Good' were merged into 'Fair'. The 'Very good' category was retained as 'Good'.

Preliminary correlation and regression analyses (see Table 4.1, 4.2, 4.3) revealed key bivariate relationships among the variables: perceived ageism was significantly negatively correlated with social participation, positively correlated with depressive symptoms, and significantly negatively correlated with cognitive function. These initial findings aligned with our theoretical expectations and laid the groundwork for constructing a more complex mechanistic model.

To systematically examine the mediating roles of social participation and depressive symptoms in the relationship between perceived ageism and cognitive function, a serial multiple mediation model was tested (see Fig. 5). This integrated model not only incorporated the aforementioned direct effects but, more importantly, allowed us to test the potential sequential mediating pathway—whereby perceived ageism impairs cognitive function by reducing social participation, which in turn exacerbates depressive symptoms.

The analysis of indirect effects using bootstrapping (Table 4.3) clearly delineated this mechanism. First, the direct negative effect of perceived ageism on cognitive function remained significant ($B = -0.543$), indicating that the detrimental impact of ageism on cognition persists even after accounting for the mediating pathways.

Second, three significant indirect pathways were identified:

1. Path 1 (Perceived ageism → Social participation → Cognitive function): This was the pathway with the largest effect size (effect = -0.267, accounting for 28.96% of the total effect). This indicates that perceived ageism significantly reduces social engagement, and this reduction directly leads to a decline in cognitive function.
2. Path 2 (Perceived ageism → Depressive symptoms → Cognitive function): This pathway (effect = -0.092, accounting for 9.98% of the total effect) suggests that ageism directly leads to more severe depressive symptoms in older adults, and these negative emotions, in turn, adversely affect their cognitive performance.
3. Path 3 (Perceived ageism → Social participation → Depressive symptoms → Cognitive function): This complete serial mediation pathway (effect = -0.019, accounting for 2.06% of the total effect), while modest in magnitude, is theoretically significant. It reveals a "cascading" effect of ageism: it first leads to social isolation (behavioral level), which then triggers depression (emotional level), ultimately collectively exacerbating cognitive decline.

In summary, the integrated model in Fig. 5 and its path analysis demonstrate that social participation and depressive symptoms play critical mediating roles in the relationship between perceived ageism and cognitive function, through both independent and sequential mechanisms. The findings underscore that the detrimental effect of perceived ageism on cognitive function is largely explained by its restriction of social activities and amplification of psychological distress. This implies that future interventions aimed at mitigating cognitive decline in older adults could be more effective by simultaneously addressing ageism, actively promoting social participation, and attending to emotional well-being.

Table 4.1
Regression analysis results of mediated model

<i>Variable</i>	<i>Model1: Social Participation</i>	<i>Model2: Depressive Symptoms</i>	<i>Model3: Cognitive Function</i>
	<i>B SE t</i>	<i>B SE t</i>	<i>B SE t</i>
Constant	58.755 1.255 46.832***	6.651 0.799 8.329***	14.858 1.181 12.578***
Perceived Ageism	-1.935 0.233 -8.312***	0.439 0.068 6.493***	-0.543 0.098 -5.567***
Social Participation	—	-0.047 0.012 -3.791***	0.138 0.017 8.003***
Depressive symptoms	—	—	-0.210 0.063 -3.353***
Never Married	-1.854 4.363 -0.425	-0.122 1.187 -0.103	3.240 1.643 1.972*
Divorced	4.519 3.592 1.258	0.495 0.979 0.506	4.730 1.355 3.490***
With Spouse and Children	0.461 0.932 0.495	-0.175 0.254 -0.688	1.351 0.351 3.846***
Manual Labor	-3.325 0.941 -3.533***	-0.039 0.259 -0.154	-1.269 0.359 -3.536***
Monthly Income	-0.764 0.872 -0.876	-0.305 0.237 -1.283	0.879 0.329 2.671**
Financial Support from Children	-2.386 1.391 -1.716	-0.070 0.379 -0.185	-1.230 0.525 -2.342*
Good Self-rated Health	-0.220 3.338 -0.066	-2.216 0.908 -2.440*	2.425 1.265 1.918
Age	-3.418 0.572 -5.973***	0.110 0.161 0.683	-0.674 0.223 -3.017**
Education Level	1.716 0.435 3.949***	-0.470 0.120 -3.916***	1.012 0.169 5.992***
R ²	0.325	0.260	0.562
MSE	75.220	5.565	10.666
F	23.630***	15.598***	52.220***
df	10, 490	11, 489	12, 488
Note. *** $p < 0.001$			

Table 4.2
Analysis of the Chain Mediating Effects of Social Participation and Depression

