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Research Progress on Functional Exercise Nursing Interventions for Elderly Patients with Alzheimer's Disease

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Abstract: Alzheimer's Disease (AD) is a degenerative disorder of the central nervous system characterized primarily by progressive cognitive decline, behavioral abnormalities, and a decrease in daily living abilities. It is predominantly observed in the elderly population, with its incidence rising annually alongside the aging demographic, posing a significant public health threat to the physical and mental well-being and quality of life of older adults. Currently, clinical treatment primarily relies on pharmacological interventions to alleviate symptoms, whereas functional exercise nursing interventions, as a core non-pharmacological approach, can effectively delay cognitive decline, improve physical motor function, enhance self-care abilities in daily life, and reduce the caregiving burden on families and society. This article systematically reviews the main types, implementation methods, influencing factors, and intervention effects of functional exercise nursing interventions for elderly patients with AD, aiming to provide theoretical foundations and practical references for the clinical implementation of standardized and individualized functional exercise nursing interventions.

Keywords: Elderly Alzheimer's disease; Functional exercise; Nursing intervention; Cognitive function

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1. Introduction

As the global population continues to age, the incidence and prevalence of Alzheimer's Disease (AD) exhibit an annual upward trend. According to the "China Report on the Development of Aging Undertakings (2025)", by the end of 2024, the population aged 60 and above in China reached 321 million, accounting for 22.8% of the total population, while those aged 65 and above numbered 217 million, representing 15.4%. The vast elderly population base poses severe challenges to AD prevention and control [1,2]. The pathological changes of AD are insidious and progressive, with early manifestations primarily including memory impairment, language dysfunction, and other cognitive impairments, leading to a decline in patients' daily living abilities and the emergence of abnormal mental behaviors, thereby imposing a heavy burden on individuals, families, and society [3]. Currently, clinical treatment for AD still predominantly relies on pharmacological interventions, which can temporarily slow down the rate of

cognitive decline but cannot reverse the pathological process and may result in adverse reactions with long-term use. Against this backdrop, non-pharmacological interventions have gradually garnered widespread attention. The "Chinese Guidelines for Non-Pharmacological Prevention of Cognitive Impairment in the Elderly" explicitly state that regular physical exercise, cognitive training, and other functional exercises are core non-pharmacological means for AD prevention and intervention (Grade A recommendation, Level 2a evidence) [4]. Due to their advantages of being easy to operate, safe, effective, and free from adverse reactions, they have become an important component of comprehensive management for AD patients. Functional exercise nursing interventions, through targeted physical exercises, cognitive training, and daily living skills training, can improve patients' physical function, delay cognitive decline, enhance quality of life, and simultaneously alleviate the burden on caregivers [5]. Therefore, it is necessary to study the research progress in functional exercise nursing interventions for elderly AD patients.

2. Main types and implementation methods

2.1. Physical function exercise

The core objective of physical function exercise is to maintain the physical activity capabilities of elderly AD patients, prevent complications such as muscle atrophy, joint stiffness, and pressure sores, improve balance and gait, and reduce the risk of falls. The implementation methods should be carried out in different grades according to the physical functional status of the patients:

For mild AD patients with largely normal physical function, moderate-intensity aerobic exercises combined with muscle strength training are recommended. Research by Han Conglin and others indicates that individuals aged 65 and above should engage in at least 150 minutes of moderate-intensity aerobic exercise or 75 minutes of vigorous-intensity aerobic exercise per week, with each session lasting over 10 minutes, and perform strength training for major muscle groups at least two days a week [6]. Active exercises such as walking, Tai Chi, square dancing, and dumbbell exercises can be conducted. Walking is the simplest and most feasible form of exercise; adhering to 30-60 minutes daily at a comfortable pace for the patient can effectively improve cardiopulmonary function, promote blood circulation, and delay physical function decline. Tai Chi, with its gentle movements and slow rhythm, emphasizes the coordination of breath and movements, improving patients' balance and physical flexibility while alleviating negative emotions such as anxiety and depression. Studies have shown that engaging in Tai Chi exercises three times a week for 60 minutes each session over 12 weeks can significantly improve gait stability and balance in mild AD patients [7]. Square dancing, combining music and dance, can stimulate patients' interest and improve exercise adherence while enhancing physical coordination and endurance, making it suitable for mild AD patients.

Guo Yuhong points out that moderate to severe AD patients experience a significant decline in physical function, often accompanied by symptoms such as balance disorders and limb stiffness, necessitating passive and assisted exercises under the assistance of nursing staff or caregivers [8]. Passive exercises mainly include joint flexion and extension and muscle massages, conducted 2–3 times daily for 15–20 minutes each session, focusing on massaging the muscles and joints of the limbs to prevent muscle atrophy and joint stiffness. Assisted exercises include walking with support, leg lifts in a seated position, and grip strength training, with nursing staff or caregivers providing full accompaniment to ensure patient safety and prevent accidents such as falls.

