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Relationship between specific leisure activities and successful aging among older adults

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ABSTRACT

Background/Objectives: This study was designed to investigate the association between specific leisure activities and successful aging among older adults, using data from the Chinese Longitudinal Healthy Longevity Survey.

Methods: A total of 7689 older adults were involved in this study and categorized as successful aging group ($n = 3989$; 51.8%) or non-successful aging group ($n = 3703$; 48.2%). Participants were identified as successful aging if they had a score of more than 3 points, or as non-successful aging. The points were based on the following five items and each item was assigned 1 point: self-rated health, self-rated psychological status or mood, cognitive function, activities of daily life, and physical activity. Six activities including gardening work, reading newspapers or books, raising domestic animals or pets, playing cards or mahjong, watching TV or listening to radio, and participating in social activities were collected to reflect leisure activities. Chi-square tests, independent sample *t*-test, and logistic regression analyses were employed to explore the association between specific leisure activities and successful aging.

Results: The prevalence of successful aging was 51.8% among Chinese older adults. A significant positive relationship was found between the frequency of participation in specific leisure activities and successful aging ($p < 0.05$). Older adults who usually participated in leisure activities had greater odds for successful aging compared to those who never participated in leisure activities (adjusted odds ratio (OR): 1.31 (95% CI: 1.15–1.49) to 1.88 (95% CI: 1.62–2.19)). Older adults participating in one or more leisure activities had greater odds for successful aging compared to those who did not participate in leisure activities (adjusted OR: 1.51 (95% CI: 1.30–1.76) to 4.10 (95% CI: 2.44–6.89)).

Conclusions: The findings provide evidence that participating more frequently and in more leisure activities was associated with a greater probability of successful aging among Chinese older adults. Encouraging older people to participate frequently in a larger number of leisure activities may be a key to promote successful aging. Therefore, the frequency and number of participation in leisure activities should be highlighted and targeted for promoting successful aging.

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1. Introduction

Population aging is one of the most pressing global concerns. Over 1 billion of the world's population is aged over 60 years, and this is projected to double to 2.1 billion by 2050.¹ Aging is associated with a range of negative health outcomes such as dependency, chronic diseases, and disability, which leads to an increase in health

care costs and economic burden.^{2–4} To minimize the adverse effects of the aging process, it is important for older people to remain functionally independent for as long as possible.^{5,6} In light of this, more attention should be focused on improving quality of life and the healthy aging among older adults.

Successful aging is an important public health goal. Although the concept of successful aging is proposed as early as 1961, there has been no standardized definition and assessment for successful aging.⁷ Rowe and Kahn⁸ defined successful aging as a multidimensional subject that includes three main components: absence of diseases and disabilities, maintenance of high cognitive and

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physical function, and sustainment of active social engagement. According to a follow-up survey conducted in London,⁹ the criteria for successful aging cover four aspects: being alive, absence of chronic diseases, avoidance of mental health problems, and good cardiovascular, metabolic, respiratory, and cognitive and physical functioning. Liu and colleagues¹⁰ performed a study among older adults in China, and they used the following five indicators to assess successful aging: no major diseases, absence of disability, high physical functioning, good cognitive functioning, and active engagement with life. With a growing number of studies on successful aging, the definitions of successful aging become more comprehensive and the assessments become more diversified.

Accumulating evidence shows that leisure activities, including physical activity, cognitive activity, intellectual activity, and social activity, are related to a range of better well-being and health outcomes for older people.^{11–14} For instance, Jeong and Park¹⁵ explored the association between participation in leisure activities and quality of life and depression among community-dwelling older adults in Korea, finding that active, emotional, social, and productive activities are positively related to the quality of life and depression. Guerrero Barragán and colleagues' cross-sectional study of older Colombian adults found that greater participation in cognitive and physical activities in later life was positively associated with cognitive impairment and dementia, independent of literacy and education level.¹⁶ Additionally, frequent participation in leisure activities has also been reported to associate with lowered all-cause mortality among older adults.^{17–19}

Successful aging is receiving increasing attention given the dramatic increase in the older adult population. In the past decades, numerous studies have examined the relationship between leisure activity and health and well-being,^{11–14} but little is known about whether leisure activities are associated with successful aging among older people. Furthermore, the prevalence of successful aging is mainly influenced by sex and age. Previous studies have revealed that men have a greater prevalence of successful aging than women, and increased age is related to a lower prevalence of successful aging.^{20,21} Thus, the specific leisure activities associated with successful aging may vary across different sex or age groups.

