

•ORIGINAL RESEARCH ARTICLE•

The Relationship between the Lifestyle of the Elderly in Shanghai Communities and Mild Cognitive Impairment

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Background: Those with mild cognitive impairment (MCI) are ten times more likely to develop Alzheimer's disease (AD) than the general population. MCI diagnosis and early intervention are helpful for the diagnosis and treatment of AD in its early stages, thus delaying its development and improving the quality of life for those with MCI.

Aims: To analyze the relationship between the lifestyle of the elderly in Shanghai communities and mild cognitive impairment and to look for preventative lifestyle measures for the elderly with mild cognitive impairment.

Methods: 1005 elderly persons were randomly selected from the community in Shanghai. Study participants were 265 people with an MCI diagnosis and 607 non-MCI elderly persons. The demographic and lifestyle data of these elderly people were collected for univariate and multivariate analysis to search for statistically significant indicators.

Results: The univariate analysis revealed that smoking ($\chi^2 = 10.808, p = 0.001$), tea drinking ($\chi^2 = 11.74, p = 0.001$), having hobbies ($\chi^2 = 20.815, p < 0.001$), reading ($\chi^2 = 28.670, p = 0.001$), surfing the internet ($\chi^2 = 12.623, p = 0.001$), and photography ($\chi^2 = 4.470, p = 0.034$) were protective factors for MCI. The binary logistic regression, a multivariate analysis, revealed that smoking, reading, and surfing the internet had statistical significance. Their OR values were 0.562 (0.358-0.883), 0.428 (0.253-0.726), and 0.238 (0.071-0.797) respectively. Thus, smoking, reading, and surfing the internet were protective factors for MCI.

Conclusions: Lifestyle is associated with the onset of MCI. Good life habits and behaviors are significant in the prevention of MCI developing into Alzheimer's.

Key words: mild cognitive impairment; lifestyle; protective factors

[Shanghai Arch Psychiatry. 2017; 29(6): 352-357. doi: <http://dx.doi.org/10.11919/j.issn.1002-0829.217059>]

1. Background

Mild cognitive impairment (MCI) refers in particular to memory or cognitive function decline, that does not meet the full diagnostic requirements for dementia. MCI is considered as a normal phase of physiological aging and can also transition into Alzheimer's disease (AD).^[1] Those with MCI are ten times more likely to develop Alzheimer's disease (AD) than those in the general population.^[2] MCI diagnosis and early intervention are helpful for the diagnosis and treatment of AD in its early stages, making it possible to push back the onset of AD and improve the quality of life for those with MCI. We

explored the risk factors and protective factors for MCI from the vantage point of lifestyle.

2. Participants and methods

2.1 Participants

This study was based on the China's national study on the evaluation, early recognition, and treatment of psychological problems in the elderly.^[3] The subjects of this study selected were elderly people that had household registration in four representative communities in Shanghai (including Pudong New Area,

Huangpu district, Changning district, and Baoshan district) in 2011. There were 4530 elderly individuals with an age of 60 years or older. SPSS statistical software was used to select 2720 elderly people by a random sampling method. Among them, 1302 people agreed to participate and provided written informed consent. Of the 1302 persons selected, 1005 people completed the survey. There were 4 psychological evaluators who assessed the cognitive function of all study subjects and collected demographic and lifestyle data. A training and comprehensive exam on the training was conducted before the study began. Evaluator consistency was assessed after the training. The intraclass correlation coefficient (ICC) was above 0.9 in all the tests of consistency, indicating good consistency. All subjects were diagnosed by 3 psychiatrists that had the rank of associate chief physician or above. In the end, a confirmed diagnosis was given to 607 normal elderly people and 265 elderly people with MCI. The study was approved by the ethics committee of the Shanghai Mental Health Center affiliated to the Shanghai Jiao Tong University.

Inclusion criteria:

The MCI group: met the MCI diagnostic criteria developed by the Petersen study group

- (a) the patient is conscious of his or her loss of memory or someone with intimate knowledge of the patient thinks the patient has a memory disorder;
- (b) the overall cognitive function is normal;
- (c) objective examination of memory impairment or an impairment of other cognitive functions. The memory or cognitive function scores were lower than the mean score of those of the same age and education attainment by 1.5 to 2 standard deviations;
- (d) the score of the clinical dementia rating scale was 0.5;
- (e) patient maintains normal daily activities;
- (f) does not meet the diagnostic criteria for dementia.

