Development and Evaluation of a Psychomotor Rehabilitation Nursing Plan for the Elderly with Mild Cognitive Impairment to Promote Cognitive Health

Research Proposal

February 2025

Protocol ID: JZMULL2025230

Ethics Approval Number: USM/JEPeM/PP/24090806

Exclusive summary of research proposal (max 300)

(Include the problem statement, objectives, research methodology, expected output/ outcomes/ implication, significance of output from the research project)

With the aging of the population, the number of older adults with mild cognitive impairment (MCI) has increased year by year, which has caused serious social and family burdens. At present, the existing drug treatment effect is limited. Studies show the application value of non-drug treatment in the older adults with mild cognitive impairment. Psychomotor Therapy (PMT) is now widely used in European countries and has formed an independent scientific system. Therefore, this topic pays attention to older adults with mild cognitive impairment, intending to promote cognitive stimulation, using PMT methods to build a rehabilitation nursing plan. Relying on older adults care institutions, older adults with mild cognitive impairment in a certain period were divided into a control group (CG) and an experimental group (EG). Older adults will be engaged in a 12-week PMT rehabilitation nursing plan involving relaxation and breathing exercises, face exercises, hand exercises, and mind exercises to promote cognitive health. SPSS 28.0 software was used to analyze data. The comparison of scores of various scales are based on paired t-test statistical methods. The P value <0.05 will be considered to indicate statistically significant with 95% confidence interval (CI). The rehabilitation effect of the two groups was evaluated according to cognitive assessments (Montreal Cognitive Assessment, MoCA), psychological assessment (Positive and Negative Syndrome Scale, PANSS), and emotional assessment (Hamilton Depression Rating Scale, HAMD-17; Hamilton Anxiety Rating Scale, HAMA-14) . The expected findings of this study may be useful for cognitive rehabilitation plans for the elderly in care institutions, rehabilitation hospitals, communities, and families.

Introduction

Research background

In the wake of demographic shifts, China is experiencing the profound effects of an aging population. In 2022, China's population aged 65 and over was estimated to be 196 million, accounting for nearly 13.7% of the total population (Feng & Wu, 2023). With the change in population structure, China faces unprecedented challenges in health care, social welfare, and economic sustainability, which has a profound impact on the aging of the

population, and cognitive impairment has become the most prominent problem in an aging society. Studies have shown that the overall prevalence of cognitive impairment in people aged 60 years and above in China is estimated to be 6% (95% CI: 5.8% ~ 6.3%)(Jia L et al., 2020), which increases the pressure on families, caregivers, and the healthcare system, and poses economic challenges to the country.

Similarly, population aging is a general trend around the world. According to the United Nations, by 2050, 1/6 of people in the world will be over 65 years old, compared to 1/11 in 2019 (Bott N T et al., 2019). As the number of elderly people increases year by year, the prevalence of cognitive impairment in older adults is also increasing. It is reported that about 5-10% of people over 60 years old in the world suffer from dementia (Liu Xuan & Xiao Zemei, 2020). Dementia is a disease characterized by cognitive decline with memory loss and impaired judgment. It not only affects the quality of life but also puts tremendous pressure on the world's healthcare systems and social support systems. Effective intervention measures are urgently needed to address this public health problem.

Mild Cognitive Impairment (MCI) refers to the prodromal stage of dementia that generally does not severely affect daily functioning, associated with an increased risk for Alzheimer's disease and other dementia. The clinical manifestations of MCI mainly include the decline of memory, language function, attention, executive function, visual-spatial structural function, and calculation ability, as well as sensory impairment and thinking disorder. While not all individuals with MCI will develop dementia. Studies have shown that MCI patients have a much higher risk of developing dementia than people with normal cognition. Early identification and intervention of MCI patients can slow or prevent the progression of dementia, thereby reducing the personal, social, and economic burden of dementia (Alzheimer's Disease International 2011).

In recent years, there has been a large amount of literature in China that explores various aspects of dementia, including risk factors, biomarkers, diagnostic criteria, and intervention strategies (Fu Yuxiang, 2021; Tian Huan et al., 2021). However, there are still some limitations for MCI. The diagnostic criteria and assessment tools for MCI in the Chinese population are still not unified, resulting in differences in prevalence estimates and diagnostic methods in different studies. In addition, there are insufficient longitudinal studies on the progression of MCI to dementia in older adults in China, which limits our exploration of the trajectory of the disease. Similarly, there is still no consensus on the heterogeneity of the MCI population, inconsistent diagnostic criteria, and the best treatment methods (Van der Steen,

2017). Furthermore, the translation of research findings into clinical practice remains a significant bottleneck, with few evidence-based interventions available for preventing or delaying the onset of dementia among individuals with MCI.

Alzheimer's Disease International has advocated for and funded several studies, including some investigating the effectiveness of pharmacological and non-pharmacological interventions for early dementia (Alzheimer's Disease International 2011). There is a great deal of ongoing research into pharmacological treatments, but traditionally, less research has been done into non-pharmacological treatments (Van der Steen, 2017). Interventions can be broadly divided into those aimed at modifying the course of the disease, those targeting the cause of the disease, and those controlling the manifestations of the disease. PMT is often considered to fall into the last category because they may help slow cognitive decline, address symptoms related to psychosocially challenging behaviors, and improve quality of life.

Problem statement

At present, there is a lot of discussion on MCI and dementia prevention. In addition to drug treatment, non-drug treatment is also a hot issue, such as music therapy, transcranial magnetic stimulation (TMS), light therapy (phototherapy), electrotherapy, acupuncture therapy, Taijiquan, Baduanjin, hyperbaric oxygen therapy (HBOT), memory therapy, etc. (Fu Yuxiang, 2021; Tian Huan et al., 2021). At present, most of the non-drug treatments target a relatively single cognitive domain, and it is difficult to solve the decline of multiple cognitive domains with one therapy. It still needs more research and discussion.

PMT is not a traditional biological model, but a kind of rehabilitation therapy under the biological-psychological-social model (Duan Zhouying, Chen Wenhua, 2021), which focuses on the concept of integrity. It is not focused on motor functions, but on motor skills in relationships, and is related to emotional, sensory, and cognitive functions. By mobilizing the initiative of dementia patients, stimulating their own weakened function (Xu Haoqin et al., 2019), and assisting with personalized PMT treatment plans, a better effect of rehabilitation nursing treatment is achieved. Few published literature has applied PMT theory to the rehabilitation treatment of older adults with MCI, and the intervention plans are not uniform. At present, PMT therapy just started in China. Is it effective for older adults with MCI in China? Which group is it applicable to? Do older adults and their families accept them? There are few studies on it.

The purpose of this study is to develop a PMT rehabilitation nursing plan and evaluate the effectiveness of the rehabilitation nursing plan in older adults with MCI. The findings of this study may be useful for future studies and provide useful reference for nursing care homes, rehabilitation hospitals, communities, and families.

Research Question(s)

1. Is the PMT rehabilitation nursing plan effective in promoting cognitive health for older adults with MCI?
2. How does the PMT rehabilitation nursing plan affect the cognitive health in older adults?

Objective

General: This study aimed to develop a psychomotor rehabilitation nursing plan and elucidate the effect of the PMT rehabilitation nursing plan among older adults with mild cognitive impairment in promoting cognitive function.

Specific:

1. To develop the psychomotor therapy (PMT) rehabilitation nursing plan through Delphi method for older adults with mild cognitive impairment (MCI) in promoting cognitive function.
2. To validate the psychomotor therapy (PMT) rehabilitation nursing plan for older adults with mild cognitive impairment (MCI) through content and face validation.
3. To evaluate the effectiveness of the psychomotor rehabilitation nursing plan in enhancing cognitive function among older adults with mild cognitive impairment.

Literature review

Mild cognitive impairment (MCI) affects a significant proportion of the aging population, posing challenges to their cognitive health and quality of life. Despite the availability of pharmacological interventions and traditional care strategies, these approaches often fail to holistically address the multifaceted needs of older adults with MCI. Emerging evidence suggests that psychomotor therapy (PMT) can play a pivotal role in enhancing cognitive functions; however, its integration into nursing practices remains underexplored.

The development of a psychomotor rehabilitation nursing plan based on the Delphi-method addresses both clinical and academic needs by offering a structured, evidence-based approach to improving cognitive health among older adults with MCI. This study will contribute to closing the gap in existing literature by evaluating the effectiveness of PMT-based interventions in a nursing context. This study aligns with global health priorities, such as the World Health Organization's emphasis on promoting healthy aging and cognitive health. By validating and implementing an innovative nursing plan, this research seeks to enhance nursing practices and improve patient outcomes in real-world settings.

Research status of Delphi-method

The Delphi Method is a structured communication technique developed in the 1950s by the RAND Corporation. Initially designed by Olaf Helmer and Norman Dalkey, it aimed to systematically gather and distill the judgments of experts through a series of questionnaires interspersed with controlled feedback. The primary objective was to forecast the impact of technology on warfare and other societal issues. The method’s core principle is anonymity, allowing experts to express their opinions without the influence of dominant personalities or groupthink. This iterative process involves multiple rounds of questionnaires, with feedback provided between each round to refine the experts' responses and converge towards a consensus.

Over the decades, the Delphi Method has evolved and found applications in diverse fields including technology forecasting, public policy, healthcare, education, and market research. The Delphi Method has been widely used to predict technological trends and innovations. For instance, Martino (1983) discussed its application in forecasting new technologies and their societal impacts. Linstone and Turoff (1975) highlighted its use in public policy to evaluate the potential impacts of proposed policies and to develop long-term strategic plans. In healthcare, the Delphi Method helps in developing clinical guidelines and assessing medical technologies. Keeney et al. (2006) demonstrated its utility in achieving consensus on healthcare interventions. The method is employed in curriculum development and educational policy-making. Gordon and Pease (2006) illustrated its effectiveness in identifying future educational needs. The Delphi Method aids in forecasting market trends and consumer behavior, helping businesses make informed strategic decisions (Rowe & Wright, 1999).