Therefore, the purpose of this study is to examine the relationship between specific leisure activities and successful aging in a large sample of the Chinese older adults stratified by sex and age, using data from the Chinese Longitudinal Healthy Longevity Survey (CLHLS). It is hypothesized that participation in specific leisure activities is associated with achieving successful aging among older adults.

2. Methods

2.1. Data source and sample

The data used in this study were obtained from the 2018 wave of the CLHLS. The CLHLS carried out in most provinces in China (23/31 provinces) was a nationwide representative population-based survey. The CLHLS collected data on family structure, self-rated health, self-evaluation of life satisfaction, psychological characteristics, cognitive functioning, the capacity of physical performance, activities of daily living, chronic disease prevalence, social activities, and so on. The data were collected by trained interviewers. More detailed information about the CLHLS and the details of the sampling design, response rates, attrition, and systematic assessments of data quality were available elsewhere.^{22,23} The CLHLS research project was approved by the Research Ethics Committee of Peking University (approval number: IRB00001052-13074). Before the survey, written informed consent was required to sign by participants or their proxy respondents.

We included adults who met the following inclusion criteria: (a) adults aged 60 years and older, (b) complete information on variables of successful aging and (c) leisure activities, and (d) complete data related to covariates such as age, body mass index (BMI), residence, co-residence, smoking, drinking, exercise, education level, marital status, and occupation before age 60. A total of 15,874 participants were surveyed in the 2018 wave of the CLHLS. After excluding adults who did not meet the inclusion criteria, there were 7689 older adults in the final analysis (Fig. 1).

2.2. Assessment of leisure activities

A six-question index of activity was used to assess the participation in leisure activities of the participants. The participants were asked "do you participate in the following six activities?". The activities were provided as follows: (a) gardening work, (b) reading newspapers or books, (c) raising domestic animals or pets, (d) playing cards or mahjong, (e) watching TV or listening to radio, and (f) participating in social activities. Based on a previous study,²⁴ responses for each activity in this study were recoded into a 3-frequency: (a) "never" (to represent "never"), (b) "sometimes" (to represent "not weekly, but at least once in a month" and "not monthly, but sometimes"), and (c) "usually" (to represent "almost everyday" and "not daily, but at least once in a week"). The classification of frequency of "never", "sometimes" and "usually" is similar to that presented in a study by Fernández-Mayoralas and colleagues,²⁵ and they divided participation in leisure activities into "inactive", "moderately active", and "active". Then the "usually" frequency was coded as "1" (to represent participation in the leisure activity), and the "sometimes" or "never" frequency was coded as "0" (to represent non-participation in the leisure activity) for each leisure activity. Finally, the number of participation in leisure activities was counted, and the total number of participation in leisure activities ranged between 0 and 6 for each participant.

2.3. Ascertainment of successful aging

According to the criteria from Shi et al.,²⁰ participants in our study were identified as successful aging if they had a score of more than 3 points, or as non-successful aging. The points were based on the following five items and each item was assigned 1 point: (a) self-rated health. Self-rated health was assessed by asking participants the question "how do you rate your health at present?". The response options included "very good", "good", "fair", "poor", and "very poor". Health self-rated as "very good" or "good" scored 1 point; (b) self-rated psychological status or mood. It was evaluated by the 10-item Centre for Epidemiological Studies Depression Scale (CES-D-10). The CES-D-10 covered 10 questions using a 4-point metric from 0 (to represent "rarely") to 3 (to represent "most of the time"). The scores of CES-D-10 ranged between 0 and 30 and lower scores suggested better psychological status.²⁶ A CES-D-10 score of less than 10 was scored 1 point; (c) cognitive function. It was assessed by the Mini-Mental State Examination (MMSE) which included five dimensions such as orientation, attention and calculation, registration, language, and recall. The score of the MMSE ranged between 0 and 30. Individuals with MMSE scores lower than 24 were considered to suffer cognitive impairment.²⁷ Cognitive function was scored 1 point if participants had MMSE scores greater than 24; (d) activities of daily life. It was evaluated based on the six self-care tasks, including eating, bathing, dressing, toileting, indoor activities, and continence. The item was scored 1 point if the participant was able to complete all the self-care tasks; (e) physical activity. It was assessed based on the three tasks, including walking continuously for 1 km at a time, lifting a weight of 5 kg, and continuously