Normal control group

- (a) age ≥ 60 , both genders;
- (b) normal cognitive functions;
- (c) not having other severe somatic diseases;
- (d) being able to cooperate and complete relevant exams.

Exclusion criteria:

- (a) excluding Alzheimer's diseases and other forms of dementia;
- (b) excluding other cognitive impairments caused by neurodegenerative diseases, brain trauma, epilepsy, tumours, or infection;

- (c) excluding cognitive impairments caused by endocrine and metabolic diseases; excluding cognitive impairments due to severe cardiovascular, hepatic, lung, renal, and hematopoietic diseases; excluding cognitive impairments due to alcohol, smoking, and psychoactive drugs; other cognitive impairments or dementia caused by physical and chemical factors;
- (d) excluding those who are not able to complete the exam due to vision or hearing impairments.

2.2 Assessment tools

We used the consolidated assessment sheets, which included general information, neuropsychological tests and scale assessments, physician assessments, laboratory examinations, and imaging examinations. General information contained lifestyle and demographic data such as gender, age, educational attainment, and occupation. Lifestyle mainly consisted of smoking, drinking history, tea drinking history, exercise, hobbies, reading, listening to music, painting, calligraphy, chess and cards, surfing the internet, fishing, and practicing Taiji. Neuropsychological test and scale evaluation comprised the Mini-mental State Examination (MMSE), Montreal Cognitive Assessment (MoCA), Neuropsychological Test Battery (NTB), Self-Rating Anxiety Scale (SAS), Geriatric Depression Scale (GDS), Life Event Scale (LES), and Social Support Rating Scale (SSRS). The sections for physicians to evaluate included the current medical history, past medical history, physical examination, and clinical scale evaluation. The clinical scale evaluation comprised The Neuropsychiatric Inventory (NPI), Activity of Daily Living Scale (ADL), Global Deterioration Scale (GDS), Clinical Dementia Rating (CDR), and Clinical Global Impression (CGI). The laboratory tests included blood routine test, blood biochemical, vitamin B12, folic acid, thyroid function, blood viscosity, and serum syphilis screening results. The imaging examination method was mainly brain magnetic resonance imaging.