Outcome Variables	Predictor Variables	β	SE	t	95%CI		R ²	F
					LLCI	ULCI		
Social participation	Perceived ageism	-1.935	0.233	-8.312***	-2.393	-1.478	0.325	23.630***
Depressive symptoms	Perceived ageism	0.439	0.068	6.493***	0.306	0.572	0.260	15.598***
	Social participation	-0.047	0.012	-3.791***	-0.071	-0.022		
Cognitive function	Perceived ageism	-0.543	0.098	-5.567***	-0.735	-0.352	0.562	52.220***
	Social participation	0.138	0.017	8.003***	0.104	0.172		
	Depressive symptoms	-0.210	0.063	-3.353**	-0.333	-0.087		
Note. *** $p < 0.001$, All analyses controlled for marital status, living arrangements, occupation, monthly income, primary source of income, self-rated health, age, and education level.								

Table 4.3
Analysis of chain mediating effects.

	Effect	Boot SE	95%Boot CI		Effect Ratio
			LLCI	ULCI	
Total effect	-0.922	0.095	-1.108	-0.735	100.00%
Direct effect	-0.543	0.098	-0.735	-0.352	58.89%
Total indirect effect	-0.378	0.071	-0.521	-0.245	41.11%
Path 1	-0.267	0.052	-0.376	-0.170	28.96%
Path 2	-0.092	0.041	-0.181	-0.019	9.98%
Path 3	-0.019	0.011	-0.044	-0.003	2.06%
Note: Confidence intervals (CIs) for indirect effects are bias-corrected bootstrap 95% CIs based on 5,000 bootstrap samples.					
**: Path 1: Perceived ageism → Social participation → Cognitive function; Path 2: Perceived ageism → Depressive symptoms → Cognitive function; Path 3: Perceived ageism → Social participation → Depressive symptoms → Cognitive function*					

Discussion

The present study examined the mediating roles of social participation and depressive symptoms between perceived ageism and cognitive function in community-dwelling older adults in China. The findings indicated that perceived ageism exerts a significant negative influence on cognitive performance. Both social participation and depressive symptoms were identified as significant partial mediators of this relationship. The sequential mediation pathway through social participation and then depressive symptoms corroborated the study's hypotheses. Consistent with these results, the regression model confirmed that perceived ageism, social participation, and depressive symptoms, along with key sociodemographic factors—including advanced age, lower educational attainment, being unmarried or divorced, non-co-residence with spouse and

children, a history of physically demanding pre-retirement occupations, and financial dependence on children—are all significant predictors of cognitive function in this population.

The effect of perceived ageism on cognitive function

Perceived ageism has been demonstrated to exert substantial negative effects on the mental health of older adults, as well as on multiple life domains, including employment, healthcare access, and social participation^[29]. as aligned with previous studies which similarly report that perceived Ageism is associated with adverse psychological outcomes, such as depression, anxiety, diminished self-esteem, negative self-perception, and feelings of marginalization that often result in social withdrawal^[30–33]. Our results further indicated that higher levels of perceived ageism were correlated with more severe depressive symptoms, thereby corroborating previous findings^[34]. Moreover, perceived ageism has been identified as a potential risk factor for both the development and progression of frailty in older adults^[35], a condition that may exacerbate mental health issues and reduce the immune and cognitive functions. Consequently, future research may prioritize interventions to mitigate mental health challenges in older adults by fostering meaningful social engagement and alleviate depression from perceived ageism. Implementing such strategies may prove vital for preventing cognitive decline in the Chinese aging population.

The mediating effects of social participation and depression

The sequential multiple mediation model suggested that cognitive decline was influenced by a complex interplay of psychological, physiological, and social factors and that perceived ageism indirectly impairs cognitive function through the sequential mediating roles of reduced social participation and increased depressive symptoms. On one hand, older adults with positive self-perceptions of aging tend to engage more frequently in social activities, which may enhance their general health, social adaptability, and involvement in economic, voluntary, and leisure activities, and thereby conferred protective benefits for cognitive function^[36]. Conversely, limited social participation is a recognized risk factor for cognitive decline and dementia^[37], whereas diversified social engagement has been demonstrated to mitigate cognitive deterioration^[20].

On the other hand, consistent evidence indicates that perceived ageism is positively associated with depressive symptoms^[34]. Depression has been extensively documented to directly impair cognitive domains such as attention, memory, and executive function^[38, 39], potentially through mechanisms involving reduced psychological flexibility and compromised memory consolidation.

Serial multiple intermediary paths

The chained mediation pathway wherein perceived ageism reduces social participation, which subsequently increases the risk of depression, ultimately contributing to cognitive decline. The existing literature supports this pathway that ageism undermines social integration and mental health, thereby discourages social engagement^[40]. Moreover, social participation helps alleviate loneliness, reduce depressive symptoms, and improve life satisfaction, thereby supporting mental health and cognitive maintenance^[41].

