



Effects of Multi-Sensory Stimulation on Apathy Symptoms in Elderly Patients with Alzheimer's Disease

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Abstract

Background: We aimed to explore the effect of multi-sensory stimulation on apathy symptoms in elderly patients with Alzheimer's disease (AD).

Methods: Eighty elderly patients with AD admitted to the Third Affiliated Hospital of Qiqihar Medical University, China from January 2022 to February 2023 were selected as the research objects by convenient sampling method. According to the random number table, they were divided into intervention group and control group, with 40 cases in each group. The control group was given routine nursing, while the intervention group was given multi-sensory stimulation based on this nursing. Apathy evaluation scale (AES), Behavioral pathology in Alzheimer's disease rating scale (BEHAVE-AD) and Quality of Life Scale for dementia patients (QoL-AD) were used to compare the results.

Results: Compared with the control group, the scores of AES and BEHAVE-AD in intervention group were lower (t was -7.312 and 11.88 respectively, $P < 0.05$), and the scores of QoL-AD in intervention group were significantly higher than those in control group were (t was -15.311, $P < 0.01$).

Conclusion: Multi-sensory stimulation can relieve apathy symptoms, mental and behavioral symptoms and improve the quality of life of elderly patients with AD, which is worth popularizing in clinical practice.

Keywords: Multi-sensory stimulation; Elderly; Alzheimer's disease; Apathy; Mental behavior; Quality of life

Introduction

As a kind of dementia, Alzheimer's disease (AD) is mainly caused by brain injury, which is charac-

terized by cognitive impairment (1). There were about 50 million dementia patients in the world



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in 2018, with 7.7 million new cases every year (2). It is estimated that by 2050, it will be more than triple to 1.52 billion, and most of them are the elderly (3). Abnormal mental behavior is an important factor leading to the deterioration of AD patients, and the risk of occurrence is as high as 83% (3).

Abnormal mental behaviors of AD patients include agitation behavior, delusion, hallucination, apathy symptoms and sleep disorder, among which apathy symptoms is the most persistent and common, and its incidence rate can reach 19% ~ 88%, with an average of 49% (4). Apathy symptoms will aggravate cognitive dysfunction, accelerate the process of dementia and affect the prognosis of patients (5).

Multi-sensory stimulation (MSS) mostly uses light, real touch, music meditation and aromatherapy to provide patients with visual, auditory, tactile and olfactory sensory stimulation. Most of them are used in senile dementia, neurodevelopmental disorders and other fields (6,7). The dementia-related guidelines issued by the National Institute of Health (NICE-SCIE) (8) recommend the application of sensory stimulation to dementia patients to reduce their neuropsychiatric symptoms. A recent meta-analysis (9) shows that MSS can effectively reduce agitation behavior and improve cognitive status of dementia patients.

We aimed to explore the application results of MSS on apathy symptoms of elderly AD patients.

Methods

Research objects

Eighty elderly patients with AD were selected as research objects. They were admitted into the Neurology Ward of the Third Affiliated Hospital of Qiqihar Medical University, Qiqihar, China from January 2022 to February 2023, including 43 males and 37 females. The age was (75.28 ± 5.712) years old.

Inclusion criteria: age ≥ 65 years old; has basic language communication skills; meet the diagnostic criteria of AD in Chinese Classification and Diagnostic Criteria of Mental Disorders-3rd Edi-

tion (CCMD-3). Exclusion criteria: complicated with severe multiple organ dysfunction; complicated with mental disorders, lack of self-awareness; inability to participate in listening and speaking activities independently.

According to the random number table, 80 patients were randomly divided into intervention group and control group, with 40 cases in each group. There were no significant differences in gender, age, educational level, course of disease, marital status, live alone, comorbidities and clinical dementia between the two groups, with comparability (Table 1).

This study met the requirements of Helsinki Declaration, and all subjects had informed consent and signed informed consent forms.

Methods

Construction of intervention group: there were 1 physician with psychological background, 3 head nurses and nurses in charge of neurology department, 1 attending physician and 2 nursing postgraduates. Psychologists and head nurses were responsible for formulating multiple sensory stimulation intervention programs, carrying out training and supervision to ensure the intervention effect; the nurse in charge was responsible for the simultaneous implementation of the intervention plan; the attending physician was responsible for the adjustment of patient treatment plan and risk control, while the graduate student was responsible for coordinating communication and data collection.