2.2. Cognitive function exercise

Cognitive decline is a core symptom of AD patients, primarily manifesting as a decline in memory, attention, language ability, and thinking ability [9]. Cognitive function exercises can stimulate the activity of brain nerve cells, delay cognitive decline, and maintain patients' cognitive levels. Implementation methods should be tailored to the patient's cognitive function status, emphasizing fun and practicality while avoiding overly complex training content.

Research indicates that strictly memory-based training interventions are more effective than interventions targeting multiple cognitive domains in improving cognitive abilities in elderly individuals with cognitive impairment [10]. Memory training mainly includes short-term memory training, long-term memory training, and episodic memory training [11]. Short-term memory training can be conducted through methods such as digit memory, word memory, and picture memory. Long-term memory training can be carried out by recalling past events, browsing old photographs, and narrating personal experiences to stimulate patients' remote memory.

Attention and thinking ability training can be conducted through activities such as jigsaw puzzles, chess, calligraphy, and painting [12]. Jigsaw puzzles and chess can exercise patients' attention and logical thinking abilities; choose puzzles and chess pieces of moderate difficulty and guide patients to complete them under the guidance of nursing staff, gradually increasing the difficulty. Calligraphy and painting can cultivate patients' concentration while exercising fine hand movements and alleviating cognitive decline. Studies have shown that engaging in calligraphy or painting training 2–3 times a week for 8 weeks can significantly improve attention and thinking abilities in AD patients [13]. Language ability training primarily targets AD patients with language impairments, exercising their language expression and comprehension abilities through methods such as reading aloud, conversation, and picture description.

2.3. Daily living skills exercise

A decline in daily living skills is one of the primary manifestations of elderly AD patients and an important factor affecting their quality of life. The goal of daily living skills exercise is to help patients maintain basic self-care abilities and reduce dependence on others.

Dressing training should be tailored to the patient's condition; mild AD patients can be allowed to choose their own clothes and dress independently, with nursing staff providing guidance and assistance only when necessary; moderate to severe AD patients require nursing staff to assist in preparing clothes and guide them through dressing actions. Eating training should focus on dietary safety and nutritional balance; mild AD patients can eat independently, with nursing staff guiding them on proper utensil use and chewing slowly; moderate to severe AD patients may experience difficulties eating and choking, requiring nursing staff to assist in feeding and choose easily swallowable and digestible foods to prevent choking and aspiration. Grooming and toilet training should be conducted under the guidance of nursing staff, enabling patients to master the basic steps of grooming and toileting and gradually improving their daily living self-care abilities.

3. Influencing factors

3.1. Patient-related factors

Patient-related factors are the core determinants influencing the effectiveness of functional exercise nursing interventions. The severity of the condition directly affects the patient's exercise capacity and intervention outcomes.

Patients with mild AD, who possess relatively intact cognitive and physical functions, can actively participate in exercises, leading to significant intervention effects [14]. Conversely, patients with moderate to severe AD experience severe cognitive decline and physical impairments, making it difficult for them to cooperate with exercises and resulting in relatively poor intervention outcomes. As age increases, patients' physical functions deteriorate, with more pronounced declines in physical activity and cognitive abilities, increasing the difficulty of exercises and affecting intervention outcomes. Gender also plays a role, with female AD patients demonstrating higher exercise compliance and better intervention outcomes compared to males. Additionally, patients' physical conditions, such as the presence of comorbidities like hypertension, diabetes, and osteoporosis, can influence the implementation and effectiveness of exercises. Patients with comorbidities face increased exercise challenges and require tailored exercises under medical guidance. Exercise compliance is a key factor affecting intervention outcomes; AD patients may forget or refuse to exercise due to cognitive decline, leading to suboptimal intervention effects [15].

3.2. Caregiver factors

Caregivers are the primary implementers of functional exercise nursing interventions for elderly AD patients, and their caregiving abilities, cognitive levels, and participation enthusiasm directly influence intervention outcomes. Insufficient caregiving abilities hinder caregivers from providing scientific exercise guidance, preventing the effective implementation of intervention plans. Low cognitive levels among caregivers regarding AD may lead them to believe that functional exercises are ineffective in improving patients' conditions, reducing their participation enthusiasm and even resulting in refusal to cooperate with functional exercises. Furthermore, caregivers' psychological states also affect intervention outcomes. Long-term caregiving for AD patients can induce adverse emotions such as anxiety, depression, and fatigue in caregivers, leading to a decline in caregiving quality and affecting the implementation of functional exercises [16].