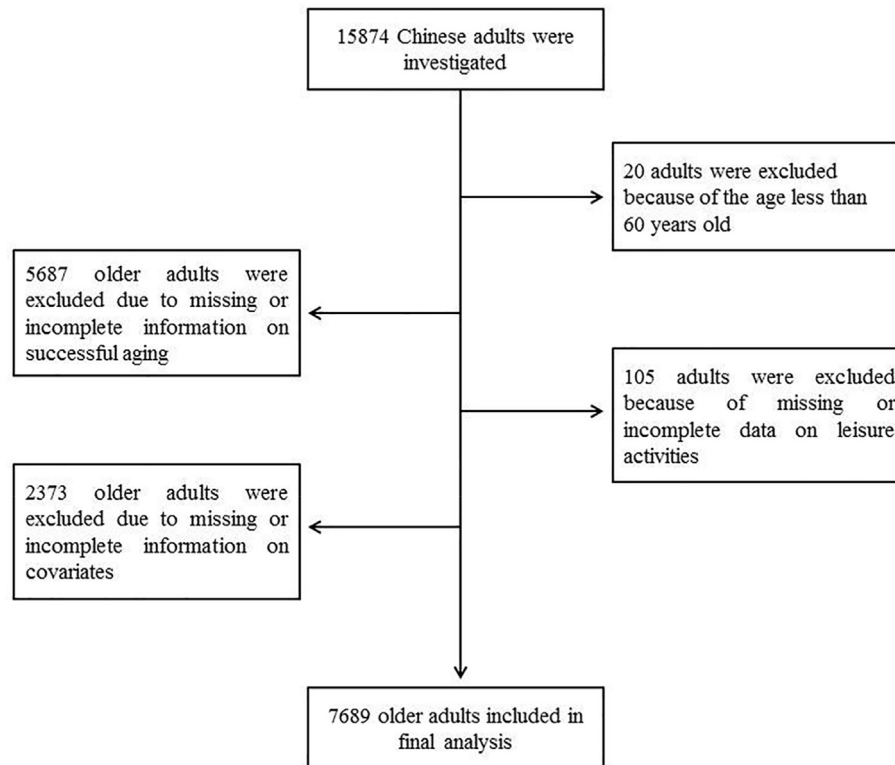


Fig. 1. Flowchart of participants included in this study.

crouching and standing up three times. Physical activity was scored 1 point if participants could complete all tasks.

2.4. Assessment of covariates

Covariates in this study included age, sex, BMI, education level, annual income, residence, co-residence, smoking, drinking, exercise, marital status, and occupation before age 60. According to Ho and colleagues,²⁸ participants were categorized as young-old adults (<80 years) and old-old adults (≥ 80 years). BMI was computed by dividing body weight (kg) by the square of body height (m^2). Education level was captured by asking participants their years of schooling. Annual income was measured as total household income in the past year. If participants habitually drank alcohol, smoked cigarettes, or exercised, then they were identified as “current drinkers”, “current smokers”, or “current exercisers”. Co-residence was divided into three groups, “with household member(s)”, “in an institution” and “living along”. Marital status was categorized as “married and living with spouse”, “widowed”, and “others”. Occupation before age 60 was identified as “workers”, “farmers”, and “others”.

2.5. Statistical analysis

Participants were described using total numbers and percentages for categorical variables, and means \pm standard deviations for numerical variables. We employed Chi-square tests for categorical data and independent sample *t*-test for continuous data to analyze the differences between successful aging and non-successful aging groups. We used logistic regression analyses to examine the association between specific leisure activities and successful aging, with and without adjusting for age, sex, BMI, education level, residence, co-residence, smoking, drinking, exercise, marital status, and

occupation before age 60. We used the “never” frequency of participation in each leisure activity and the “0” number of total leisure activities as the reference. The logistic regression analyses were performed repeatedly, stratified by sex (men and women) and age (young-old and old-old adults). Odds ratios (OR) with 95% confidential intervals (95% CI) for successful aging were calculated for all the logistic regression analyses. Statistical analyses were executed using SPSS Statistics for Windows (Version 25.0, IBM Corp, Armonk, NY). The statistical significance threshold was set at $p < 0.05$ for all the analyses.