2.3 Statistical methods

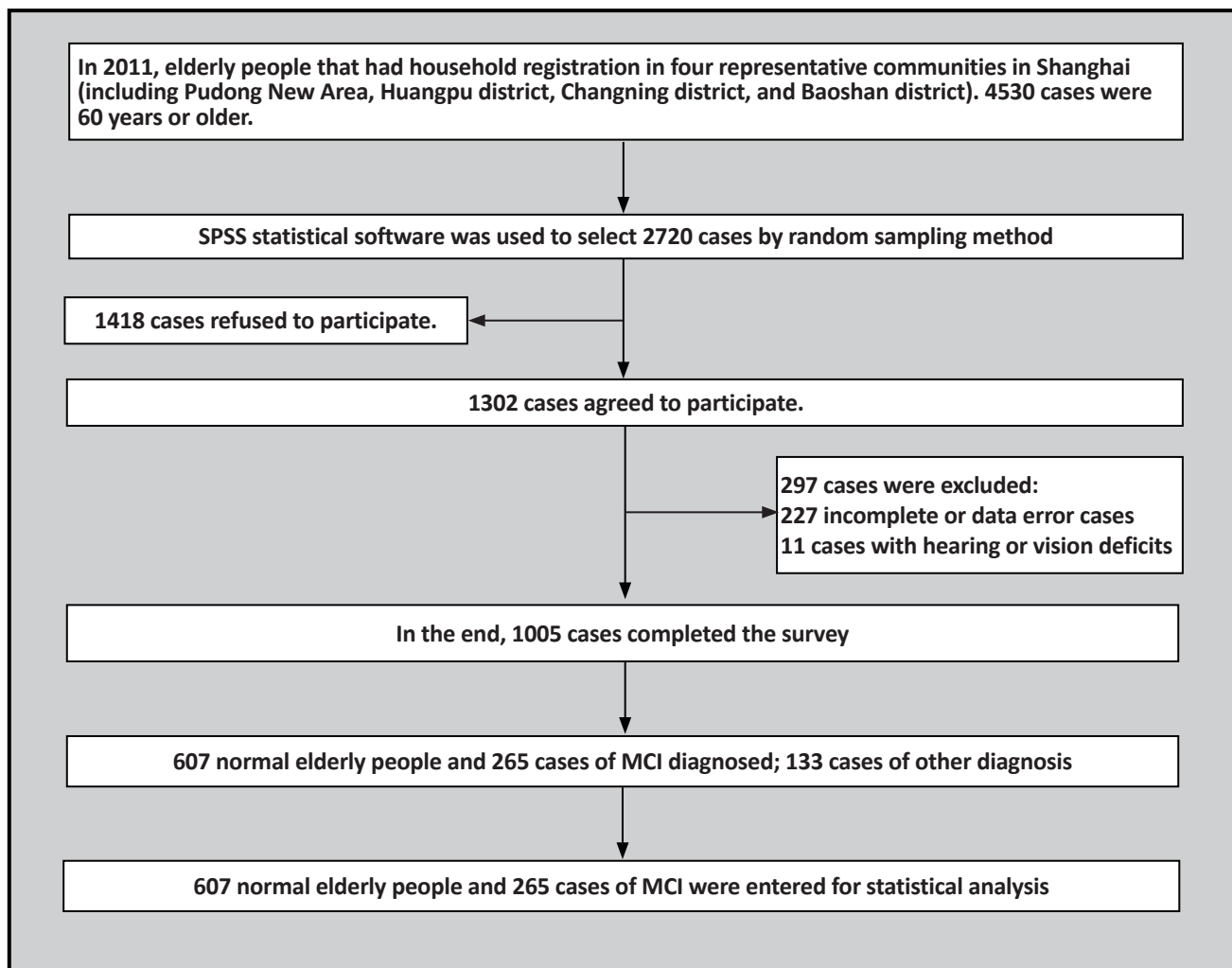
SPSS 20.0 statistical software was used for data processing. The chi-square test was used to compare the numeration data. T-test was used to compare measurement data. Logistic regression analysis was used for multivariate analysis, in which a difference of $p < 0.05$ was considered statistically significant.

3. Results

3.1 Demographic data of the study subjects in 2 groups

The average age of the MCI group was older than the normal control group; the female ratio was higher than the normal control group; the years of education was lower than the normal control group. The difference of age, gender, and years of education between two groups had statistical significance, age ($t = -11.352, p < 0.001$), gender ($\chi^2 = 25.072, p < 0.001$), years of education ($t = 10.430, p < 0.001$). See table 1.

Figure 1. Flowchart of the study



3.2 The univariate analysis of the relationship between the elderly people’s lifestyle and mild cognitive impairment

Smoking ($\chi^2= 10.808, p= 0.001$), tea drinking ($\chi^2=11.747, p=0.001$), having hobbies ($\chi^2= 20.815, p< 0.001$), reading ($\chi^2= 28.670, p< 0.001$), surfing on the internet ($\chi^2= 12.623, p< 0.001$), and photography ($\chi^2= 4.470, p= 0.034$) were protective factors for MCI. See table 2.

3.3 The multivariate analysis of the relationship between the elderly people’s lifestyle and mild cognitive impairment

Binary logistic regression was conducted for the study participants of both groups. The dependent variables were the elderly people with a diagnosis of MCI and non-MCI elders. All the study factors in table 2 were independent variables. From the results, the variables smoking, reading, and surfing the internet had statistical significance at the 0.05 level. The OR values were 0.562 (0.358- 0.883), 0.428 (0.253- 0.726), and 0.238 (0.071- 0.797) respectively. Hence, smoking, reading, and surfing the Internet were protective factors for MCI. See table 3.

4. Discussion

4.1 Main findings

Dementia is one of the major diseases that threatens the health of the elderly. China has a large population and a large base of patients with dementia. Currently, there are over 7 million persons with Alzheimer’s in China, accounting for approximately 1/4 of all cases in the world. Annually, the number of people who develop Alzheimer’s in China is about 300,000. The prevention and treatment of dementia is directly related to our national economy and people’s livelihood.^[4] The vast majority of neurodegenerative and vascular dementia are irreversible. The existing treatment methods are far from meeting the goal of delaying or stabilizing the disease. How to prevent dementia has attracted much attention among researchers. MCI is the transition phase of cognitive decline and dementia induced by normal aging. The diagnosis and intervention of MCI can facilitate early diagnosis and treatment of dementia, thus delaying its development and improving the quality of life in patients with MCI. However some of the high risk factors such as gender, age and educational attainment cannot be changed. However, we can change other factors such as lifestyle and diet.

