

The Effects of Playing Mahjong on The Cognitive Function of Elderly People in China

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Abstract. Background: The proportion of elderly people in China has increased due to an ageing population. Cognitive decline in the elderly has become a major threat to public health, including MCI (mild cognitive impairment), cognitive impairment and even Alzheimer's dementia. **Objective:** To investigate whether the leisure activity of mahjong affects cognitive function in today's older adults, and whether this effect has long-term benefits. **Methods:** The article comprehensively searched Google Scholar, PubMed and China National Knowledge Infrastructure (CNKI), through these searches, we can obtain data, screen, organize and summarize the data, and finally analyze it. **Results:** The experimental data were collected in China, with 45 records identified through targeted searches, 26 of which were reviewed in full text and 12 ultimately selected for inclusion. Although the measures used in the various literature studies varied, 58.3% of the literature used the MMSE (Mini-Mental State Examination), a scale of cognitive functioning. All selected experimental results in the literature suggest that playing mahjong has more or less significant effects on cognitive function. The sample sizes of the references ranged from a low of 38 to a high of 38,582, with more women than men in five-sixths of the experimental samples. **Conclusion:** The sustained beneficial effects observed on cognitive performance indicators suggest that mahjong has the potential to be an effective intervention for the maintenance and improvement of cognitive performance in older populations.

Keywords: Play mahjong; the elderly; cognitive function.

1. Introduction

To investigate the relationship between elderly people's participation in mahjong, a popular entertainment activity, and their cognitive function. Until now, there has been a lack of effective treatment for the stabilization or reversal of cognitive decline in MCI [1]. Although some studies have suggested that the game of Chinese Mahjong can improve attention, memory and concentration, further research is needed into its effects on cognitive or executive functions [1].

1.1. China's growing aging population

The issue of population aging is a major concern for countries worldwide, China included. China entered the ranks of aging societies in 2000, with over 10% of its population now over 60 years old [2]. In 2019, there were 164.5 million Chinese citizens aged 65 and over (65+) and 26 million aged 80 and over (80+), accounting for 18% of the world's population [3]. In 2021, China has entered a period of severe ageing, with more than 14% of the population aged 65 and over. This means that China has more than 200 million citizens above the 65-year mark. The global ratio of the population aged 65 and over is 10%, indicating that China's ageing population is well above the global average. According to international standards, China's aging process will accelerate from 2027 onwards, reaching over 20% of the population aged 65 and over by 2030, thus transforming into a super-aged society [4].

1.2. Public health threats posed by cognitive decline

With the rapid aging of the population, cognitive decline and cognitive disorders have become serious health issues among the elderly in China. Due to its large population size, China has a higher number of elderly individuals experiencing cognitive impairments than any other country in the world.

Research indicates that nearly 20% of Chinese individuals aged 60 and above have mild cognitive impairment, and this condition progresses into dementia at a rate of 6% annually [5]. The prevalence of this disease continues to rise, accompanied by a decrease in family-based care for the elderly, a lack of long-term care facilities, and an increase in the cost of informal care. These challenges affect not only the elderly population and their families but also society as a whole. Against this backdrop, there is a growing interest among professionals in finding methods to help Chinese elderly individuals maintain cognitive functioning and slow down cognitive decline.

1.3. Impact of cognitive decline on individuals

The negative effects of cognitive decline affect older people, one of the most common symptoms of cognitive decline or impairment in older adults is memory loss, where they may often forget important things in their daily life; it can also lead to a decline in language ability, where they may have difficulty finding the right words, speaking fluently or slowing down their speech; and it can lead to a lack of concentration, where they may be easily distracted and unable to concentrate for long periods of time.

1.4. Cognitive decline risk factors

Much research has shown that cognitive decline is linked to many factors:

1.4.1 Cardiovascular risk factors

Looking at the data from this study, the following cardiovascular diseases have a greater or lesser impact on cognitive function: First, people with diabetes have an increased likelihood of cognitive decline progressing to dementia [6]. What's more, obesity in midlife also affects people's cognition. Overweight people in middle age have a lower risk of dementia, while underweight people have a higher risk [6]. In addition, controlling hypertension can lower the likelihood of cognitive decline and may even prevent it [6].