Over the years, several enhancements have been made to the original Delphi Method to address its limitations and increase its efficiency:

E-Delphi: The use of electronic platforms for conducting Delphi studies, known as e-Delphi, has streamlined the process, making it faster and more accessible for participants (Gordon & Pease, 2006).

Mixed Methods: Combining quantitative and qualitative methods has enriched the depth and breadth of Delphi studies, allowing for more comprehensive analyses (Skulmoski et al., 2007).

Real-Time Delphi: Implementing real-time feedback mechanisms has accelerated the consensus-building process, reducing the time required for each iteration (Gordon, 1994).

Future research on the Delphi Method can explore several promising areas:

Automation and AI: Leveraging artificial intelligence and machine learning to partially automate the Delphi process can enhance efficiency and reduce human biases (Bojarczuk et al., 2018).

Cross-Disciplinary Applications: Expanding the application of the Delphi Method to new and emerging interdisciplinary fields can uncover its potential in addressing complex global challenges (Landeta, 2006).

Methodological Integration: Integrating Delphi with other forecasting and decision-making techniques can create robust hybrid models that capitalize on the strengths of multiple methodologies (Murry & Hammons, 1995).

Global Studies: Conducting Delphi studies in diverse cultural and geographic contexts can provide insights into the method's adaptability and effectiveness in different settings (Hasson et al., 2000).

The Delphi Method remains a vital tool for structured expert elicitation and consensus-building. Its wide-ranging applications and iterative, anonymous approach provide significant advantages for addressing complex and uncertain issues. Despite its limitations, ongoing methodological advancements and the integration of new technologies continue to enhance its effectiveness. As the method evolves, its future research and application hold promising potential for contributing to various fields of study and practice.

Research status of rehabilitation nursing for MCI

Before 1998, the research related to MCI and dementia in China focused on disease diagnosis and treatment and epidemiological investigation, while less is related to nursing. In 1999, China entered the aging society, and domestic scholars gradually attached importance

to older adults care or long-term care of patients with senile dementia. At present, there have been a large number of studies and systematic clinical guidelines or consensus on the prevention and treatment of dementia around the world, which provide strong support for the development of standardized full-cycle rehabilitation programs for dementia and the establishment of management systems. However, more clinical research is still needed to provide support for the rehabilitation treatment plan for each stage of dementia, especially the comprehensive care mode for MCI (Yang Qing, Jia Jie, 2021).

In China, although there is no effective method for the treatment of MCI, the nursing model has been tried to improve the quality of life of older adults with MCI (Ma Dongfei et al., 2019) to slow down the progress of the disease and improve clinical symptoms (Medina M et al., 2017). At present, Orem self-care mode (Wang Enshi et al., 2016), Habituation nursing mode (Peng Ali et al., 2020), 3R specialty nursing mode (Spagnolo P et al., 2015), Hospital-Community-Family triple linkage nursing mode (Tang Yue et al, 2017), Traditional Chinese medicine rehabilitation nursing mode (Yu Mei, Wu Qinying, Lin Xiaomei, 2018) and “3+1” Holistic rehabilitation nursing model (Sun Jingna et al., 2021) have shown some efficacy in improving the quality of life and/or cognitive function of patients with mild senile dementia.

Experts pointed out that the comprehensive rehabilitation nursing objectives for patients with MCI should be formulated individually based on the level of cognition and other functions and the level of daily living ability. For mild and moderate patients, cognitive stimulation therapy and cognitive training combined with computer-assisted cognitive rehabilitation technology can be used to improve the cognitive function level of patients as much as possible. Combining exercise therapy, physical exercise and rehabilitation treatment for apraxia, can improve the patients' exercise ability and promote the improvement of cognitive function (Special Committee of Neurodegenerative Diseases of Chinese Society of Microcirculation et al., 2020). In addition, music therapy (Dorris, J. L.., 2021), nostalgia therapy, virtual reality technology, and non-invasive neural regulation technology can also be used to improve the cognitive function of patients with dementia, and alleviate or eliminate mental and behavioral symptoms, and improve their daily life and participation ability, but their efficacy needs to be confirmed by more clinical trials (Lefaucheur J P et al., 2020; Van Der Steen J T et al., 2018; Bao Feng, 2019; Ding Duyu, Zhang Wei, 2019).

The basic characteristics and quality evaluation results of the references are shown in Table.

Table: **Studies reporting the intervention measures for rehabilitation nursing mode in older adults**

Population	Intervention duration (month)	Interventions	Outcome assessment	Primary Outcomes	Studies
MCI patients (n=58), Age >= 65	3	Cognitive Training	Mini mental State Examination (MMSE); Montreal Cognitive Assessment (MoCA); Wechsler Memory Scale Revised (WMS-R) ; Wechsler Adult Intelligence Scale-III	Delayed verbal memory; Improved attention and executive function.	(Suziki H et al., 2014)
MCI patients (n=72), Age >70	3	Cognitive Training	Mini mental State Examination (MMSE); Health-related quality of life (HRQoL) ; Yesavage Geriatric Depression Scale; Hamilton Rating Scale; SF-12	Improved cognitive performance, anxiety, depression.	(Carcelen-Fraile MDC et al., 2022)
MCI patients (n=293), Age = 50-85	3	Cognitive Training	Mini mental State Examination (MMSE); Alzheimer's Disease Assessment Scale-cognitive subscale (ADAS-Cog); Con trolled Oral Word Association Test (COWAT); Geriatric Depression Scale (GDS-15); Multifactorial Metamemory Questionnaire (MMQ)	Cognitive improvements.	(Jeong, 2016)
MCI patients (n=60), Age = 50-85	3	Exercise therapy	Mini mental State Examination (MMSE); Montreal Cognitive Assessment (MoCA); Functional Activities Questionnaire, FAQ); Short-Form 36 item health survey questionnaire (SF-36).	Improved cognitive function and quality of life.	(Wu Han, 2016)

AD patients (n=80), Age >= 65	6	Orem self-care mode	Dementia Quality of Life (DQOL).	Improved quality of life and self-efficacy.	(MA Jing, 2023)
MCI patients (n=45), Age > 65	2	Cognitive Training	Mini mental State Examination (MMSE); Montreal Cognitive Assessment (MoCA); Loewenstein Occupational Therapy Cognitive Assessment (LOTCA); Hamilton Depression Scale (HAM-D).	Beneficial effects on attention, language, orientation, visual perception, organization of visual movement, and logical questioning.	(LIU Xin Yan et al., 2016)
MCI patients (n=47), Age > 65	3	Exercise therapy	Montreal Cognitive Assessment (MoCA); Senior Fitness Test (SFT); Controlled Oral Word Association Test (COWAT).	Delayed cognitive decline and improved physical fitness.	(Hong SG, 2018)
AD patients (n=280), Age > 60	—	Habituation nursing mode	Activity of Daily Living Scale (ADL); Montreal Cognitive Assessment (MoCA); Mini mental State Examination (MMSE).	Delayed the progression and improved the living quality.	(Peng Ali et al., 2020)
MCI patients (n=36), Age = 65-88	—	3R specialty nursing mode; Cognitive Training	Mini mental State Examination (MMSE); Basic Activity of Daily Living (ADL) ; Instrumental Activity of Daily Living (IADL) ; Geriatric Depression Scale (GDS) ; Neuropsychiatric Inventory (NPI).	Benefit cognitive functions and level of autonomy in the basic activities of daily living; Reduce behavioral disorders.	(Spagnolo P et al., 2015)
AD patients, Age >= 60	—	Hospital-Community-Family triple linkage nursing mode	Mini mental State Examination(MMSE); Activity of Daily Living Scale (ADL).	Delayed the progression.	(Tang Yue et al, 2017)
AD patients (n=86), Age = 60-84	—	Traditional Chinese medicine rehabilitation nursing mode	Mini mental State Examination(MMSE); Activity of Daily Living Scale (ADL); Nursing satisfaction.	Improved self-care ability and improve patients' satisfaction with care.	(Yu Mei, Wu Qinying, Lin Xiaomei, 2018)
MCI	3	Exercise and Multimodal	Mini mental State Examination(MMSE);	Improved verbal recognition memory;	(Bisbe, 2020)

patients (n=36), Age = 65-85		Physical Therapy	Hospital Anxiety and Depression Scale (HADS); 36-Short Form (36-SF).	Improved visual delayed recall; Improved balance and gait performances; Affects cognition positively.	
MCI patients (n=34)	3	VR	Montreal Cognitive Assessment (MoCA); Instrumental Activity of Daily Living (IADL)	Improved cognitive function, IADL and neural efficiency.	(Liao YY, 2019)
AD patients (n=1796), Age >= 60	2, 6, 12	"3+1" Holistic rehabilitation nursing model	Mini mental State Examination (MMSE); Barthel index; Activity of Daily Living Scale (ADL); Chinese rehabilitation Research Center Standard Aphasia Examination (CRR-CAE).	Improved the mental condition and quality of life; Improved self-care ability and language ability.	(Sun Jingna et al, 2021)
AD patients (n=100), Age >= 60	6	"3+1" Holistic rehabilitation nursing model	Mini mental State Examination (MMSE); Barthel index	Improved the mental condition and quality of life.	(Wang Lijuan et al., 2018)
MCI patients (n=495), Age >= 60	3	Music intervention	Mini mental State Examination (MMSE); Geriatric Quality of Life-Dementia; Positive and Negative Affect Schedule.	A small but statistically significant effect on cognitive function.	(Dorris, J. L.., 2021)
MCI patients (n=32), Age >= 60	2	Virtual Shopping Training	Korean version of the Executive Function Performance Test (EFPT-K); Korean Instrumental Activities of Daily Living (K-IADL)	Executive function and instrumental activities of daily living were improved.	(Park, J.H., 2022)
MCI patients (n=88), Age >= 60	0.5	Behavioral Interventions	Quality of Life-AD (QoL- AD); Center for Epidemiologic Studies Depression Scale (CES-D); REACH Anxiety Inventory Form (REACH-anx); Self-efficacy for Managing MCI Scale (Sem-MCI); Dementia Rating Scale-2 (DRS-2)	Efficacious and effective in impacting the trajectory of MCI.	(Levy et al., 2022)