Table 1. Comparison of the general data between the non-MCI elders and patients with MCI

Group	Control group	MCI group	χ^2 or <i>t</i>	<i>p</i>
Age (years)	70.10 (7.555)	76.46 (7.734)	-11.352	<0.001
Gender (male/ female)	294/ 313	80/ 185	25.072	<0.001
Years of education (years)	8.95 (4.281)	5.22 (4.775)	10.430	<0.001

Table 2. Univariate analysis of lifestyle related factors

Factors	Control group	MCI group	χ^2	<i>p</i>
Smoking	166 (27.3%)	45 (17.0%)	10.808	0.001*
Alcohol drinking	109 (18.0%)	38 (14.3%)	1.722	0.189
Tea drinking	253 (47.1%)	78(29.4%)	11.747	0.001*
Exercise	375 (61.8%)	147 (55.5%)	3.054	0.081
Hobbies	317 (54.5%)	94 (37.7%)	20.815	0.000*
Reading	157 (25.9%)	26 (9.8%)	28.670	0.000*
Listening to music	113 (18.6%)	39 (14.7%)	1.949	0.163
Calligraphy	22 (3.8%)	4 (1.5%)	2.852	0.091
Chess and cards	86 (14.2%)	33 (12.5%)	0.461	0.497
Surfing on the internet	42 (6.9%)	3 (1.1%)	12.623	0.000*
Photography	30 (4.9%)	5 (1.9%)	4.470	0.034*
Fishing	10 (1.6%)	5 (1.9%)	0.063	0.083
Taiji	47 (7.7%)	20 (7.5%)	0.010	0.920

Table 3. Multivariate analysis of lifestyle related factors

Factors	Parameter estimation	Standard error	Wald χ^2	<i>p</i>	OR	95% confidence interval
Smoking	-0.576	0.230	6.264	0.012*	0.562	0.358-0.883
Reading	-0.848	0.269	9.907	0.002*	0.428	0.253-0.726
Surfing the internet	-1.438	0.618	5.415	0.020*	0.238	0.071-0.797

This study showed that the average age of the MCI group was older than the control group. The number of MCI cases increased with age and the difference was statistically significant. It is consistent with the general rule that cognitive function declines with age. The education attainment of the MCI group was lower than the control group, which is also consistent with past studies. A meta-analysis of 19 studies by Caamano-Isorna and colleagues^[5] found that the risk of dementia was negatively associated with education attainment. This indicates that high education attainment is a protective factor for cognitive functioning. Some studies have shown that this may be associated with less cortical synapses due to low educational attainment. There is a significant gender difference with the MCI group in this study with females more than males. Some epidemiological studies show that the prevalence of AD among women is significantly higher than that of men.^[6,7,8] The incidence of AD in postmenopausal women is higher than men of the same age group. The

reason is related to the decrease of estrogen levels in postmenopausal women.^[5]

This study has found that smoking, tea drinking, having some hobbies such as reading, surfing the internet, and photography are protective factors for MCI. The impact of smoking on cognitive function is still controversial. Some reports suggest that smoking may reduce cognitive function or increase the risk of Alzheimer's disease.^[9] However, nicotine has been proven to be able to improve cognition and emotion under certain conditions.^[10] In terms of its independent effect, smoking has a protective effect on AD and the mechanism may be related to nicotine having a proposed anti-aging effect. Nevertheless, most studies suggest that smoking increases the risk of cardiovascular disease, thereby increasing the risk of AD.^[11] In addition, other studies^[12] showed that the protective effect of smoking depends on the dosage and time of smoking. The protective effect is more apparent when the person has had a smoking duration of 40 to 49 years or 200 to

299 packs of cigarette per year. However, this protective effect is gone when the smoking duration is over 60 years or the amount of smoking is more than 400 packs per year. Hence, only a moderate dosage of smoking has a protective effect on the decline of cognitive function. For a large number of smokers, the risk of other diseases and mortality may increase by merging with other smoking related diseases. Moreover, some other studies^[13] have reported a positive correlation between smoking and cognitive impairment in middle-aged people. Yet this correlation wanes as the age increases. The amount and duration of smoking were not further analyzed in this study. All in all, the effect of smoking on cognition remains to be further studied.