1.4.2 Lifestyle risk factors

First, current smoking has been shown to increase the risk of cognitive decline and possibly dementia. In addition, heavy smoking in midlife may even double the risk of dementia in later life [6]. Second, regular physical activity is thought to be beneficial for cognitive decline, but the evidence is inconclusive [6]. Thirdly, certain dietary interventions to prevent high blood pressure have been shown to be effective in preventing cognitive decline. Finally, although excessive drinking has not been shown to have a beneficial effect, a meta-analysis suggests that light to moderate drinking may reduce the risk of cognitive decline and dementia in older adults [6].

1.4.3 Other risk factors

In addition to lifestyle factors, other risk factors have been studied. Level of formal education is consistently associated with a lower risk of cognitive decline, with those with more years of formal education or higher literacy levels having a lower risk [6]. On the other hand, the effect of depression and other depressive disorders on cognitive decline remains controversial.

These risk factors provide valuable insights into the relationship between lifestyle choices, cardiovascular health, education, mental health, and cognitive decline. Understanding these factors is key to developing effective strategies to prevent and manage cognitive decline and dementia.

1.5. The origin, definition and game rules of Mahjong

Mahjong is a very popular leisure activity in China, and positive associations between cognitive recreational pursuits and strong cognitive health have been shown in recent years. For instance, the use of computers has been linked to improved cognitive function in older adults. However, there is still a lack of research in China on whether mahjong as a sport has an influence on cognitive performance in elder adults. These questions are still worth investigating.

Gradually, through observing the entertainment activities and some behaviors taken by the elderly, we found that seniors who engage in the game of Mahjong are less likely to suffer from cognitive decline than those who don't.

Mahjong is a gambling game invented in ancient China that originated in the Ming Dynasty and is similar to card games. Originally it was a small, long square made out of bone, bamboo or synthetic material with designs or words carved on it, containing 136-152 pieces (according to the variation of the play) and 3 dices. The main types of Mahjong cards include "Cake", "Tiao", "Wan", "Eastern Wind", "Western Wind", "Northern Wind", "Southern Wind", and so on. Mahjong is a social game played by many different groups in China, especially the elderly. It is characterized by a competitive element involving four players. To achieve victory, participants must engage in focused and coordinated visual, psychological, and physical activities. These repetitive activities may potentially enhance executive functions during the aging process. The game of Mahjong requires 4 people to sit around a table with elevated sides. They alternate between rolling dice, taking pieces based on the dice rolled, determining the order in which the pieces are drawn, and organising their own pieces in a specific spatial order. Subsequently, players alternate between drawing a tile from a facedown pile and discarding one from their hand. The ability to remember the tiles played and predict the actions of other players, utilizing this information to formulate strategies for maximizing winning opportunities, is of paramount importance; therefore, it has become one of the most attractive dominoes in Chinese history.

2. Methods

2.1. Inclusion Criteria and exclusion criteria

The eligibility criteria for selecting participants in this study are as follows: individuals must be 60 years of age or older and reside in China. They should have the hobby or experience of playing mahjong in their daily lives, with no restrictions on the type or form of mahjong played. The diagnosis and confirmation of cognitive decline, cognitive dysfunction or Alzheimer's disease must be obtained from qualified and reliable sources. In addition, participants should not have any other diseases or disorders that could potentially affect cognitive function, including depression, schizophrenia, mania, and other similar conditions.

There are certain exclusion criteria for the selection of participants. Individuals with hearing or visual impairments that significantly affect their ability to perform normal daily activities will be excluded. In addition, to ensure consistency of exposure variables, participants who played mahjong in their younger years but stopped playing after the age of 60 will not be included in the study.