MCI patients (n=126), Age >= 65	—	Balint group activity	Montreal Cognitive Assessment (MoCA); Geriatric Depression Scale (GDS); Signs of Depression Screening Scale (SDSS)	Improved negative emotions; Enhanced social functions and quality of life.	(Wang Lijun et al, 2023)

In the late 1990s, American medical experts introduced the Montessori education method into the treatment of dementia (Wilson N L et al., 1997), which is called the Montessori - Based Dementia Programming(MBDP). It emphasizes that patients with dementia should participate in activities that match their ability and state under prepared conditions, and repeatedly practice and strengthen language, sense, or related intellectual activities through independent selection of teaching aids, to exercise the patient's thinking ability and practical ability, and rebuild self-esteem (Van Der Ploeg E S, O'Connor D W, 2010). Research shows that Montessori method can improve the participation enthusiasm of dementia patients, effectively alleviate the symptoms of dementia, reduce complications (Sheppard C L et al., 2016), improve mental and behavioral symptoms (YUEN I, KWOK T, 2019; Van Der Ploeg E S, Eppingstall B, 2013; Roberts G et al., 2015), improve cognitive ability, improve swallowing function and eating ability, and improve daily living ability and quality of life (Wilks S E et al., 2019). In recent years, it has been widely used in dementia care institutions in America and Canada.

In America, continuing care for Alzheimer's disease mainly existed in the form of a continuing care community for a long time. At the same time, a professional institution for the continuing care of Alzheimer's disease, "Alzheimer's Care Center", was established to provide comprehensive hospital-community-family continuing care services for patients in cooperation with adult day care centers and medical homes for continuing care at home. According to the survey, the hospital-community-family continuous care for Alzheimer's disease in America has effectively improved patients' participation and sense of security, reduced disease mortality, and relieved the psychological and emotional pressure and burden of family caregivers (Sun Fei et al., 2019).

The British government released the National Strategy for Alzheimer's Disease in 2009, which will improve the recognition and understanding of Alzheimer's disease, early diagnosis and intervention, and high-quality care as three key areas to improve service level (Wang Ning, 2021). Accordingly, the main objectives for coping with Alzheimer's disease and the

evaluation criteria for the quality of life of patients and caregivers/family members were put forward.

As one of the countries with the highest degree of population aging in the world, the Japanese government has proposed the prevention and control goal of "delaying the onset of dementia in the 70~79 age group for one year within 10 years, and reducing the incidence rate by 1%". It has successively launched the Orange Plan (2012) and the New Orange Plan (2015) for Alzheimer's patients (Tian Xianglan, 2020). The comprehensive care system from hospital to community to family in the new orange plan is worth learning.

According to Alzheimer's Disease International (2022), South Korea has integrated a medical and social care model to meet the diverse and complex needs of dementia patients and their caregivers, from diagnosis until the end of life, according to the clinical stage of dementia. One of the most important features of this model is the Local Dementia Centers (LDCs). They can provide many services in the community, such as dementia prevention, diagnosis, and post-diagnosis care. Usually, LDCs provide personalized services for each dementia patient based on some relevant information from the community. This model was officially launched in September 2017 as part of the National Dementia Initiative (NDI). It has brought many changes in raising awareness of dementia among Koreans and building infrastructure such as LDCs and dementia-specialized institutions. NDI has been expanding the number of beneficiaries of long-term care services and working to reduce the costs caused by medical treatment and long-term care.

Research status of PMT

Psychomotor Therapy (PMT) originated in France. In 1950, Ms. Giselle Soubiran founded the clinical branch of psychomotor and the treatment method of psychomotor rehabilitation (Duan Zhouying, Chen Wenhua, 2021). It is the theory and method system of non-drug and non-large instrument treatment for psychomotor dysfunction (individual's psychosomatic function development obstacle and adaptability obstacle to the surrounding human environment, manifested as cognitive function, motor function, and emotional expression obstacle, which may be accompanied by mild neuropathological signs) caused by various reasons such as gene, development or functional disorder and degeneration. It collects all motor functions closely related to thinking, psychology, emotion, and brain functions (Faulkner G, Carless D, 2006) and improves the patients' motor, cognitive, and participation abilities through a series of "physical and mental remodeling" methods.

PMT is especially suitable for neuropsychological disorders caused by brain degeneration in the elderly, and has developed into a mature treatment technology in France. However, this therapy just started in China, and domestic research is scattered in various fields. Shao Quanwei and Li Bai (2015) mentioned in their research that PMT applies to the treatment of sports injury, diabetes, hypertension and other diseases. Zhang Ruixing et al. (2017) introduced the application of PMT in depression, schizophrenia, eating disorders, personality disorders and mental disorders. The research points out that PMT has an overall coordination and integration effect on human physiological, psychological, and social functions, has a positive impact on patients' emotions, cognition, and behavior, and can effectively promote the maintenance or improvement of patients' social functions. Chen Xuelian et al. (2018) pointed out that PMT has effectively improved the residual mental symptoms of mental patients, improved the cognitive and social functions of the brain, and reduced the functional disability of patients with mental disorders.

Wang Qiong et al. (2021) found that the intervention of senile dementia patients based on PMT theory can improve part of their cognitive function, and the patient's memory, memory ability, language, visuospatial ability and self-care ability. Zhang Weiwei (2022) proposed that PMT treatment can effectively improve the cognitive function of mild to moderate Alzheimer's patients, but whether it is suitable for severe Alzheimer's patients remains to be studied. Liang Jingzhao and Zhi Yanmin (2022) found that the nursing model based on PMT theory can improve the intelligence and psychological state of senile dementia patients, promote the recovery of mental symptoms, and improve the ability of daily living. At present, the research on rehabilitation nursing based on PMT in China is relatively weak, and especially the PMT intervention measures for senile dementia patients have not been carried out. It is necessary to learn from foreign experience to form an application system suitable for China in the future.

Kluger et al. (1997) conducted extensive motor or psychomotor and cognitive assessments on 41 cognitively normal older adults, 25 non-demented patients with mild cognitive impairment and future risk of dementia, and 25 patients with mild (early) AD to determine the association between cognitive impairment and motor behavior in older adults. The results showed that an important factor in cognitive decline in older adults is decreased motor ability. The motor/psychomotor assessment was found to be as sensitive as traditional cognitive function tests in identifying people affected by older adults stages of AD pathology. The ability to identify at-risk non-demented older adults can be improved in older adults with different educational levels.

A study of dementia prevalence and risk factors (W. D. Oswald et al., 2001) found that a comprehensive memory and psychomotor training program developed within the SIMA-Studies framework had a risk-reducing effect.

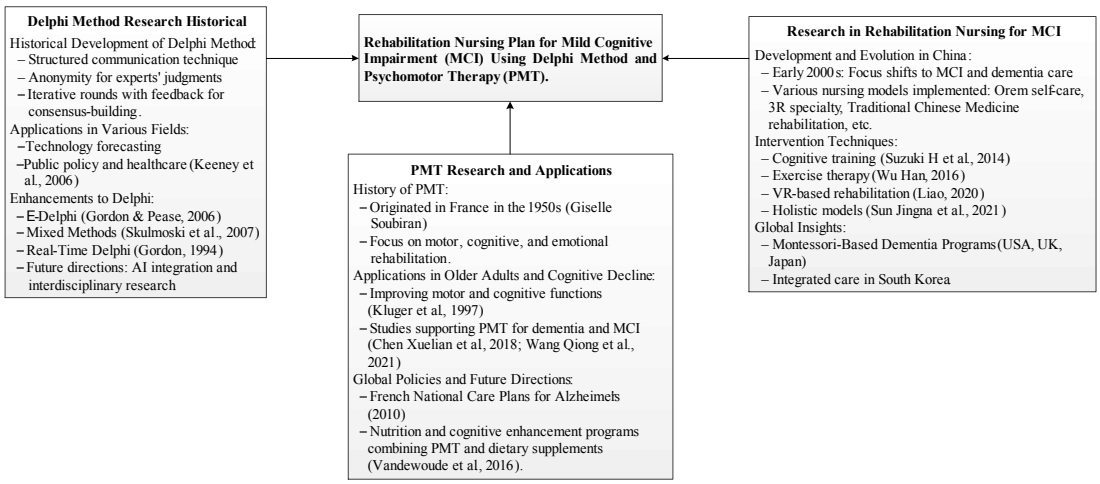
A study (M Hofman et al. , 2000) aimed at investigating the discriminative value of simple psychomotor and visuospatial tasks implemented in a computer-assisted test battery reported that a simple psychomotor test battery could be used to discriminate between patients with AD, patients with depression, and age-matched healthy controls. The results of the study showed that psychomotor tests were effective in discriminating healthy older adults from patients with AD and depression.