Although previous studies have suggested an association between perceived ageism and cognitive function, this study is the first to elucidate the underlying mechanism using a multiple mediation framework, highlighting the sequential mediating effects of social participation and depression. These findings provide an empirical basis for developing targeted interventions to promote social engagement and improve mental health to counteract the negative effects of ageism and thereby foster cognitive health and support healthy aging.

Limitation and future directions

This study has several limitations. First, the cross-sectional design precludes solid causal inferences among the variables. Although correlations between perceived ageism and cognitive function were observed among community-dwelling older adults, the causal interpretation assumed that the timing of measurement was not equivalent to the timing of causes.

Future studies should employ longitudinal or experimental designs with prospective data collection to better elucidate the causal pathways and temporal dynamics of perceived ageism in older adults. Second, the data primarily relied on self-reported measures, which may be subject to recall and social desirability biases that potentially compromise the accuracy and reliability of the results. Furthermore, the sample was drawn exclusively from communities in Wuhan, which may limit the generalizability of the findings. Future replication studies involving more diverse and representative older adult populations across different regions are warranted. Additionally, although a random sampling was employed, the possibility of selection bias cannot be entirely ruled out, particularly due to the requirement for informed consent and the potential exclusion of individuals who were unwilling or unable to participate. Therefore, future research may adopt multi-center designs to enhance the generalizability and applicability of the findings.

Conclusion

Perceived ageism significantly threatens older adults' cognitive function through dual mediating pathways: reduced social participation and increased depressive symptoms. Maintaining cognitive health in later life is not solely a medical issue but also a psychosocial one. Future interventions may adopt multidimensional and systematic approaches that integrate strategies to reduce ageism and promote social and behavioral engagement to maintain mental health of older adults. Such integrated efforts can effectively promote healthy aging.

Declarations

Authorship Contributions

Li Yang, ZHANG Qian, WEI Shanshan: Conceptualization, Methodology, Investigation, Data Curation, Writing – Original Draft. These authors contributed equally to this work and share first authorship.

CHEN Fang: Writing – Review & Editing, Supervision, Project Administration.

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HAN Jiaxin, ZHENG Jinjin, WANG Yun cui, GUAN Yue, HE Deng xin, ZHAO Mei cun: Investigation, Data Curation.

Ethics Statement

All participants provided written informed consent, please refer to the supplementary materials in Appendix 1. No experimental interventions were performed. The ethical approval code for this study is 2024001.

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Conflicts of Interest

The authors declare no conflicts of interest.

Consent for Publication

Personal information about the study participants will not be published.

Data Availability Statement

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Clinical trial number: Not applicable

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Figures

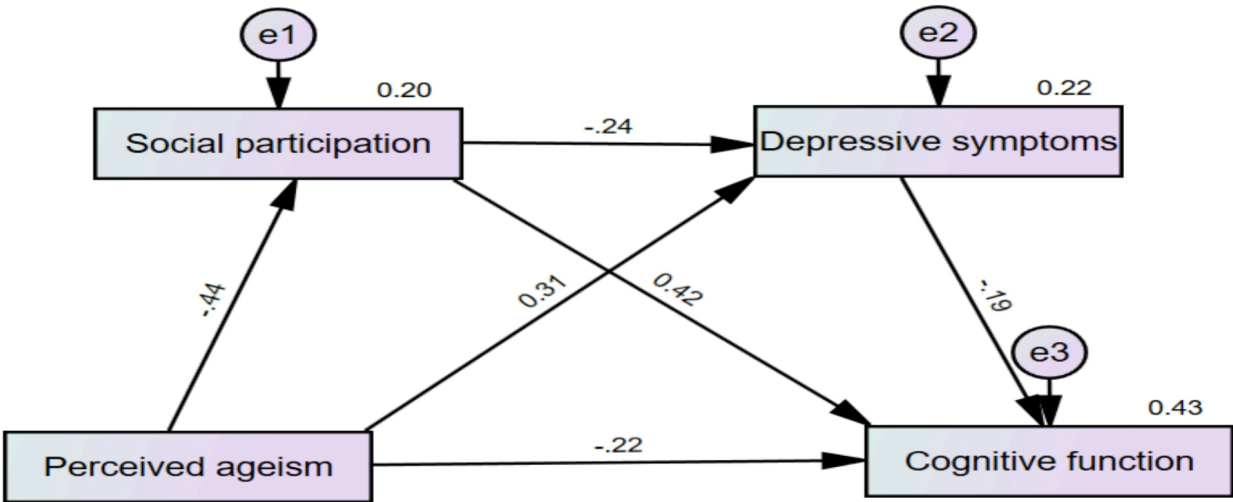


Figure 1

Series Multiple Mediation Model of Perceived Ageism, Cognitive Function, Social Participation, and Depression

Note: Path coefficients were shown in the standardized regression coefficient.