Intervention methods

The patients in control group received regular rehabilitation training for dementia, and the training contents were determined by rehabilitation experts according to specific conditions, including life skills training (teaching patients to master basic skills such as brushing teeth, washing face, making beds and dressing), memory training (improving memory, teaching patients to remember a group of numbers, etc.), intelligence training (training patients' reasoning ability through intelligence-related games such as chess, poker and digital memory), language training (reading news-

papers or reading with patients, requiring patients to pronounce paragraphs as fluently as possible, etc.); twice a day for 2 h each time for 12 weeks.

Table 1: Comparison of general data of Senile Alzheimer's disease patients between the two groups

<i>Item</i>	<i>Control group N (%)</i>	<i>Intervention group N (%)</i>	<i>χ^2/t value</i>	<i>P value</i>
Gender (example)				
Male	22 (51.2)	21 (48.8)	0.05	0.823
Female	18 (48.6)	19 (51.4)		
Age (years old, $\bar{X} \pm s$)	74.18 \pm 5.144	76.38 \pm 6.096	-1.744	0.085
Education level (example)				
Primary school and below	17 (63.0)	10 (37.0)	7.501	0.058
Junior high school	8 (57.1)	6 (42.9)		
High school and technical secondary school	3 (20.0)	12 (80.0)		
University and above	12 (50.0)	12 (50.0)		
Course of disease (years, $\bar{X} \pm s$)	3.13 \pm 1.418	2.95 \pm 1.413	0.553	0.582
Marital status (example)				
Alive spouse	17 (60.7)	11 (39.3)	3.141	0.208
No spouse	13 (52.0)	12 (48.0)		
Death of spouse	10 (37.0)	17 (63.0)		
Live alone (example)				
Yes	20 (48.8)	21 (51.2)	0.050	0.823
No	20 (51.3)	19 (48.7)		
Complication				
Hypertension	19 (59.4)	13 (40.6)	2.147	0.342
Diabetes mellitus	7 (38.9)	11 (61.1)		
Others	14 (46.7)	16 (53.3)		
Clinical evaluation of dementia				
Mild	8 (32.0)	17 (68.0)	4.907	0.086
Moderate	20 (60.6)	13 (39.4)		
Severe	12 (54.5)	10 (45.5)		

The intervention group was given MSS intervention on the basis of the control group:

① Construction of multi-theme sensory room: After obtaining the consent of the department director, the natural environment and high-tech

products were adopted, including colored wall-paper, plants, miniature water column, flower beds, spotlights, small ponds, vibrating water-beds, magic mirror balls, small round mirrors, dynamic color wheels, aromatic devices, computers and screen projectors, etc., so as to create four theme areas: sea, sky, orchard and animal world.

② Establishment of MSS detachments: According to four theme spaces, patients were divided into four detachments with 10 patients in each detachment. The nurse in charge and the patients draw up a timetable in advance, determine a fixed time according to the time plan, and enter the room by the patients themselves or accompanied by their families. First of all, the patient independently contacted and freely controlled the device, controlled various scene changes, or was guided and helped by the caregiver to relax and guide his visual, auditory, olfactory and tactile stimulation;

③ Group activities: The intervention group suggested that group members participate in group activities or small games to strengthen communication among members and improve interpersonal relationships. Intervention was conducted twice a week for 1 h each time for 12 weeks.

Observation indicators

The required indicators were collected before and after the intervention. 1) Apathy symptoms symptom: Apathy evaluation scale (AES) was developed by Marin et al., including cognitive, behavioral, emotional and other dimensions, with 18 items in total (10). Likert grade 4 was used, and the total score was 18 ~ 72. The higher the score was, the more severe the apathy symptoms were, which has been applied in AD patients. Cronbach's α coefficient was 0.967, test-retest reliability was 0.906, which could be adopted. 2) Psychiatric symptoms: Behavioral pathology in Alzheimer's disease rating scale (11) (BEHAVE-AD), which included 25 items altogether, and adopted Likert 5 grade scoring method, the high-

er the score was, the more serious the mental and behavioral symptoms were. Cronbach's α coefficient was 0.7703, ICC value was 0.960 and retest consistency coefficient r was 0.961. 3) Quality of life: Quality of life - Alzheimer's disease (12) (QoL-AD) was developed by Logsdon in 1999, and localized by Chinese scholar Zhang Huimin in 2013, the scale included 13 items and adopted Likert grade 4 score, the total score was 13 ~ 54, Cronbach's α coefficient was 0.869, with good reliability and validity, which could be adopted.