3.3. Environmental factors

Environmental factors, encompassing both home and hospital environments, can enhance patients' exercise compliance and strengthen intervention outcomes [17]. A clean, spacious, and safe home environment provides patients with a suitable space for exercises, while the availability of necessary exercise equipment, such as walkers, dumbbells, and puzzles, facilitates exercise participation. In hospital settings, a well-organized ward layout, complete facilities, designated exercise areas, and the presence of professional nursing staff and rehabilitation therapists offer patients scientific exercise guidance and safety assurance. Additionally, the social environment influences intervention outcomes. Insufficient societal attention to AD patients and a lack of professional caregiving institutions and rehabilitation resources can limit the implementation of functional exercise nursing interventions.

4. Intervention outcomes

4.1. Improvement in cognitive function

Cognitive decline is a core symptom of AD patients. Functional exercise nursing interventions can stimulate brain neuronal activity, promote neurotransmitter secretion, and delay cognitive decline [18]. Research by Fu Xiaoxiao and others demonstrates that a 12-week multi-sensory stimulation training program based on cognitive remodeling for mild AD patients, including memory training, concentration training, and arithmetic and logical thinking ability training, significantly improves patients' MMSE and WGOQOL-BREF scores, effectively reducing psychiatric

symptoms and agitation levels while enhancing cognitive function and quality of life [19]. Another study shows that combining physical and cognitive exercises significantly enhances cognitive levels and self-care abilities in patients with moderate to severe AD [20]. Furthermore, novel cognitive exercise methods such as digital nostalgia therapy and virtual reality training can further improve intervention outcomes by activating the brain's default mode network and delaying hippocampal atrophy.

4.2. Improvement in physical function

Physical dysfunction is a common complication in elderly AD patients. Functional exercise nursing interventions can effectively maintain patients' physical activity capabilities, prevent muscle atrophy and joint stiffness, and improve balance and gait. An 8-week program of passive and assisted exercises for patients with moderate to severe AD significantly expands their range of physical motion, enhances muscle strength, and alleviates joint stiffness. Practicing Tai Chi three times a week for 12 weeks significantly improves balance and gait stability in mild AD patients, reducing the risk of falls. Additionally, 150 minutes of aerobic exercise per week can elevate brain-derived neurotrophic factor (BDNF) levels, further improving physical and cognitive functions [21].

4.3. Enhancement of daily living abilities

A decline in daily living abilities significantly impacts the quality of life of elderly AD patients. Functional exercise nursing interventions, through targeted daily living skills training, can help patients maintain basic self-care abilities and reduce dependence on others [22]. Research indicates that a 6-month daily living skills training program for AD patients, including dressing, eating, grooming, and toileting, significantly improves their ADL scores and self-care abilities [23]. After systematic daily living skills training, patients with moderate to severe AD can complete basic life activities with the assistance of nursing staff or caregivers, alleviating the burden on caregivers. Moreover, integrating eating into thought-stimulating scenarios, such as guiding plate arrangement under the pretext of "preparing a snack break", can enhance eating interest through "food associations", further improving patients' daily living abilities.

4.4. Alleviation of adverse emotions and improvement in quality of life

Elderly AD patients are prone to adverse emotions such as anxiety, depression, and loneliness due to cognitive decline and physical impairments, affecting their quality of life [24]. Functional exercise nursing interventions can alleviate these adverse emotions and improve quality of life through physical activity and social interaction. For example, collective exercise methods like square dancing and group walks increase patients' social opportunities, reduce loneliness, and alleviate anxiety and depression. Exercise methods such as calligraphy and painting provide patients with a sense of accomplishment, boosting their confidence and improving their psychological state. Furthermore, functional exercises can reduce the burden on caregivers, with a significant decrease in the Zarit Burden Interview (ZBI) scores, further enhancing patients' caregiving quality and quality of life.

5. Conclusion

Elderly Alzheimer's Disease is a degenerative condition that severely threatens the physical and mental health of the elderly. Functional exercise nursing interventions, as a core non-pharmacological approach, can effectively delay cognitive decline, improve physical function, enhance daily living abilities, alleviate adverse emotions, and

reduce the caregiving burden on families and society. In the future, it is essential to further strengthen related research, develop standardized intervention guidelines, innovate intervention methods, enhance caregiver training, increase investment in rehabilitation resources, and continuously improve the functional exercise nursing intervention system to achieve standardized, individualized, and scientific interventions.

Disclosure statement

The authors declare no conflict of interest.

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