In 2010, the French Higher Health Agency issued the supplementary provisions of the decree "National 2008-2012 Family Care Plan for Alzheimer's Disease", which officially included psychomotor rehabilitation treatment in the care plan for older adults living at home with Alzheimer's disease and related diseases (Haute Autorité de Santé, 2010). PMT can effectively improve the cognitive function of AD patients, delay the deterioration of cognitive function, and improve the quality of life of AD patients.

A review (Vandewoude et al., 2016) showed that 26% to 80% of community-dwelling patients with AD were at risk of under-nutrition by the Mini Nutritional Assessment (MNA) score. Another study (Odete Vicente de Sousa et al., 2017) aimed to determine the effectiveness of an oral nutritional supplementation (ONS) intervention combined with a PMT rehabilitation program on nutritional, functional, and cognitive parameters in community-dwelling AD patients who were nutritionally inadequate or at risk. Develop a multi-component/modular geriatric psychomotor rehabilitation program for patients with AD with targeted goals, including attention, body strength, tension, static and dynamic balance exercises, body awareness, spatial and temporal reorganization, immediate and working memory and practice, fine motor skills, and gross motor skills training. The sessions consisted of 1 hour of exercise in the morning, twice a week. Each participant was required to complete 12 sessions. The results of the study suggest that a 21-day low-dose, high-protein, high-energy ONS combined with a psychomotor rehabilitation program is effective in improving long-term nutritional and functional status in community-dwelling older adults with mild AD.

In summary, the application of psychomotor therapy (PMT) has been predominantly studied in populations with dementia and AD, demonstrating its effectiveness in improving motor coordination and cognitive engagement. Only one study (E Kwang, 2021) showed that 11 MCIs and 11 subjectively healthy older adults(sHE) underwent a single 45-minute PMT intervention. Resting-state electroencephalography, the Rey Auditory-Verbal Learning Test, MoodMeter®, and the Positive and Negative Affect Schedule were compared between groups and pre- and post-PMT. PMT intervention does have functional influences on the central nervous level and therefore, might prevent and treat cognitive, psychological, and psychiatric symptoms of people with mild cognitive impairment. However, this study only conducted a single intervention and had a small number of subjects. Currently, there is limited research exists specifically addressing its role in mild cognitive impairment (MCI). This gap highlights the need for targeted investigations to evaluate PMT's potential to delay cognitive decline in MCI populations.

Conceptual framework



Methodology

Description of methodology

1) Research design: Quasi-Experimental Design (Non-randomized controlled trial) with experiment and control groups for comparison. Because of ethical considerations on older adults for logistical and economical wise, easy to travel, practical, less budget. Similar studies involving rehabilitation or behavioural interventions in real-world settings have widely used quasi-experimental designs. Studies by MA Handley(2018) and AD Harris (2006) demonstrated reliable outcomes using this approach.

2) Study area: Liaoning Province, China.

3) Study population

i) Reference population: Older adults living in Liaoning.

ii) Source population / sampling pool: Elderly care institutions and rehabilitation centers, Liaoning Province.

iii) Target population: Jinzhou Comprehensive Elderly Care Institution and Rehabilitation Center, Liaoning Province.

iv) Sampling frame: List of members from the two elderly care institution and rehabilitation center; Jinzhou Pension Comprehensive Service Center (JPCSC)), and Jinzhou Rehabilitation Hospital (JRH), Liaoning Province.

4) Subject criteria

Objective No. 1 and 2: To develop and validate the psychomotor rehabilitation nursing plan through content/face validation using the Delphi method.

Inclusion criteria:

i) Professionals with ≥5 years of experience in geriatric care, neurological rehabilitation, cognitive rehabilitation, or psychomotor therapy.

ii) Academic researchers with publications in related fields.

iii) Intermediate professional title or above.

iv) Willingness to participate in multiple Delphi rounds and provide informed feedback.

Exclusion criteria:

i) Experts without sufficient relevant experience.

ii) Those unable to commit to the Delphi process.

Objective No. 3: To evaluate the effectiveness of the psychomotor rehabilitation nursing plan in enhancing cognitive function among older adults with mild cognitive impairment. (Experimental and control group)

Inclusion criteria:

i) Older adults are aged 50 years and above.

ii) Subjective cognitive complaints from the individual or caregiver.

iii) Screening for MCI using the Mini-Cog scores between 0-2 (SN Abayomi, 2024).

iv) Basic language communication, listening, speaking, and understanding skills.

v) Ability to provide informed consent.

Exclusion criteria:

i) Diagnosed with severe psychiatric conditions (e.g., schizophrenia, major depressive disorder).

ii) It is at the end stage of important functional organ diseases, such as malignant tumors, cardiac failure, etc.

iii) Limb dysfunction.

iv) Diagnosed with dementia.

Withdrawal criteria:

i) Withdrawal of consent by the participant.

ii) Non-compliance with study requirements (e.g., missing >25% sessions).

iii) Significant health deterioration affecting participation.

5) Study groups

Experimental group: Older adults with MCI from Jinzhou Rehabilitation Hospital (JRH), with psychomotor rehabilitation uursing plan.

Control group: Older adults with MCI from Jinzhou Pension Comprehensive Service Center (JPCSC), without psychomotor rehabilitation uursing plan.

6) Operational definition:

i) Mild cognitive impairment (MCI): Mild Cognitive Impairment (MCI) is defined as a condition characterized by noticeable cognitive decline beyond what is expected for an individual's age and education level, but not severe enough to interfere significantly with daily life or independent functioning. It serves as an intermediate stage between normal aging and dementia. (Petersen, R.C., 2004; B. Winblad, 2004).

ii) Psychomotor therapy (PMT): Psychomotor therapy is a form of therapeutic intervention that focuses on the connection between psychological and motor (physical) functions (Duan Zhouying, Chen Wenhua, 2021).

7) Sample size determination

Objective No. 1 and 2: To develop and validate the psychomotor rehabilitation nursing plan through content/face validation using the Delphi method for older adults with mild cognitive impairment in promoting cognitive function.

A sample size of 8 to 15 respondents has been recommended for Delphi studies, given that smaller samples reduce reliability and bigger ones do not appear to add much value (Kenney et al., 2010). For this study, we aimed to recruit 10-12 participants.

Objective No. 3: To determine the effectiveness of the psychomotor rehabilitation nursing plan in enhancing cognitive function among older adults with mild cognitive impairment .

The sample size was calculated for specific objective 2. It was estimated by using the sample size formula compared with the average of two samples（Ni Ping et al., 2010）. The sample size calculation formula and parameters were as below:

$$\mathbf{N1= N2= 2[(t_{\alpha/2}+t_{\beta})S/\delta]^2}$$

N1 is the sample content of the experimental group.

N2 is the sample content of the control group.

S is the estimated value of the standard deviation between the two populations.

δ is the difference between the two averages.

The S and δ were the values of the MMSE scale decided by the researcher based on expert opinion (Liang Jingzhao, Zhi Yanmin, 2022), S= 2.75 , δ= 2.14. The level of significance (α) was 0.05, $t_{0.05/2}$= 1.96, β was 0.10, $t_{0.1}$= 1.28. By substituting the formula, 34 samples were required for each of the two groups.

An estimated 10% was added to the calculated sample size in anticipation of some missing data. The calculated sample size for this study was 76 patients (EG: 38 patients, CG: 38 patients).

8) Sampling method: Purposive sampling

9) Subject setting and participant

PHASE 1 (Delphi-method study for screening and recruitment)

The psychomotor rehabilitation nursing plan design will use Delphi-method which is an integration involving multiple expertise for the PMT development. The participants are the professionals with academic and/or practical experience in Neurology and cognitive training in China's hospitals or universities. There is no agreed method to consider someone an expert in a given field. To facilitate the selection process, it will use a simple point evaluation system. It will include all professionals with a final evaluation of at least 2 points. Regarding academic experience, it will consider the following factors: At least one publication on the

field of cognitive training (1 point) & at least one publication on the field of Neurology (1 point) OR at least one publication on the field of cognitive training in MCI (2 points). Concerning practical experience, it will consider experience in the development of a cognitive training program (1 point). Moreover, it will also consider if the professional had clinical experience in the application of cognitive training (1 point).

Purposive sampling. Potential participants will be identified through a literature review, existing academic contacts, and a web search for cognitive training programs (for MCI or Neurology or other conditions) and the respective scientific teams. After being evaluated in accordance to the point system previously described, professionals who met the inclusion criteria (2 points or more) will be invited to participate by email. In the initial questionnaire, they will be asked to recommend other professionals who they considered to be experts in the field. Recommended professionals who met the inclusion criteria will be contacted and invited to join the expert panel.

PHASE 2 (Quasi-Experimental design for PMT rehabilitation nursing interventional study)

This experimental method will be used in Quasi-Experimental Design (Non-randomized controlled trial) with experiment and control groups for comparison. Ethics consideration on older adults which would psychologically and emotionally impact in case not selected for experimental group. This research will be carried out in Liaoning Province of China. The rehabilitation nursing intervention will be carried out for older adults with MCI admitted in two China elderly care institutions which the name is Jinzhou Pension Comprehensive Service Center (JPCSC) and Jinzhou Rehabilitation Hospital (JRH). Because of ethical consideration on older adults for logistical and economical wise, easy to travel, practical, less budget. So the experimenatl group is JRH, and the control group is JPCSC. Purposive sampling, whereby older adults with MCI will be selected and invited to participate the study.

The PMT rehabilitation nursing intervention plan

From Table in the literature review, we can see that most interventions lasted for 3 months. Therefore, older adults will be engaged in a 12-week PMT rehabilitation nursing plan involving 2 phases of relaxation and breathing exercises, face exercises, hand exercises and mind exercises to promote cognitive health. The experimental group will be given interventions, twice a week every Tuesday and Thursday 9-10 am along with the study

intervention. Meanwhile, the control group will be given a standard health education on cognitive health.