Data collection methods

AES, BEHAVE-AD and QoL-AD scales were distributed after the patients were enrolled and the intervention was completed, which were distributed uniformly by two nursing postgraduates after training, and filled out by patients themselves or by researchers. The final questionnaires were all valid.

Statistical method

Data were analyzed by IBM SPSS 25.0 software (IBM Corp., Armonk, NY, USA). When the distribution was normal, the measurement data were expressed by mean \pm standard deviation ($\bar{x} \pm s$), and the comparison between groups was conducted by t -test. The counting data were described by frequency and percentage (%), and the comparison between groups was performed by χ^2 test. The test level was $\alpha = 0.05$, and the difference was statistically significant with $P < 0.05$.

Results

The comparison of apathy symptoms of aged AD patients before and after intervention

There was no difference between the two groups at baseline. After intervention, the AES scores of both groups decreased, and the level of apathy symptoms in the intervention group was lower, with statistical significance ($P < 0.05$) (Table 2).

Table 2: Comparison of apathy symptoms in elderly AD patients before and after intervention

Group	Number of cases	Total AES score	Cognitive-behavioral factor	Social apathy symptoms factor
Before intervention				
Intervention group	40	55.73±7.507	47.3±7.394	8.43±1.448
Control group	40	52.95±7.324	44.45±7.121	8.5±1.649
<i>t</i> value		1.673	1.756	-0.216
<i>P</i> value		0.098	0.083	0.829
After intervention				
Intervention group	40	35.58±6.23	30.73±5.966	4.85±2.007
Control group	40	46.8±7.446	40.15±7.022	6.65±1.424
<i>t</i> value		-7.312	-6.469	-4.626
<i>P</i> value		0.000	0.000	0.000

Mental and behavioral symptoms of aged AD patients before and after intervention

There was no significant difference in the scores of mental and behavioral symptoms between the two groups. After the intervention, the BEHAVE-AD scores of both groups decreased, and

the levels of paranoia and delusion, hallucination, behavior disorder, aggressive behavior, day and night rhythm disorder, emotional disorder, anxiety and fear in the intervention group were lower ($P < 0.05$) (Table 3).

Table 3: Comparison of mental and behavioral symptoms of elderly AD patients before and after intervention

Group	Number of cases	Paranoia and delusion	Hallucination	Behavior disorder	Aggressive behavior	Disturbance of day and night rhythm	Affective disorder	Anxiety and fear	Total score
Before intervention									
Intervention group	40	14.13±4.48	7.33±3.354	6.28±1.921	6.88±2.151	1.9±1.008	3.13±1.202	7.65±1.703	47.28±6.263
Control group	40	14.88±5.761	7.55±3.508	6.73±2.47	6.43±2.62	1.23±1.187	2.93±1.575	8.05±2.782	47.78±7.553
<i>t</i> value		-0.65	-0.293	-0.909	0.84	2.741	0.638	-0.776	-0.322
<i>P</i> value		0.518	0.77	0.366	0.404	0.008	0.525	0.44	0.748
After intervention									
Intervention group	40	9.25±3.726	4.93±2.712	2.28±1.301	3.1±1.15	0.98±0.832	0.75±0.439	3.8±2.323	25.5±5.388
Control group	40	11.78±4.029	7.45±3.351	4.88±2.323	6.35±2.19	1.63±1.03	2.6±1.277	7.05±2.195	41.73±6.752
<i>t</i> value		2.91	3.705	6.177	8.308	3.105	8.666	6.432	11.88
<i>P</i> value		0.005	0.000	0.000	0.000	0.003	0.000	0.000	0.000

Comparison of quality of life of aged AD patients before and after intervention

There was no significant difference in quality of life scores between the two groups ($P > 0.05$). After intervention, QoL-AD scores of both groups increased, and the level of physical health,

behavioral compliance, mental and psychological state, living environment and social relations, and life satisfaction in the intervention group were higher, with statistical significance ($P < 0.05$) (Table 4).