2.2. Sources of information, search strategy, selection of studies

Google Scholar, PubMed, and CNKI databases were searched for material on the relationship between playing mahjong and cognitive decline in the past four years, until February 28, 2024. The following search query was used, regardless of language: (playing mahjong or mahjong games), (cognitive decline or cognitive disorder, mild cognitive impairment, or senile dementia), and (the elderly or older people). The primary literature screening step is to check the title, abstract, and background before downloading the full text, select according to the predefined inclusion criteria, and review and exclude similar articles from different sources (Google Scholar, Pubmed and CNKI).

2.3. Data Items and synthesis

This study used a standardized approach to extract key data from eligible studies retrieved from Google Scholar, Pubmed and CNKI, including publication details, study settings, inclusion and exclusion criteria, participant demographics, sample sizes, diagnostic methods for cognitive decline, impairment or Alzheimer's disease, and the relationship between mahjong frequency and cognitive health. Data collection focused on demographic information, mahjong playing frequency, personal cognitive status, and cognitive assessment methods. Demographic variables such as gender, age, pre-

retirement occupation, education, and mahjong hobby were included alongside cognitive diagnoses and functional assessments. This study will use a narrative synthesis approach to integrate and summarize findings from the selected studies.

3. Results

3.1. Study Selection

Initially, 45 articles were retrieved from Google scholar, Pubmed and CNKI using keyword and reverse searches, and 36 potentially suitable papers were identified after initial screening of titles and abstracts. In the final full-text screening, the authors found 12 acceptable papers for inclusion in our study after screening out 12 articles (Figure 1). Rejection criteria may be that the full text is not available, that there is no privileged access, or that the actual content is irrelevant.