3. Results

Older adults were categorized as successful aging group ($n = 3989$; 51.8%) or non-successful aging group ($n = 3703$; 48.2%). Older adults in the successful aging group were more likely to be men (28.4% vs. 19.8%, $p < 0.001$), younger (78.6 ± 9.8 vs. 85.3 ± 11.1 years, $p < 0.001$), have a greater BMI (23.3 ± 4.3 vs. 22.3 ± 4.4 kg/m^2 , $p = 0.001$), higher education (4.9 ± 4.5 vs. 3.3 ± 4.3 years, $p = 0.015$), live in urban (17.6% vs. 14.8%, $p = 0.002$) and live with household member(s) (42.9% vs. 37.3%, $p < 0.001$) compared to those in the non-successful aging group. Older adults in the successful aging group were also found to have a higher prevalence of current smokers (10.5% vs. 6.5%, $p < 0.001$), current drinkers (10.8% vs. 5.5%, $p < 0.001$), current exercisers (25.3% vs. 12.8%, $p < 0.001$), and have an increased prevalence of married and living with spouse (30.8% vs. 18.4%, $p < 0.001$) and being workers (18.7% vs. 13.5%, $p < 0.001$) before age 60 when compared to those in the non-successful aging group (Table 1).

Table 2 showed logistic regression analyses of the relationship between leisure activities and successful aging. Compared to older adults who never participated in leisure activities (gardening work, reading newspapers or books, raising domestic animals or pets,

Table 1
The characteristics of participants stratified by successful aging.

	Successful aging (n = 3986)	Non-successful aging (n = 3703)	p value
Age (yrs)	78.6 ± 9.8	85.3 ± 11.1	<0.001
Weight (kg)	58.7 ± 12.6	53.6 ± 12.9	0.004
Height (cm)	158.4 ± 9.5	154.7 ± 10.5	<0.001
BMI (kg/m ²)	23.3 ± 4.3	22.3 ± 4.4	0.001
Education level (yrs)	4.9 ± 4.5	3.3 ± 4.3	0.015
Annual income (RMB)	48423.6 ± 37444.0	42813.8 ± 37454.8	0.786
Sex, n (%)			<0.001
Men	2185 (28.4)	1524 (19.8)	
Women	1801 (23.4)	2179 (28.3)	
Residence, n (%)			0.002
Urban	1354 (17.6)	1137 (14.8)	
Rural	2632 (34.2)	2566 (33.4)	
Current smokers, n (%)			<0.001
Yes	807 (10.5)	498 (6.5)	
No	3179 (41.3)	3205 (41.7)	
Current drinkers, n (%)			<0.001
Yes	830 (10.8)	425 (5.5)	
No	3156 (41.0)	3278 (42.6)	
Current exercisers, n (%)			<0.001
Yes	1945 (25.3)	982 (12.8)	
No	2041 (26.5)	2721 (35.4)	
Co-residence, n (%)			<0.001
With household member(s)	3301 (42.9)	2868 (37.3)	
Living alone	605 (7.9)	668 (8.7)	
In an institution	80 (1.0)	167 (2.2)	
Marital status, n (%)			<0.001
Married and living with spouse	2366 (30.8)	1418 (18.4)	
Widowed	1491 (19.4)	2174 (28.3)	
Others	129 (1.7)	111 (1.4)	
Occupation before age 60			<0.001
Workers	1468 (18.7)	1036 (13.5)	
Farmers	2191 (28.5)	2281 (29.7)	
Others	357 (4.6)	386 (5.0)	

Abbreviations: BMI, body mass index; RMB, Chinese money Renminbi.

playing cards or mahjong, watching TV or listening to radio, and participating in social activities), those who usually participated in leisure activities had greater odds for successful aging (adjusted odds ratio (OR): 1.31 (95% CI: 1.15–1.49) to 1.88 (95% CI: 1.62–2.19)). Older adults participating in one or more leisure activities had greater odds for successful aging compared to those who did not participate in leisure activities (adjusted OR: 1.51 (95% CI: 1.30–1.76) to 4.10 (95% CI: 2.44–6.89)).