Table 4: Comparison of quality of life of elderly AD patients before and after intervention

Group	Number of cases	Physical health and behavioral compliance	Mental and psychological state	Living environment and social relations	Life satisfaction	Total score
Before intervention						
Intervention group	40	4.75±1.149	9.3±1.454	9.2±1.224	2.45±1.616	25.7±2.803
Control group	40	4.78±1.625	8.98±1.209	9.15±1.578	2.05±1.431	24.95±3.129
<i>t</i> value		-0.079	1.087	0.158	1.172	1.129
<i>P</i> value		0.937	0.28	0.875	0.245	0.262
After intervention						
Intervention group	40	7.85±1.942	12.23±1.25	14.05±1.694	2.95±1.467	37.08±2.786
Control group	40	5.95±1.501	9.28±1.377	10.1±1.533	2.05±1.377	27.38±2.88
<i>t</i> value		-4.895	-10.03	-10.936	-2.83	-15.311
<i>P</i> value		0.000	0.000	0.000	0.006	0.000

Discussion

Apathy symptoms often occurs in the early stage of dementia and runs through the whole course of dementia, which can lead to a variety of adverse outcomes (13), such as hypofunction, prolonged course of disease, decreased cognitive function and increased mortality (14-17). 32.1% ~ 93.2% of AD patients had apathy symptoms (18), and a Meta-analysis in China found that the incidence rate was 19% ~ 88% (19). However, due to the overlap between apathy symptoms and depressive symptoms (20), it is often misdiagnosed or ignored. Early identification and timely targeted intervention are of great significance to improve the prognosis of AD patients. MSS can provide visual, auditory, olfactory and tactile stimulation for patients by creating a multi-

sensory stimulation environment, and assist patients in functional exercise. It has been proved that MSS has intervention effect on behavior, emotion and cognition of dementia patients.

This study found that after multi-sensory stimulation, the level of apathy symptoms in the intervention group was lower, and the difference was statistically significant ($P < 0.05$), suggesting that MSS could effectively relieve apathy symptoms in elderly AD patients, which is consistent with the results of other studies (21, 22). Patients with AD who lack environmental stimulation are more prone to depression (7), and their sensory perception decreases with age, which is an important sign of "deterioration" or "progress" of the disease (23, 24). MSS is an intervention that adjusts the amount and intensity of stimulation and can be applied to dementia patients without strict requirements on the severity of their symptoms. It

can make use of patients' own physical advantages, make up for their sensory defects, adjust insufficiency and improve the prognosis of patients. Cruz et al. (25) found that multisensory therapy can increase the frequency and duration of patients smiling and looking directly at caregivers. In addition, MSSE intervention also encourages patients to speak actively, encourages patients to get along better with others (26), reduces patients' social interaction withdrawal behavior, and helps elderly AD patients to relieve apathy symptoms (27).

In addition, we found that after multi-sensory stimulation, the level of mental and behavioral symptoms in the intervention group was lower, and the difference was statistically significant ($P < 0.05$), suggesting that MSS can effectively alleviate the mental and behavioral symptoms of elderly AD patients, which is consistent with others (28, 29). The reason might be that MSSE can provide relaxing aroma, real touch, lighting effect and meditation music, stimulate patients' sense organs such as smell, touch, vision, hearing and taste, effectively promote patients' limbic system to recover and activate brain nerve cells, and improve their neuropsychiatric symptoms (30).

In addition, we confirmed that multi-sensory stimulation could improve the quality of life of elderly AD patients (31), and the difference is statistically significant ($P < 0.05$). Multi-sensory training can effectively stimulate patients' collective perception, relax patients' body and mind, improve negative emotions to a certain extent, promote patients' rehabilitation, make them face diseases and life with an optimistic attitude, and reduce patients' behaviors such as excitement, aggression, irritability, distraction and out-of-control words and deeds, so as to effectively improve their mental and behavioral symptoms, promote their disease rehabilitation, and further improve their quality of life.

Conclusion

Multi-sensory stimulation therapy can be applied to elderly patients with AD, which can effectively

relieve apathy symptoms, paranoia, delusion, behavioral disorder, aggressive behavior and other mental and behavioral symptoms of elderly patients with AD, and improve the quality of life of patients, which is worthy of clinical promotion.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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