Table The Mind-body Exercise of Psychomotor Rehabilitation Nursing Plan

Week	Phase	**Intervention methods**	Assessment
Week 0-6 Tuesday Thursday 9:00-10:00 am	Psychomotor function Phase 1	1.Do relaxation and breathing exercises before and after exercise (10 minutes). 2.Blink alternately, bulge left and right cheeks, and improve facial motor function (10 minutes). 3.(10 minutes) 4.(10 minutes) 5.Carry out upper limb gymnastics exercises to improve limb motor function (20 minutes).	Assessment time is at the baseline (before intervention).
Week 7-12 Tuesday Thursday 9:00-10:00 am	Psychomotor function Phase 2	1. Do relaxation and breathing exercises before and after exercise (10 minutes). 2.(10 minutes) 3.(10 minutes)	Assessment time is at the 12 week (after intervention).

		 1. (10 minutes) 2. Carry out upper limb gymnastics exercises with music to improve limb motor function (20 minutes).	

10) Data collection and Research tool

Phase 1: To develop and validate the psychomotor rehabilitation nursing plan through content/face validation using the Delphi Method for older adults with mild cognitive impairment.

The draft of the PMT rehabilitation nursing plan will be summarized through a literature review. An expert letter questionnaire will be formulated to make the PMT rehabilitation nursing plan more suitable for MCI older adults in China, and specialist consultation will be conducted face-to-face or by email, according to the actual situation. The Delphi method was used to reach a consensus on each program's characteristics, structure, and cognitive training tasks of the PMT rehabilitation nursing plan. A panel of experts was invited to participate in the content validation by answering two rounds of questions (scale and free-text boxes) regarding the program. Changes were made between the rounds according to the results of the first round. The consensus was defined as at least 70% of the experts agreeing on the validity of a characteristic. Experts will be invited to rate the importance and feasibility of the questionnaire items. The experts will be required to provide feedback to us within 2 weeks after receiving the questionnaire. After the first round of expert inquiry, the PMT

rehabilitation nursing program will be modified, deleted and supplemented based on the experts' scores and opinions on the items, so as to determine the second round of expert inquiry questionnaires and conduct the second round of expert inquiry. There will be a 3-week interval between the first and second rounds. After receiving the questionnaires from the experts, the inquiry results will be summarized and statistically analyzed until the experts' opinions reach a consensus, and the entire inquiry process will be terminated.

The duration of participant involvement in the Delphi method will be approximately 6 – 10 weeks in total, depending on the number of rounds required to reach expert consensus. Each Delphi round will require participants to complete the questionnaire, which is estimated to take 20 – 30 minutes per round. Between rounds, there will be a 1 – 2-week interval for data analysis and feedback preparation. While we anticipate achieving consensus within two rounds, a third or fourth round may be necessary if the responses require further refinement. In such a case, participants will be informed in advance, and their continued involvement will be requested. We will strive to minimize the burden on participants while ensuring robust and reliable results.

Phase 2: To evaluate the effectiveness of the psychomotor rehabilitation nursing plan among older adults with mild cognitive impairment.

The data will be collected from January 2025 to December 2025 in China's older adults care institutions. The data collection form was created by the researcher to record general information about older adults, such as age, gender, education level, family history of dementia, marital status, personal annual income, chronic disease. It will take no more than 5 minutes. Then, It will conduct questionnaire surveys before the intervention (baseline) and after the intervention (12 weeks). The questionnaires involved include MoCA, which has 11 questions and takes about 10 minutes; PANSS, which has 30 questions and takes about 20 minutes; HAMA-14, which has 14 questions and takes about 10 minutes; HAMD-17, which has 17 questions and takes about 15 minutes. All questionnaires will take no more than 60 minutes. Due to ethical issues, the names of the elderly participating in this study are only used for data collection, and their identity information will not be disclosed.

Data/Specimen handling:

1. Collection: Participant data will be collected through questionnaires and assessments during the study. No biological specimens will be collected as part of this research.

2. Storage and Security: All participant data will be anonymized and stored in a password-protected electronic database. Hard copies, if any, will be kept in a locked cabinet accessible only to the research team.

3. Usage: The data will be used exclusively for this study to evaluate the effectiveness of the psychomotor rehabilitation nursing plan. No secondary use of data will occur without additional consent from participants.

4. Retention and Destruction: Data will be retained for 5 years following the publication of the study findings, after which it will be securely destroyed by permanent deletion of digital files and shredding of hard copies.

5. Confidentiality: Participant confidentiality will be strictly maintained throughout the study. All identifiers will be replaced with unique codes to ensure privacy."

Research material: The materials used in PMT rehabilitation nursing intervention plan.

i) Rehabilitation functional training hand coordinator

ii) Rehabilitation training geometric figure cognitive plug-in board

iii) Hand-eye-brain coordination training ball

iv) Finger Function Dexterity Trainer

v) Intelligence training puzzle board

vi) Music for upper limb gymnastics exercises

1) Rehabilitation functional training hand coordinator

2) Rehabilitation training geometric figure cognitive plug-in board

3) Hand-eye-brain coordination training ball

4) Finger Function Dexterity Trainer

5) Intelligence training puzzle board

Questionnaire:

i) Cognitive assessment:

The cognitive status of older adults was assessed by the Montreal Cognitive Assessment (MoCA) scale. Developed by Nasreddine et al. in Canada with reference to the MMSE, the MoCA evaluates multiple cognitive domains, including attention, executive function, memory, language, visuospatial skills, abstract thinking, calculation, and orientation, making it suitable for a comprehensive assessment of various types of cognitive impairment (Nasreddine ZS, 2005). In Western countries, a cutoff score of 26 is commonly used to identify MCI.

In China, various versions of the MoCA are available, including the Beijing, Changsha, and Cantonese versions, with the Beijing version being the most widely used. The cutoff scores of the MoCA Beijing version vary for different populations. According to a study by Lu et al. (2011) involving 8,411 community-dwelling older adults aged 65 years and above, the optimal cutoff scores for diagnosing MCI with the Beijing version are $\leqslant 13$ for illiterate

individuals, ⩽19 for those with primary education, and ⩽24 for those with middle school education or higher. The sensitivity and specificity for identifying MCI were 80.5% and 82.5%, respectively.

ii) Psychological assessment：

The psychological of older adults was assessed by the Positive and Negative Syndrome Scale (PANSS), including the positive scale (7 items, 7~49 points), the general psychopathology scale (16 items, 16~112 points), and the negative scale (7 items, 7~49 points). The higher the score is, the worse the rehabilitation.

The reliability and validity of the Chinese version of PANSS have been verified (SI Tianmei et al. , 2004) and applied in clinical practice. The internal consistency reliability was 0.87(Cronbach α). The internal consistency reliability of the 5 dimensions ranged from 0.74 ~ 0.90. The structure, validity and reliability of PANSS (Chinese version) are acceptable.

iii) Emotional assessment：

The emotional assessment was assessed by the Hamilton Depression Rating Scale (HAMD-17) and the Hamilton Anxiety Rating Scale (HAMA-14), which are among the most widely used scales for evaluating emotional status. HAMA-14 contains two aspects; physical and mental. It includes 14 items with a total score of 56. HAMD-17 covers; despair, somatization symptoms, sleep disorders, and anxiety. It consists of 17 items with a total score of 52. (Maier, 1988; Maier, 1990). The 2025 Expert Consensus on Neuropsychological Assessment of Mild Cognitive Impairment (2025) recommends the use of these scales, as they effectively identify and quantify depressive and anxiety symptoms in patients with MCI. These tools have been widely adopted due to their high sensitivity and specificity, as well as their ease of administration and interpretation.

11) Data analysis

Objective No. 1 and 2 : To develop and validate the psychomotor rehabilitation nursing plan through content/face validation using the Delphi Method for older adults with mild cognitive impairment in promoting cognitive health.

Quantitative analyses will be conducted using SPSS version 28. The mean, standard deviation, coefficient of variation (CV), and full score ratio of all items will be calculated. The positive coefficient and authority coefficient (Cr) of the experts will be calculated. The

authority coefficient will equal to the mean value of the expert's self-assessed familiarity and the basis of expert judgment. The coordination degree of expert opinions will be expressed by Kendall's coordination coefficient (W). The P value < 0.05 will be considered to indicate statistical significance.

Expected result (Dummy Table): The Delphi-method of the PMT rehabilitation nursing plan

Table General information of experts

Items	Groups	Number of people	Composition ratio (%)
Gender	Male		
	Female		
Age (years)	30-40		
	40-50		
	> 50		
Education level	Undergraduate		
	Master		
Years of working experience	< 10		
	10-20		
	> 20		
Professional title	Intermediate		
	Senior		
Professional composition	Nursing		
	Neurology		
	Rehabilitation Medicine		
Province	Liaoning		
	Beijing		
	Shanghai		
	Guangzhou		

Table Specific data statistical results of each item in the first round of correspondence consultation

Item	Statements	Score (±)	CV	Consensus, n (%)
1. General Aspects of The PMT Rehabilitation Nursing Plan				
1.1 The Plan Structure	Older adults will be engaged in a 12-week PMT rehabilitation nursing plan involving 2 phases (twice a week every Tuesday and Thursday 9-10 am).			
1.2 Performance Sequence	All older adults will perform the same execution/performance sequence. The tasks must take place sequentially according to the pre-defined logic. In total, the plan comprises 5 distinct tasks in each phase.			