For older men, those who usually participated in any leisure activities had greater odds for successful aging compared to those who never participated in the leisure activity (adjusted OR: 1.31 (95% CI: 1.09–1.59) to 1.82 (95% CI: 1.47–2.24)). For older women, except for participating in some social activities, those who usually participated in any leisure activities had greater odds for successful aging compared to those who did not participate in the leisure activity (adjusted OR: 1.32 (95% CI: 1.11–1.57) to 1.99 (95% CI: 1.60–2.47)). Linear correlations were found between the number of leisure activities and successful aging in both older men and women (all $p < 0.001$; Table 3) after adjustment.

For young-old adults, except for raising domestic animals or pets, adults who usually participated in any leisure activities had greater odds for successful aging compared to those who did not participate in the leisure activity (adjusted OR: 1.37 (95% CI: 1.04–1.81) to 1.69 (95% CI: 1.40–2.03)). For old-old adults, adults who usually participated in any leisure activity had greater odds for successful aging (adjusted OR: 1.36 (95% CI: 1.11–1.68) to 2.30 (95% CI: 1.84–2.87)) compared to those who never participated in the leisure activity. Compared to older adults with 0 leisure activity, those with 2 or more leisure activities had greater odds for

successful aging (adjusted OR: 1.72 (95% CI: 1.31–2.28) to 3.68 (95% CI: 1.77–7.62)) for young-old adults; those with 1 or more leisure activities had greater odds for successful aging (adjusted OR: 1.72 (95% CI: 1.43–2.07) to 4.81 (95% CI: 3.00–7.70)) for old-old adults (Table 4).

4. Discussion

The prevalence of successful aging was 51.8% among Chinese adults aged 60 years and over in the present study. Using a representative sample of older adults in China, Shi and colleagues²⁰ reported a prevalence of successful aging reaching 56.8% among adults aged 65 years and older, which was similar to our study. In the present study, we also found that mean BMI for successfully aging older adults was significantly higher compared to their unsuccessfully aging peers. This finding is consistent with that of others and emphasizes the importance of higher BMI for successful aging.^{29,30} Luo et al.³¹ found that older Chinese men with obesity had greater odds for successful aging compared to their normal weight peers, and older Chinese women who were underweight had lower odds of successful aging compared to their normal weight peers. These results indicate that a higher BMI may be beneficial for successful aging among older adults. Successful aging was observed more prevalent among older men in our study. One possible reason is that men had higher incomes and more social resources than women. An unexpected result was that the proportion of current smokers and drinkers was higher in the successful aging group. That may be because men had a greater probability to achieve successful aging than women, and a large

Table 2
Logistic regression analyses of the relationship between leisure activities and successful aging.

	Successful aging	
	OR (95% CI)	Adjusted OR ^a (95% CI)
Gardening work		
Never	1.00 (reference)	1.00 (reference)
Sometimes	1.37 (1.09–1.74)*	0.94 (0.73–1.21)
Usually	2.59 (2.28–2.93)*	1.77 (1.55–2.03)*
Reading newspapers or books		
Never	1.00 (reference)	1.00 (reference)
Sometimes	1.42 (1.19–1.70)*	0.87 (0.71–1.06)
Usually	2.35 (2.09–2.64)*	1.50 (1.29–1.74)*
Raising domestic animals or pets		
Never	1.00 (reference)	1.00 (reference)
Sometimes	0.96 (0.72–1.27)	0.76 (0.56–1.04)
Usually	1.61 (1.44–1.80)*	1.31 (1.15–1.49)*
Playing cards or mahjong		
Never	1.00 (reference)	1.00 (reference)
Sometimes	1.74 (1.45–2.07)*	1.17 (0.97–1.42)
Usually	2.58 (2.25–2.97)*	1.88 (1.62–2.19)*
Watching TV or listening to radio		
Never	1.00 (reference)	1.00 (reference)
Sometimes	1.26 (1.01–1.58)*	0.94 (0.75–1.19)
Usually	3.05 (2.69–3.44)*	1.71 (1.49–1.96)*
Participating in social activities		
Never	1.00 (reference)	1.00 (reference)
Sometimes	1.97 (1.69–2.29)*	1.28 (1.08–1.51)*
Usually	2.33 (1.93–2.82)*	1.38 (1.13–1.70)*
Number of leisure activities		
0	1.00 (reference)	1.00 (reference)
1	2.13 (1.85–2.45)*	1.51 (1.30–1.76)*
2	4.32 (3.73–5.00)*	2.48 (2.11–2.91)*
3	6.17 (5.18–7.34)*	3.03 (2.50–3.68)*
4	8.50 (6.46–11.19)*	3.58 (2.66–4.81)*
5–6	9.85 (6.00–16.17)*	4.10 (2.44–6.89)*
p for trend	<0.001	<0.001

Abbreviations: OR, odds ratio; CI, confidential intervals.