The results of this study show that reading and surfing the internet are protective factors for cognitive function, which is consistent with the previous studies.^[14] In epidemiological studies,^[15] having a regular lifestyle, proper intensity of mental activity, maintaining curiosity about new things, high education, wide social relationship, and a reasonable diet can help reduce the risk of AD. Strengthening brain function exercises can help maintain or increase memory function. Some scholars^[6] have reported that strengthening physical exercises of the left half of the body can help improve the role of the right hemisphere (memory increase), and finger movement exercises provide positive stimulation to the brain. Frequent use of the brain and hands, persistent study, and maintaining sharp insight and analytical ability can prevent mental deterioration. The protective mechanism of intellectual activities on cognitive function may be that intellectual activities strengthen the synaptic function and slow brain atrophy so as to delay the occurrence of cognitive impairment.^[16]

4.2 Limitations

This study investigated only 4 communities in Shanghai, which can only represent the elderly in these Shanghai communities. As a result, extrapolation has some limitations. Furthermore, the study was a cross-sectional study and there was no further follow-up.

4.3 Implications

We found that lifestyle was associated with the onset of MCI. In addition to smoking, good lifestyle and behaviors may have positive significance to MCI prevention. Active intervention on lifestyle can reduce the risk of MCI to some extent. Lifestyle interventions that are easy to implement may have the most significance towards the prevention of neurodegenerative diseases.

Funding statement

The National Key Technology Research and Development Program (project code: 2009BA177803).

Conflict of interest statement

The authors declare no conflict of interest related to this manuscript.

Informed consent

All the participants in this study provided written informed consent.

Ethical approval

This study was approved by the ethics committee of the Shanghai Mental Health Center affiliated to Shanghai Jiao Tong University.

Authors' contributions

Ning Su was responsible for doing cognitive function assessment on some of the subjects, collecting data of demography and lifestyle, data statistics, and writing and modifying this article. Wei Li was responsible for doing cognitive function assessment on some of the subjects, collecting data of demography and lifestyle, and providing valuable advice on the statistics in this paper. Xia Li, Tao Wang, and Minjie Zhu were responsible for the diagnosis of the subjects. Yuanyuan Liu and Yan Shi were responsible for doing cognitive function assessment on some of the subjects and collecting data of demography and lifestyle. Shifu Xiao was the head of the project and corresponding author.

上海社区老人生活方式与轻度认知功能损害的关系

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背景: 轻度认知功能损害 (Mild cognitive impairment, MCI) 老人发展为阿尔茨海默病 (Alzheimer's disease, AD) 的风险比普通人群高 10 倍。对 MCI 诊断及早期干预有助于早期诊治 AD, 从而延缓其发展, 改善 MCI 老人的生活质量。

目的: 分析上海社区老人生活方式与轻度认知损害的关系, 从生活方式中寻找老年轻度认知损害的防治措施。

方法: 随机抽取 1005 名上海社区老人, 最终确诊的 265 名 MCI 和 607 名正常老人作为研究对象, 搜集这些老人的人口学、生活习惯等资料, 进行单因素和多因素分析, 寻找有统计学意义的指标。

结果: 单因素分析发现吸烟 ($\chi^2=10.808, p=0.001$)、饮茶 ($\chi^2=11.74, p=0.001$)、有业余爱好 ($\chi^2=20.815, p<0.001$)、读书 ($\chi^2=28.670, p=0.001$)、上网 ($\chi^2=12.623, p=0.001$)、摄影 ($\chi^2=4.470, p=0.034$) 为 MCI 的保护性因素。多因素分析二项分类 logistic 回归分析发现, 吸烟、读书、上网有统计学意义, 其 OR 值分别为 0.562 (0.358-0.883)、0.428 (0.253-0.726)、0.238 (0.071-0.797)。即吸烟、读书、上网为 MCI 的保护性因素。

结论: 生活方式和 MCI 的发病相关, 良好的生活习惯及行为方式对预防 MCI 有积极意义。

关键词: 轻度认知功能损害; 生活方式; 保护因素

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