2. Description of The PMT Rehabilitation Nursing Plan				
2.1 Phase 1 -Task 1	Do relaxation and breathing exercises before and after exercise (10 minutes).			
2.2 Phase 1 -Task 2	Blink alternately, bulge left and right cheeks, and improve facial motor function (10 minutes).			
2.3 Phase 1 -Task 3	Hand-eye coordination training： The older adults followed instructions to grab the colorful beads with their hands and slide them along the curved track (10 minutes).			
2.4 Phase 1 -Task 4	Cognitive training puzzle board： The older adults put puzzle pieces of different colors and shapes into the corresponding grooves according to the instructions (10 minutes).			
2.5 Phase 1 -Task 5	Carry out upper limb gymnastics exercises to improve limb motor function (20 minutes).			
2.6 Phase 2 -Task 1	Do relaxation and breathing exercises before and after exercise (10 minutes).			
2.7 Phase 2 -Task 2	Hand muscle training/flexibility training/hand-eye coordination/improved circulation： The older adults held and rotated two balls with one hand according to instructions (10 minutes).			
2.8 Phase 2 -Task 3	Hand fine training/flexibility training/hand-eye coordination/endurance and concentration training (10 minutes).			
2.9 Phase 2 -Task 4	Hand-eye coordination training/cognitive ability training/fine skills training/teamwork and social interaction training (10 minutes).			
2.10 Phase 2 -Task 5	Carry out upper limb gymnastics exercises with music to improve limb motor function (20 minutes).			

Objective No. 3: To evaluate the effectiveness of psychomotor rehabilitation nursing plan in enhancing cognitive function among older adults with mild cognitive impairment.

Data entry and analysis will be performed using SPSS 28.0 software. Descriptive statistics will be used to summarize the general information of older adults. Numerical data will be presented as mean (SD) or median (IQR) based on their normality distribution. Categorical data will be presented as frequency (%). The comparison of scores of various scales are based on paired t-test statistical methods. The P value <0.05 will be considered to indicate statistically significant with 95% confidence interval (CI).

Expected result (Dummy Table): The effect assessment of the PMT rehabilitation nursing plan

Table Comparison of cognitive status between two groups ($\overline{x} \pm s$, scores)

Assessment	Before (n = 76)	After (n = 76)	Diff (95% CI)	t	P
Orientation					
Registration					
Attention and Calculation					
Recall					
Language and Praxis					
MoCA total score					

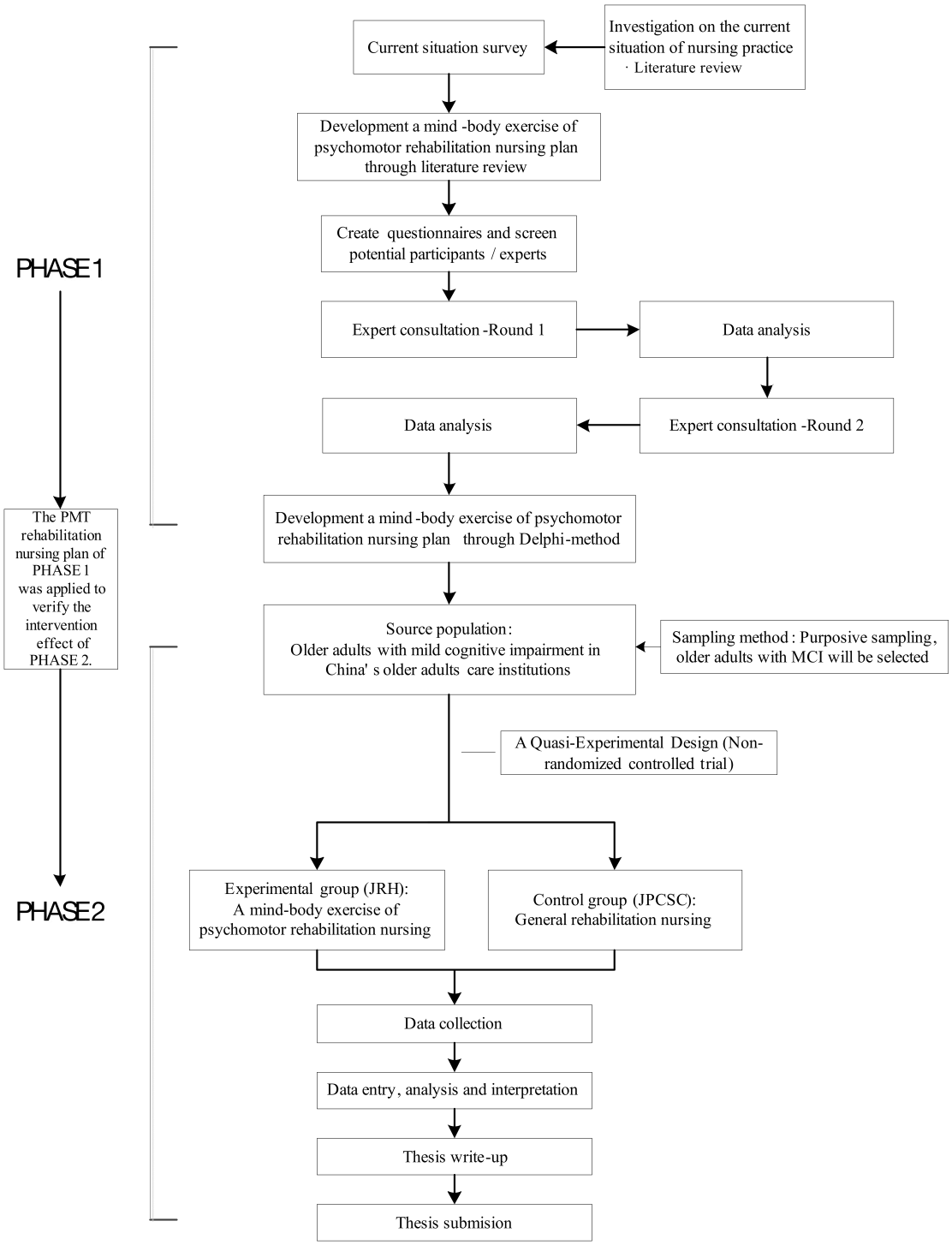
Table Comparison of psychological status between two groups ($\overline{x} \pm s$, scores)

Assessment	Before (n = 76)	After (n = 76)	Diff (95% CI)	t	P
Positive scale					
General psychopathology scale					
Negative scale					

Table Comparison of mental rehabilitation status between two groups ($\overline{x} \pm s$, scores)

Assessment	Before (n = 76)	After (n = 76)	Diff (95% CI)	t	P
Mood-related signs					
Behavioral disturbance					
Cyclic functions					
Ideational disturbance					

Study flowchart



Gantt chart & milestone

Research Activities	2024				2025				2026			
	Jan–Mar	Apr–Jun	Jul-Sep	Oct-Dec	Jan–Mar	Apr–Jun	Jul-Sep	Oct-Dec	Jan–Mar	Apr–Jun	Jul-Sep	Oct-Dec
Preliminary discussion												
Preparing research proposal												
Ethical application and approval from USM												
Data collection												
Data analysis and interpretation												
Thesis write-up and submission												

Ethical consideration

This study will require ethical approval from the Human Research Ethics Committee of USM (JePEM). The research activity will only be commenced after obtaining the ethical approval.

1) Subject vulnerability

i) Informed consent: Before beginning the questionnaire or interview, clearly explain the purpose, content, and participants' choices, ensuring that they fully understand their rights and know they can withdraw at any time without affecting their rights.

ii) Emphasize voluntary participation: Make it clear that participants are free to refuse to answer any questions and can withdraw from the interview or questionnaire at any point.

2) Declaration of absence of conflict of interest

i) Declaration of no conflicts of interest: I have not received any compensation, shares, or other forms of remuneration from any company or financial interest involved in the research, nor do I stand to gain any direct or indirect benefits from the research results. I am not subject to any external pressure, and all research activities, data analysis, and result reporting are based on scientific methods and objective judgment.

ii) Ensuring and maintaining the integrity of the research: Throughout the research process, I will maintain transparency. All data collection, analysis, and reporting will strictly adhere to scientific norms and standards, ensuring independence and freedom from external influences. I will follow the ethical guidelines set by academic and research institutions to ensure that no external parties influence the design, handling of data, interpretation of results, or reporting. If a potential conflict of interest arises at any stage of the research, I will immediately report it to the relevant institutions and implement appropriate measures, such as introducing independent oversight or review procedures, to eliminate or manage the conflict.

3) Privacy and confidentiality

The ethical issues considered in this study are related to older adults' confidential information and means of intervention and rehabilitation care. Because their personal information will be obtained and new rehabilitation care methods will be implemented. The names in older adults data will not be disclosed.

4) Community sensitivities and benefits

When designing questionnaires or interview questions related to cognitive impairment in the older adults, it is essential to minimize potential distress, anxiety. Avoid negative or potentially embarrassing wording, using neutral and respectful terms. For exemple, use “cognitive changes” instead of “cognitive impairment”. Refrain from using stigmatizing terms such as “dementia”, and opt for more neutral or supportive language like “memory issues” or “thinking difficulties”. Ensure the environment in which the questionnaire is conducted is safe and stress-free, giving participants ample time to respond. Foster an atmosphere of respect, empathy, and care to reduce tension. If participants show signs of anxiety or distress during the interview, pause or stop the

session, check in with their feelings, and decide whether to continue based on the situation.

Direct benefits to participant: Participants may experience improvement in their cognitive function and overall mental health through participation in the psychomotor rehabilitation program. They will undergo regular health evaluations, which may help in identifying and addressing potential health issues early. Free access to the intervention program and related therapeutic activities may enhance their quality of life during the study period.