* Statistical significance ($p < 0.05$).

^a Adjusted for age, sex, body mass index, residence, co-residence, smoking, drinking, exercise, education level, marital status, and occupation before age 60.

proportion of men had smoking and drinking habits.

The frequency of participation in leisure activities has been shown to be highly helpful in older people to maintain physical function, cognitive function, and mental health,^{13,32–34} and thus to contribute to successful aging. For example, Verghese et al.³⁵ investigated the relationship between leisure activities and the risk of dementia in adults aged 75 years and older. They noted that the frequency of engagement in leisure activities was linked with a lower risk of dementia, even after adjusting for covariates and baseline cognitive status. Paggi et al.³⁶ explored the associations between leisure activities, health and well-being considering the role of age, and demonstrated that the age-related decrease in leisure activity has more to do with physical health limitations when compared with older age itself. It is worth noting that the health outcomes in the previous studies are either the main components of successful aging or closely associated with successful aging. In our study, we found that a higher frequency of participation in leisure activities is related to greater odds of successful aging. This is the first research to assess the relationship between specific leisure activities and successful aging among Chinese older adults.

Apart from the frequency, we also found that the number of leisure activities was associated with successful aging. Compared to individuals with no participation in leisure activity, those

participating in one or more leisure activities were at greater odds for successful aging. The more the number of participation in leisure activities, the higher probability of successful aging was observed. The result is consistent with the results obtained in a hospital-based cohort study on dementia and cognitive function conducted by Wong and colleagues.³⁷ They found that engagement in a greater number of leisure activities is linked with better cognitive function. Additionally, Kobayashi et al.¹⁷ conducted a cohort study to determine the association of participation in leisure activities with mortality, discovering that the number of leisure activities was associated with lower odds for all-cause mortality (adjusted OR: 0.93 (95% CI: 0.92–0.95)) among older Japanese adults. The above findings suggest that encouraging participation in different kinds of leisure activities may promote physical and mental health, which may lead to successful aging in older adults.

Sex and age have been regarded as two of the most significant physiological determinants of many diseases or health outcomes.^{38–41} Our results showed that a greater frequency of participation in some social activities was related to higher odds for successful aging in older men, but the relationship was not observed in older women (Table 3). Moreover, our study also found that raising domestic animals or pets was associated with successful aging in adults aged 80 years and older (old-old adults), but not in adults aged less than 80 years (young-old adults) (Table 4). It follows that sex and age-related differences exist between specific leisure activities and successful aging among older persons.

Figuring out contributing factors is of great public health significance for promoting successful aging in older persons. In the current study, we indicated that there is an association between the frequency of participation in specific leisure activities and successful aging among the Chinese older population. The probability of successful aging increased linearly with the number of participation in leisure activities. According to the results, it is necessary to take action to promote successful aging in older adults. For instance, Geard et al.⁴² used a randomized controlled trial to examine the effect of an exercise intervention on successful aging indicators. Their study showed that 12 weeks of cycling training helped promote greater social and physical functioning among middle-aged adults aged 40 years and older. Encouraging older adults to participate in a larger number of leisure activities frequently may be beneficial to promote successful aging. Longitudinal studies are needed to confirm the effect of participation in leisure activities on successful aging in older adults.

The major strengths of the present study are the use of a large sample of the Chinese older adults and the use of many specific leisure activities such as gardening work, reading newspapers or books, raising domestic animals or pets, playing cards or mahjong, watching TV or listening to radio, and participating in social activities. Moreover, we adjusted for several covariates in our logistic regression analyses. However, there are still several limitations to our study. First, there is no standardized definition and assessment for successful aging. We defined successful aging based on the criteria from Shi and colleagues,²⁰ which is somewhat different from other definitions of successful aging. Second, although we adjusted for several covariates, other potential factors such as overall physical activity levels were not measured and could not be considered. Third, this study was cross-sectional and we therefore were unable to infer causality. Last, we could not explore underlying causal mechanisms.