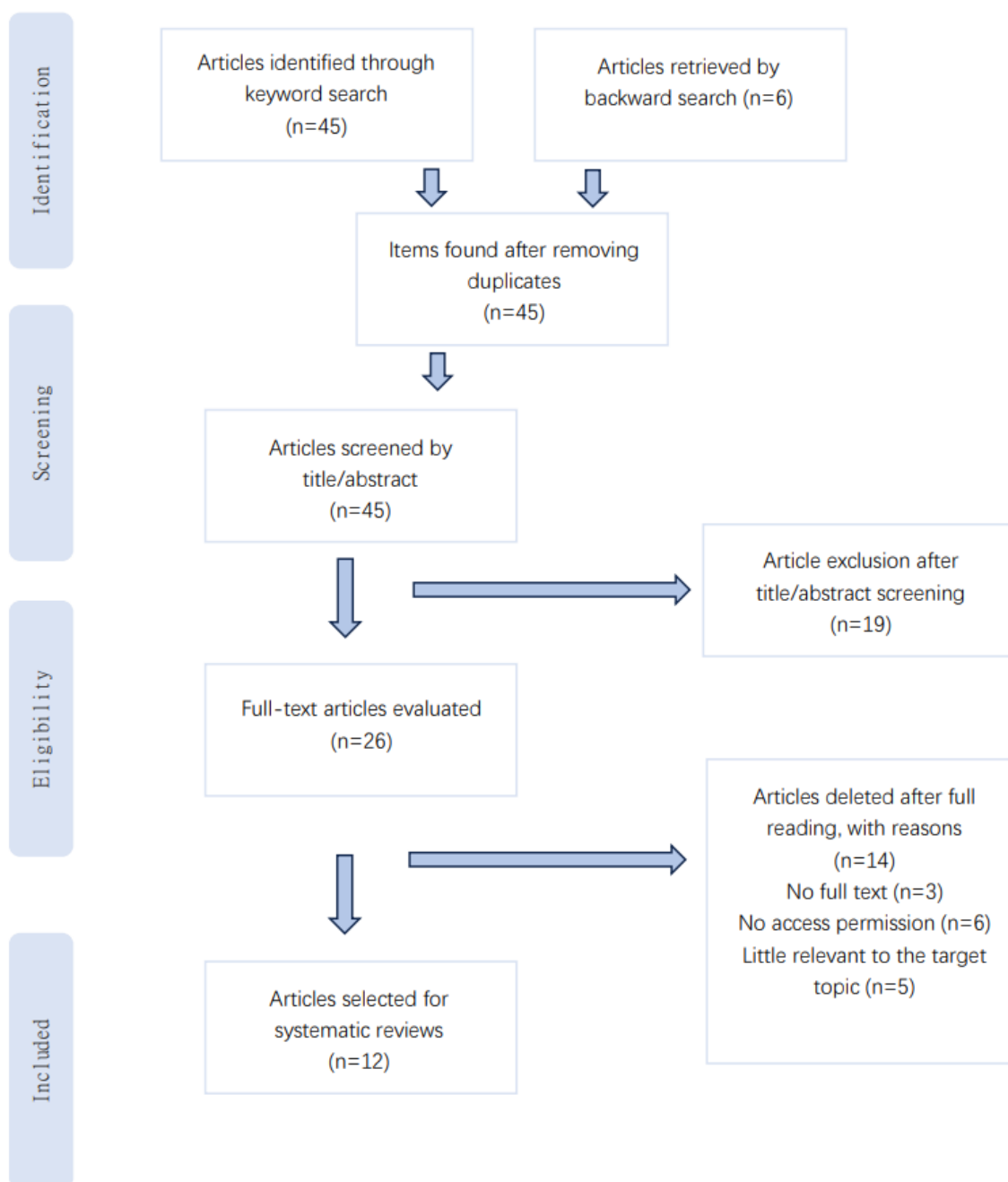


Fig. 1 Process of literature review

3.2. Study Characteristics

The following characteristics were specified for the included articles: author and year, country and region, sample size, mean age of the sample, measure of cognitive function, male/female ratio, usefulness or not (Table 1).

Table 1. Characteristics of included trials (Table view)

Author/year	Country	Setting	Sample Size	Investigating region	Average age	Measuring method	Ratio of men to women	Frequency of mahjong playing	Impact
Jin Wang/2022 [7]	China	Institutional	7308	22 provinces in China	/	MMSE	Male(55.27%), Female(44.73%)	Play mahjong almost every day or once a week and once a month	significant
Lu Chu-Man/2015 [8]	China	Institutional	92	/	Women(66.93), Men(68.95)	CASI C-2.0	Male(40.2%), Female(60.8%)	70–90min thrice a week for 12 weeks	significant
Han Zhang/2020 [1]	China	Institutional	56	Nanchong	74.3	Beijing (MoCA-B), (STT), (FAQ),	Male(26.8%), Female(73.2%)	three times a week for 12 weeks	significant
Xin Liu/2021 [9]	China	Community	4003	Songjiang district, Shanghai	69.37	CLAI	Male(43.6%), Female(56.4%)	A few times a month or a few times a week	significant
Sheung-Tak Cheng/2014 [10]	China	Institutional	110	Hong Kong	81.9	MMSE	Male(36%), Female(64%)	three times weekly for 12 weeks	significant
Gang Tian/2022 [11]	China	Institutional	11821	22 cities in 31 provinces in China	89.02	MMSE	Male(39.9%), Female(60.1%)	almost every day	significant
Cheng Mao/2019 [12]	China	Institutional	10741	/	88.0	MMSE	Male(45.6%),	almost every day	significant

							Female(54.4%)		
Wenyi Lin/2023 [13]	China	Institutional	38582	23 provinces and autonomous regions in China	84.28	MMSE	Male(35.6%), Female(54.4%)	almost every day	significant
Wei Wang/2023 [14]	China	Institutional	38	Xiangtan city, Hunan Province	67.43	MMSE, MOCA	Male(65.79%), Female(34.21%)	5 times per week, 3 hours per session for 12 weeks	significant
Ming Ding/2021 [15]	China	Community	728	Guangzhou	70.91	MOCA	Male(33.58%), Female(66.42%)	2-3 times weekly, 4 or more times weekly	significant
Xu Liu/2020 [16]	China	Institutional	500	Jin zhou	69.4	CSID	Male(47.8%), Female(52.2%)	/	significant
Changhui Wei/2021 [17]	China	Institutional	4643	23 provinces in China	/	MMSE	Male(46.6%), Female(53.4%)	Almost daily or at least once a week	significant