Indirect benefits to participant: The participants' involvement will contribute valuable data to the development of better care strategies for individuals with mild cognitive impairment. Their participation may increase awareness and understanding of MCI among themselves and their families, potentially leading to improved daily care practices. The findings of this study may have a positive impact on public health policies and future interventions for similar populations.

5) Honorarium and incentives

All participants will receive a gift. Transportation costs will be covered by the principal investigator of the study.

6) Potential risk to participant

All participants Fall or Injury Risk: Older adults may have weaker muscle strength, balance, and coordination, which makes them more prone to falls or injuries during rehabilitation activities. If participants fall or are injured during the intervention, necessary medical support will be provided.

Feelings of Frustration: If older adults do not experience the expected progress during rehabilitation, they may develop feelings of frustration, disappointment, or reduced self-efficacy. If participants experience any discomfort, psychological support will be provided, and they may withdraw from the study at any time.

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APPENDICES

Data Collection Form

Name: **ID :**

Elderly's General information:

1. Sex
   - Female : _____
   - Male : _____
2. Age (years) : _____
3. Education Level
   - Illiteracy : _____
   - Primary school : _____
   - Middle school : _____
   - College or above : _____
4. Family history of dementia (Yes or No) : _____
5. Marital status
   - Single / Divorced / Widowed : _____
   - Married : _____

6. Personal annual income : _____

7. Chronic disease (Yes or No. If yes, please write the specific disease name)

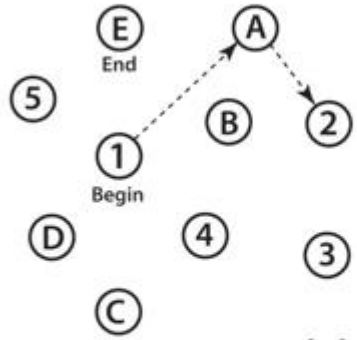
: _____

MONTREAL COGNITIVE ASSESSMENT (MOCA)

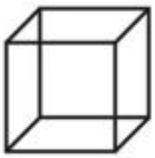
Version 7.1 Original Version

NAME :
Education :
Sex :
Date of birth :
DATE :

VISUOSPATIAL / EXECUTIVE



Copy cube



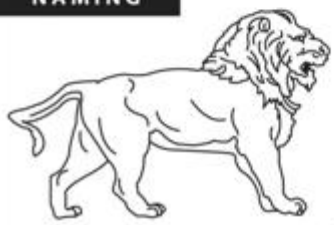
[ ] [ ]

Draw CLOCK (Ten past eleven)
(3 points)

[ ] Contour [ ] Numbers [ ] Hands

POINTS __/5

NAMING



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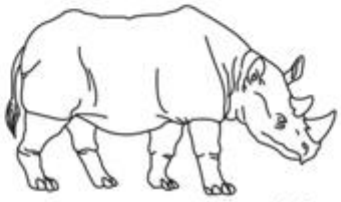

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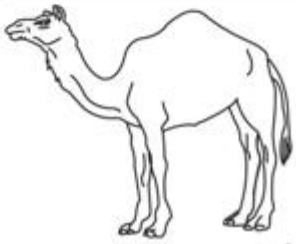

[ ]

__/3

MEMORY

Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.

	FACE	VELVET	CHURCH	DAISY	RED
1st trial					
2nd trial					

No points

ATTENTION

Read list of digits (1 digit/ sec.).

Subject has to repeat them in the forward order [ ] 2 1 8 5 4

Subject has to repeat them in the backward order [ ] 7 4 2

__/2

Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors

[ ] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B

__/1

Serial 7 subtraction starting at 100 [ ] 93 [ ] 86 [ ] 79 [ ] 72 [ ] 65

4 or 5 correct subtractions: **3 pts**, 2 or 3 correct: **2 pts**, 1 correct: **1 pt**, 0 correct: **0 pt**

__/3

LANGUAGE

Repeat : I only know that John is the one to help today. [ ]

The cat always hid under the couch when dogs were in the room. [ ]

__/2

Fluency / Name maximum number of words in one minute that begin with the letter F [ ] _____ (N ≥ 11 words)

__/1

ABSTRACTION

Similarity between e.g. banana - orange = fruit [ ] train – bicycle [ ] watch - ruler

__/2

DELAYED RECALL

Optional

	FACE	VELVET	CHURCH	DAISY	RED	
Has to recall words WITH NO CUE	[ ]	[ ]	[ ]	[ ]	[ ]	Points for UNCUED recall only
Category cue						
Multiple choice cue						

__/5

ORIENTATION

[ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City

__/6

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www.mocatest.org

Normal ≥ 26 / 30

TOTAL __/30

Add 1 point if ≤ 12 yr edu

Administered by: _____

POSITIVE AND NEGATIVE SYNDROME SCALE (PANSS)

ITEMS	SCORE
POSITIVE SCALE (P):	
P1. DELUSIONS - Beliefs which are unfounded, unrealistic and idiosyncratic.	☐
P2. CONCEPTUAL DISORGANISATION - Disorganized process of thinking characterized by disruption of goal-directed sequencing, e.g. circumstantiality, loose associations, tangentiality, gross illogicality or thought block.	☐
P3. HALLUCINATORY BEHAVIOUR - Verbal report or behavior indicating perceptions that are not generated by external stimuli. These may occur in the auditory, visual, olfactory, or somatic realms.	☐
P4. EXCITEMENT - Hyperactivity as reflected in accelerated motor behavior, heightened responsivity to stimuli, hypervigilance or excessive mood lability.	☐
P5. GRANDIOSITY - Exaggerated self-opinion and unrealistic convictions of superiority, including delusions of extraordinary abilities, wealth, knowledge, fame, power and moral righteousness.	☐
P6. SUSPICIOUSNESS/PERSECUTION - Unrealistic or exaggerated ideas of persecution, as reflected in guardedness, ad distrustful attitude, suspicious hypervigilance or frank delusions that others mean harm.	☐
P7. HOSTILITY - Verbal and nonverbal expressions of anger and resentment, including sarcasm, passive-aggressive behavior, verbal abuse, and assualtiveness.	☐
NEGATIVE SCALE (N):	
N1. BLUNTED AFFECT - Diminished emotional responsiveness as characterized by a reduction in facial expression, modulation of feelings and communicative gestures.	☐
N2. EMOTIONAL WITHDRAWAL - Lack of interest in, involvement with, and affective commitment to life's events.	☐
N3. POOR RAPPORT - Lack of interpersonal empathy, openness in conversation and sense of closeness, interest or involvement with the interviewer. This is evidenced by interpersonal distancing and reduced verbal and nonverbal communication	☐
N4. PASSIVE/APATHETIC SOCIAL WITHDRAWAL - Diminished interest and initiative in social interactions due to passivity, apathy, anergy or avolition. This leads to reduced interpersonal involvements and neglect of activities of daily living.	☐
N5. DIFFICULTY IN ABSTRACT THINKING - Impairment in the use of the abstract-symbolic mode of thinking, as evidenced by difficulty in classification, forming generalizations, and proceeding beyond concrete or egocentric thinking in problem-solving tasks.	☐
N6. LACK OF SPONTANEITY AND FLOW OF CONVERSATION - Reduction in the normal flow of communication associated with apathy, avolition, defensiveness or cognitive deficit. This is manifested by diminished fluidity and productivity of the verbal interactional process.	☐
N7. STEREOTYPED THINKING - Decreased fluidity, spontaneity and flexibility of thinking, as evidenced in rigid, repetitious or barren thought content.	☐
GENERAL PSYCHOPATHOLOGY SCALE(G):	
G1. SOMATIC CONCERN - Physical complaints or beliefs about bodily illness or malfunctions. This may range from a vague sense of ill being to clear-cut delusions of catastrophic physical disease.	□
G2. ANXIETY - Subjective experience of nervousness, worry, apprehension or restlessness, ranging from excessive concern about the present or future to feelings of	□

panic.	
G3. GUILT FEELINGS - Sense of remorse or self-blame for real or imagined misdeeds in the past.	□
G4. TENSION -Overt physical manifestations of fear, anxiety, and agitation, such as stiffness, tremor, profuse sweating and restlessness.	□
G5. MANNERISMS AND POSTURING – Unnatural movements or posture as characterized be an awkward, stilted, disorganised, or bizarre appearance.	□
G6. DEPRESSION - Feelings of sadness, discouragement, helplessness and pessimism.	□
G7. MOTOR RETARDATION – Reduction in motor activity as reflected in slowing or lessening or movements and speech, diminished responsiveness of stimuli, and reduced body tone.	□
G8. UNCOOPERATIVENESS - Active refusal to comply with the will of significant others, including the interviewer, hospital staff or family, which may be associated with distrust, defensiveness, stubbornness, negativism, rejection of authority, hostility or belligerence.	□
G9. UNUSUAL THOUGHT CONTENT - Thinking characterized by strange, fantastic, or bizarre ideas, ranging from those that are remote or atypical to those that are distorted, illogical, and patently absurd.	□
G10. DISORIENTATION - Lack of awareness of one's relationship to the milieu, including persons, place and time, which may be due to confusion or withdrawal.	□
G11. POOR ATTENTION - Failure in focused alertness manifested by poor concentration, distractibility from internal and external stimuli, and difficulty in harnessing, sustaining or shifting focus to new stimuli.	□
G12. LACK OF JUDGEMENT AND INSIGHT - Impaired awareness or understanding of one's own psychiatric condition and life situation. This is evidenced by failure to recognize past or present psychiatric illness or symptoms, denial of the need for psychiatric hospitalization or treatment, decisions characterized by poor anticipation or consequences, and unrealistic short-term and long-range planning.	☐
G13. DISTURBANCE OF VOLITION – Disturbance in the wilful initiation, sustenance, and control of one's thoughts, behavior, movements, and speech.	☐
G14. POOR IMPULSE CONTROL - Disordered regulation and control of action on inner urges, resulting in sudden, unmodulated, arbitrary or misdirected discharge of tension and emotions without concern about consequences.	☐
G15. PREOCCUPATION - Absorption with internally generated thoughts and feelings and with autistic experiences to the detriment of reality orientation and adaptive behavior.	☐
G16. ACTIVE SOCIAL AVOIDANCE - Diminished social involvement associated with unwarranted fear, hostility, or distrust.	☐

(Adapted from SR Kay, A Fiszbein, LA Opler, 1987)

HAMILTON ANXIETY RATING SCALE (HAM-A)

Below is a list of phrases that describe certain feelings that people have. Rate the patients by finding the answer that best describes the extent to which he/she has these conditions. Select one of the five responses for each of the 14 questions.