To conclude, aging successfully is important for good health, especially given the aging of the world's population. There is a

Table 3
Logistic regression analyses of the association of leisure activities with successful aging stratified by sex.

	Men		Women	
	OR (95% CI)	Adjusted OR ^a (95% CI)	OR (95% CI)	Adjusted OR ^a (95% CI)
Gardening work				
Never	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Sometimes	1.03 (0.75–1.42)	0.80 (0.57–1.13)	1.78 (1.26–2.52)*	1.14 (0.78–1.65)
Usually	2.39 (1.99–2.87)*	1.72 (1.41–2.10)*	2.80 (2.36–3.31)*	1.82 (1.51–2.19)*
Reading newspapers or books				
Never	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Sometimes	1.30 (1.03–1.64)*	0.94 (0.73–1.21)	1.29 (0.97–1.71)	0.77 (0.56–1.05)
Usually	1.91 (1.64–2.22)*	1.52 (1.27–1.83)*	2.44 (2.00–2.97)*	1.42 (1.10–1.83)*
Raising domestic animals or pets				
Never	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Sometimes	0.80 (0.54–1.19)	1.01 (1.00–1.03)*	1.11 (0.73–1.68)	0.94 (0.60–1.46)
Usually	1.66 (1.40–1.96)*	1.31 (1.09–1.59)*	1.62 (1.39–1.88)*	1.32 (1.11–1.57)*
Playing cards or mahjong				
Never	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Sometimes	1.46 (1.15–1.86)*	1.12 (0.87–1.45)	1.91 (1.47–2.49)*	1.23 (0.93–1.64)
Usually	2.29 (1.88–2.79)*	1.82 (1.47–2.24)*	2.72 (2.22–3.33)*	1.99 (1.60–2.47)*
Watching TV or listening to radio				
Never	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Sometimes	1.14 (0.81–1.59)	0.89 (0.62–1.27)	1.29 (0.96–1.73)*	0.99 (0.72–1.35)
Usually	2.74 (2.26–3.33)*	1.74 (1.40–2.15)*	2.92 (2.49–3.43)*	1.69 (1.41–2.02)*
Participating in social activities				
Never	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Sometimes	1.94 (1.57–2.39)*	1.44 (1.14–1.81)*	1.81 (1.44–2.26)*	1.13 (0.89–1.45)
Usually	2.35 (1.78–3.12)*	1.50 (1.11–2.02)*	2.25 (1.73–2.92)*	1.28 (0.96–1.70)
Number of leisure activities				
0	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
1	2.08 (1.67–2.59)*	1.70 (1.34–2.14)*	2.01 (1.67–2.42)*	1.40 (1.14–1.70)*
2	3.49 (2.79–4.36)*	2.36 (1.85–3.00)*	4.72 (3.88–5.75)*	2.65 (2.14–3.29)*
3	5.54 (4.28–7.16)*	3.32 (2.50–4.40)*	5.84 (4.58–7.45)*	2.78 (2.12–3.64)*
4	6.29 (4.35–9.08)*	3.26 (2.20–4.85)*	10.19 (6.66–15.60)*	4.18 (2.65–6.59)*
5–6	13.67 (6.63–28.16)*	7.17 (3.40–15.14)*	11.80 (7.86–16.52)*	5.79 (3.83–8.11)*
p for trend	<0.001	<0.001	<0.001	<0.001

Abbreviations: OR, odds ratio; CI, confidential intervals.

* Statistical significance ($p < 0.05$).

^a Adjusted for age, body mass index, residence, co-residence, smoking, drinking, exercise, education level, marital status, and occupation before age 60.

growing body of studies on well-being and health, and most of them focus on single outcomes such as cognitive function, depression, or physical health. But the different dimensions of well-being and health are generally linked with other. Therefore, we used a composite measure of successful aging and found that participating more frequently and in more leisure activities was associated with a greater probability of successful aging in a national sample of Chinese older adults. Our findings have important implications in the fields of gerontology and geriatrics. Encouraging older people to participate frequently in a larger number of leisure activities may be a key to promote successful aging. Hence, the frequency and number of participation in leisure activities should be highlighted and targeted for promoting successful aging. Future prospective studies should explore whether leisure activity interventions have a positive effect on successful aging among the older population.