Note:

MOCA: (Montreal Cognitive Assessment)

CASI C-2.0: (Cognitive Abilities Screening Instrument, Chinese version 2.0)

FAQ: (the Functional Activities Questionnaire)

STT: (the Shape Trail Test)

CLAI:(cognitive leisure activity index)

CSID:(The brief Community Screening Instrument for Dementia)

3.3. Synthesis of Results

According to the results of the previous research, mahjong, a daily leisure activity, may have an effect on cognitive function in older people. The following are the main conclusions based on the inclusion of the articles: All the studies included in this analysis are from China, encompassing populations from various regions. Approximately one third of the sample was derived from a single city, while the remaining participants were recruited from different provinces across the country. The studies exhibited a wide range of sample sizes, with an average of 6,552 participants in statistical terms. The research was conducted exclusively on individuals aged 60 and above, with a mean age of 76.353 across the samples. Regarding cognitive assessment tools, 58.3% of the studies employed the Mini-Mental State Examination (MMSE), a widely used tool for identifying cognitive dysfunction

or decline. Additionally, 25% of the studies incorporated the Montreal Cognitive Assessment (MOCA) scores for assessing cognitive function. When examining the gender distribution within the sample, it became apparent that the proportion of females generally exceeded that of males, likely due to a higher number of females engaging in the recreational activity of playing mahjong. The consensus among these studies was that playing mahjong is beneficial in preventing cognitive decline in older individuals and may even improve the condition of those already experiencing cognitive impairment. However, the specific mechanisms underlying this effect remain unclear, as the studies failed to provide a definitive explanation. Furthermore, the frequency of playing mahjong emerged as an important factor, with more frequent players exhibiting fewer cognitive decline issues compared to infrequent players. Nevertheless, some studies suggested that excessive mahjong playing might have adverse effects, highlighting the uncertain and randomized nature of the findings.

4. Discussion

There has been much interest in gerontological research into the cognitive benefits of leisure activities, particularly mahjong. Mahjong is deeply rooted in Chinese culture. It provides a unique cognitive challenge that may help maintain and even improve cognitive function in older adults.

4.1. Cognitive Stimulation and Brain Plasticity in Mahjong

Mahjong is a sport that combines many different cognitive processes. Players have to remember the correct order of the cards in their hands, be able to recall and retrieve cards that were previously discarded on the table, and rely on certain skills in order to win. Of course, concentration is also an important part of Mahjong, as players must keep their eyes on the ever-changing table to ensure they don't miss any important card play opportunities. Due to the complex rules and gameplay, Mahjong requires players to make quick decisions based on their own thinking and observing the card situation. Continuous brain activity throughout the game strengthens neural connections and promotes brain plasticity, which is essential for the maintenance of cognitive function. This is essential for maintaining cognitive function. Especially as we age and experience the natural decline in cognitive abilities, this is essential for maintaining cognitive function.

Research shows that engaging in complex cognitive activities such as mahjong benefits cognitive function in older adults. The cognitive stimulation of mahjong helps to keep the mind sharp and to slow down the possibility of cognitive decline. [1] However, it is important to note that mahjong's specific cognitive effects may vary from person to person. More research is needed to have a better understanding of the mechanisms behind these cognitive benefits. [1]