	0 = Not present	1 = Mild	2 = Moderate	3 = Severe	4 = Very severe
1. Anxious mood Worries, anticipation of the worst, fearful anticipation, irritability.	☐	☐	☐	☐	☐
2. Tension Feelings of tension, fatigability, startle response, moved to tears easily, trembling, feelings of restlessness, inability to relax.	☐	☐	☐	☐	☐
3. Fears Of dark, of strangers, of being left alone, of animals, of traffic, of crowds.	☐	☐	☐	☐	☐
4. Insomnia Difficulty in falling asleep, broken sleep, unsatisfying sleep and fatigue on waking, dreams, nightmares, night terrors.	☐	☐	☐	☐	☐
5. Intellectual Difficulty in concentration, poor memory.	☐	☐	☐	☐	☐
6. Depressed mood Loss of interest, lack of pleasure in hobbies, depression, early waking, diurnal swing.	☐	☐	☐	☐	☐
7. Somatic (muscular) Pains and aches, twitching, stiffness, myoclonic jerks, grinding of teeth, unsteady voice, increased muscular tone.	☐	☐	☐	☐	☐
8. Somatic (sensory) Tinnitus, blurring of vision, hot and cold flushes, feelings of weakness, pricking sensation.	☐	☐	☐	☐	☐
9. Cardiovascular symptoms Tachycardia, palpitations, pain in chest, throbbing of vessels, fainting feelings, missing beat.	☐	☐	☐	☐	☐
10. Respiratory symptoms Pressure or constriction in chest, choking feelings, sighing, dyspnea.	☐	☐	☐	☐	☐
11. Gastrointestinal symptoms Difficulty in swallowing, wind abdominal pain, burning sensations, abdominal fullness, nausea, vomiting, borborygmi, looseness of bowels, loss of weight, constipation.	☐	☐	☐	☐	☐
12. Genitourinary symptoms Frequency of micturition, urgency of micturition, amenorrhea, menorrhagia, development of frigidity, premature ejaculation, loss of libido, impotence.	☐	☐	☐	☐	☐
13. Autonomic symptoms Dry mouth, flushing, pallor, tendency to sweat, giddiness, tension headache, raising of hair.	☐	☐	☐	☐	☐
14. Behaviour at interview Fidgeting, restlessness or pacing, tremor of hands, furrowed brow, strained face, sighing or rapid respiration, facial pallor, swallowing, etc.	☐	☐	☐	☐	☐

Scoring: Each item is scored on a scale of 0 (not present) to 4 (very severe), with a total score range of 0–56, where <17 indicates mild severity, 18–24 mild to moderate severity, 25–30 moderate to severe and 31-56 severe to very severe.

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HAMILTON DEPRESSION RATING SCALE (HAM-D17)

1 DEPRESSED MOOD *(sadness, hopeless, helpless, worthless)*
- 0 [ ] Absent.
- 1 [ ] These feeling states indicated only on questioning.
- 2 [ ] These feeling states spontaneously reported verbally.
- 3 [ ] Communicates feeling states non-verbally, i.e. through facial expression, posture, voice and tendency to weep.
- 4 [ ] Patient reports virtually only these feeling states in his/her spontaneous verbal and non-verbal communication.

2 FEELINGS OF GUILT
- 0 [ ] Absent.
- 1 [ ] Self reproach, feels he/she has let people down.
- 2 [ ] Ideas of guilt or rumination over past errors or sinful deeds.
- 3 [ ] Present illness is a punishment. Delusions of guilt.
- 4 [ ] Hears accusatory or denunciatory voices and/or experiences threatening visual hallucinations.

3 SUICIDE
- 0 [ ] Absent.
- 1 [ ] Feels life is not worth living.
- 2 [ ] Wishes he/she were dead or any thoughts of possible death to self.
- 3 [ ] Ideas or gestures of suicide.
- 4 [ ] Attempts at suicide (any serious attempt rate 4).

4 INSOMNIA: EARLY IN THE NIGHT
- 0 [ ] No difficulty falling asleep.
- 1 [ ] Complains of occasional difficulty falling asleep, i.e. more than ½ hour.
- 2 [ ] Complains of nightly difficulty falling asleep.

5 INSOMNIA: MIDDLE OF THE NIGHT
- 0 [ ] No difficulty.
- 1 [ ] Patient complains of being restless and disturbed during the night.
- 2 [ ] Waking during the night – any getting out of bed rates 2 (except for purposes of voiding).

6 INSOMNIA: EARLY HOURS OF THE MORNING
- 0 [ ] No difficulty.
- 1 [ ] Waking in early hours of the morning but goes back to sleep.
- 2 [ ] Unable to fall asleep again if he/she gets out of bed.

7 WORK AND ACTIVITIES
- 0 [ ] No difficulty.
- 1 [ ] Thoughts and feelings of incapacity, fatigue or weakness related to activities, work or hobbies.
- 2 [ ] Loss of interest in activity, hobbies or work – either directly reported by the patient or indirect in listlessness, indecision and vacillation (feels he/she has to push self to work or activities).
- 3 [ ] Decrease in actual time spent in activities or decrease in productivity. Rate 3 if the patient does not spend at least three hours a day in activities (job or hobbies) excluding routine chores.
- 4 [ ] Stopped working because of present illness. Rate 4 if patient engages in no activities except routine chores, or if patient fails to perform routine chores unassisted.

8 RETARDATION (slowness of thought and speech, impaired ability to concentrate, decreased motor activity)
- 0 [ ] Normal speech and thought.
- 1 [ ] Slight retardation during the interview.
- 2 [ ] Obvious retardation during the interview.
- 3 [ ] Interview difficult.
- 4 [ ] Complete stupor.

9 AGITATION
- 0 [ ] None.
- 1 [ ] Fidgetiness.
- 2 [ ] Playing with hands, hair, etc.
- 3 [ ] Moving about, can't sit still.
- 4 [ ] Hand wringing, nail biting, hair-pulling, biting of lips.

10 ANXIETY PSYCHIC
- 0 [ ] No difficulty.
- 1 [ ] Subjective tension and irritability.
- 2 [ ] Worrying about minor matters.
- 3 [ ] Apprehensive attitude apparent in face or speech.
- 4 [ ] Fears expressed without questioning.

11 ANXIETY SOMATIC (physiological concomitants of anxiety) such as:
gastro-intestinal – dry mouth, wind, indigestion, diarrhea, cramps, belching
cardio-vascular – palpitations, headaches
respiratory – hyperventilation, sighing
urinary frequency
sweating
- 0 [ ] Absent.
- 1 [ ] Mild.
- 2 [ ] Moderate.
- 3 [ ] Severe.
- 4 [ ] Incapacitating.

12 SOMATIC SYMPTOMS GASTRO-INTESTINAL
- 0 [ ] None.
- 1 [ ] Loss of appetite but eating without staff encouragement. Heavy feelings in abdomen.
- 2 [ ] Difficulty eating without staff urging. Requests or requires laxatives or medication for bowels or medication for gastro-intestinal symptoms.

13 GENERAL SOMATIC SYMPTOMS
- 0 [ ] None.
- 1 [ ] Heaviness in limbs, back or head. Backaches, headaches, muscle aches. Loss of energy and fatigability.
- 2 [ ] Any clear-cut symptom rates 2.

14 GENITAL SYMPTOMS (symptoms such as loss of libido, menstrual disturbances)
- 0 [ ] Absent.
- 1 [ ] Mild.
- 2 [ ] Severe.

15 HYPOCHONDRIASIS
- 0 [ ] Not present.
- 1 [ ] Self-absorption (bodily).
- 2 [ ] Preoccupation with health.
- 3 [ ] Frequent complaints, requests for help, etc.
- 4 [ ] Hypochondriacal delusions.

16 LOSS OF WEIGHT ***(RATE EITHER a OR b)***

a) According to the patient:	**b) According to weekly measurements:**
0 [ ] No weight loss.	0 [ ] Less than 1 lb weight loss in week.
1 [ ] Probable weight loss associated with present illness.	1 [ ] Greater than 1 lb weight loss in week.
2 [ ] Definite (according to patient) weight loss.	2 [ ] Greater than 2 lb weight loss in week.

17 INSIGHT
- 0 [ ] Acknowledges being depressed and ill.
- 1 [ ] Acknowledges illness but attributes cause to bad food, climate, overwork, virus, need for rest, etc.
- 2 [ ] Denies being ill at all.

Total score: [ ][ ]

Ratings should be based upon symptoms over the past one week.

Ratings should be based on a clinical interview, supplemented, where necessary, by collateral history from caregivers.

Hamilton, M. (1960). A rating scale for depression. *Journal of Neurology, Neurosurgery, and Psychiatry, 23*(1), 56–62. https://doi.org/10.1136/jnnp.23.1.56