Author contributions

XZ contributed to all aspects of the study, including designing this research. JY and NL collected, processed, and analyzed data. All authors have read and agreed to the published version of the manuscript.

Ethical approval and consent to participate

The CLHLS research project has been reviewed and approved by

the Biomedical Ethics Committee of Peking University (approval number: IRB00001052–13074). Before the survey, written informed consent was required to sign by participants or their proxy respondents.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Data availability statement

The data that support the findings of this study are available in Peking University Open Research Data at <https://opendata.pku.edu.cn/dataverse/CHADS>.

Declaration of competing interest

The author(s) have no conflicts of interest relevant to this article.

Table 4
Logistic regression analyses of the association between leisure activities and successful aging stratified by age.

	Young-old adults (<80 years)		Old-old adults (≥80 years)	
	OR (95% CI)	Adjusted OR ^a (95% CI)	OR (95% CI)	Adjusted OR ^a (95% CI)
Gardening work				
Never	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Sometimes	0.77 (0.57–1.03)	1.12 (0.91–1.37)	2.01 (1.36–2.97)*	1.52 (1.01–2.31)*
Usually	1.93 (1.62–2.30)*	1.69 (1.40–2.03)*	2.62 (2.18–3.14)*	1.83 (1.51–2.24)*
Reading newspapers or books				
Never	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Sometimes	1.01 (0.80–1.27)	0.86 (0.67–1.10)	1.34 (0.99–1.80)	0.92 (0.67–1.28)
Usually	2.00 (1.68–2.39)*	1.60 (1.30–1.98)*	2.25 (1.91–2.65)*	1.36 (1.11–1.68)*
Raising domestic animals or pets				
Never	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Sometimes	0.97 (0.83–1.13)	0.98 (0.92–1.05)	0.94 (0.58–1.52)	0.92 (0.56–1.54)
Usually	1.12 (0.91–1.27)	1.10 (0.89–1.34)	1.83 (1.53–2.18)*	1.59 (1.31–1.93)*
Playing cards or mahjong				
Never	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Sometimes	1.24 (0.98–1.57)	1.11 (0.87–1.41)	1.67 (1.25–2.22)*	1.26 (0.93–1.71)
Usually	1.81 (1.49–2.20)*	1.59 (1.30–1.95)*	2.81 (2.28–3.46)*	2.30 (1.84–2.87)*
Watching TV or listening to radio				
Never	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Sometimes	1.10 (0.75–1.61)	1.00 (0.68–1.49)	1.10 (0.82–1.47)	0.87 (0.65–1.18)
Usually	1.95 (1.55–2.45)*	1.53 (1.20–1.95)*	2.70 (2.32–3.16)*	1.79 (1.51–2.12)*
Participating in social activities				
Never	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Sometimes	1.30 (1.06–1.60)*	1.09 (0.87–1.36)	2.30 (1.82–2.90)*	1.35 (0.99–1.86)
Usually	1.74 (1.34–2.26)*	1.37 (1.04–1.81)*	2.26 (1.69–3.02)*	1.54 (1.19–1.99)*
Number of leisure activities				
0	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
1	1.17 (0.89–1.53)	1.07 (0.81–1.42)	2.16 (1.82–2.58)*	1.72 (1.43–2.07)*
2	1.97 (1.51–2.58)*	1.72 (1.31–2.28)*	4.33 (3.58–5.25)*	2.89 (2.35–3.56)*
3	2.91 (2.17–3.92)*	2.31 (1.70–3.15)*	5.44 (4.26–6.95)*	3.16 (2.41–4.15)*
4	3.30 (2.23–4.87)*	2.33 (1.55–3.51)*	9.75 (6.27–15.17)*	4.81 (3.00–7.70)*
5–6	5.46 (2.68–11.14)*	3.68 (1.77–7.62)*	6.57 (3.10–13.89)*	3.42 (1.55–7.55)*
p for trend	<0.001	<0.001	<0.001	<0.001

Abbreviations: OR, odds ratio; CI, confidential intervals.

* Statistical significance (p < 0.05).

^a Adjusted for sex, age, body mass index, residence, co-residence, smoking, drinking, exercise, education level, marital status, and occupation before age 60.

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