4.2. Social Interaction and Cognitive Health in Mahjong

Playing mahjong has significant cognitive benefits. However, the social aspect of mahjong is equally important. Since mahjong is a sport that must be played in groups, it encourages older people to participate in social activities and enjoy the happiness that social attributes bring. People are beginning to realise that playing mahjong as a social activity is an effective way of slowing down the decline in the cognitive function of the elderly. One of the main benefits of playing mahjong as a social activity is to alleviate the feelings of isolation and loneliness associated with cognitive decline. People have the opportunity to connect with others and build meaningful relationships by participating in group activities. This reduces or even eliminates the negative effects of social isolation. The experience of playing mahjong together can create a supportive and inclusive environment. This promotes a sense of belonging and active social participation in older adults. The inherently social nature of mahjong and the emotional stimulation it provides can have a positive impact on cognitive performance. By activating areas of the brain associated with positive emotions, participation in enjoyable social activities improves cognitive function. When people experience positive emotions and enjoyment during social activities, they produce more favourable affective states, thereby improving cognitive performance. In addition, social interactions in mahjong games

often involve communication, cooperation and negotiation, requiring individuals to communicate verbally and non-verbally. These interactions stimulate language skills, social cognition and emotional intelligence. All of these are related to cognitive processes.

To sum up, the social aspect of playing Mahjong provides a unique way for individuals to socialise, form social bonds and combat the negative effects of isolation and loneliness. The achievement of a more positive emotional and psychological state through these social activities may have a positive impact on cognitive abilities. [7]

4.3. Motor Skills and Cognitive Benefits in Mahjong

Specific activities such as shuffling and recording cards in mahjong may also have cognitive benefits. By stimulating the motor cortex of the brain, these mental exercises may promote the development of general cognitive function areas. Although the mechanism of the cognitive benefits of playing mahjong is not fully known, this study should explore the potential influence of the cultural familiarity of people with mahjong, and the role of social characteristics in the cognitive benefits. Individual differences in playing Mahjong are also important. Factors such as age, skill level, personal interests, social background of playing Mahjong, and family background may influence the extent to which an individual benefits from playing Mahjong. Individual differences in cognitive reserve and the presence of pre-existing cognitive impairment may also influence the effects of Mahjong on cognitive function. [12]

In conclusion, although there is evidence that Mahjong may have beneficial effects on cognitive function in older adults, more research is needed to understand the underlying mechanisms and to determine the extent to which this pattern replicates across different populations and cultures. By exploring these pathways, we can better understand the role of cognitive leisure activities such as mahjong in the promotion of healthy ageing and potentially mitigate the effects of cognitive decline in later life.

5. Strengths and limitations of the study

Limitations of the study include a non-representative sample of elderly Chinese. This limits the generalizability of the findings to the global population of mahjong players. The robustness of the data may also be affected by the regional imbalance within China and the reliance on widely accepted but subjective cognitive assessment tools such as the MMSE and MOCA. In addition, the exclusion of variables such as marital status and dietary intake from the analysis could introduce bias. The short-term nature of the study raises questions about the long-term validity of the results.

The strength of the study lies in its comprehensive examination of cognitive leisure activities across different adult age groups, providing a nuanced understanding of their impact on cognitive health. Valuable insights into the interplay between cultural practices and cognitive function are provided by the focus on mahjong as a culturally significant game in China. The inclusion of longitudinal data from studies such as [11] is crucial in assessing long-term cognitive changes. The use of different cognitive assessment tools enhances the comprehensiveness of the evaluation. The literature also covers a wide range of topics, from the influence of mahjong on mortality to its role in cognitive function in the institutionalized elderly. This provides a holistic view of the subject.

6. Conclusions

In summary, the results of the study have shown that playing mahjong is indeed connected with cognitive function in the elderly Chinese populations, and that playing mahjong can improve or even prevent cognitive function in the elderly to some extent to reduce the risk of dementia, and the frequency of playing mahjong seems to be positively correlated with cognitive function, but the evidence is still insufficient to support this view. For the prevention and delay of the onset of cognitive dysfunction in older adults, mahjong is a good complementary therapy that combines recreation,

socialization and intelligence, and should encourage meaningful participation by older citizens in this activity. Of course, indulging in mahjong without considering the time and their health status can be detrimental.

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