

Impact of Action Observation Therapy along with Usual Physiotherapy Intervention of Individual with Alzheimer's Disease

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Abstract

Alzheimer's disease (AD) is a neurodegenerative disorder characterized by cognitive impairments in the initial stage, which lead to severe cognitive dysfunction in the later stage. Action observation therapy (AOT) is a multisensory cognitive rehabilitation technique where the patient initially observes the actions and then tries to perform. The study aimed to examine the impact of AOT along with usual physiotherapy interventions to reduce depression, improve cognition and balance of a patient with AD. A 67 years old patient with AD was selected for this study because the patient has been suffering from depression, dementia, and physical dysfunction along with some other health conditions like diabetes and hypertension. Before starting intervention, a baseline assessment was done through the Beck Depression Inventory (BDI) tool, the Mini-Cog Scale, and the Berg Balance Scale (BBS). The patient received 12 sessions of AOT along with usual physiotherapy interventions thrice a week for four weeks, which included 45 minutes of each session. After four weeks of intervention, the patient demonstrated significant improvement in depression, cognition, and balance, whereas the BDI score declined from moderate 21/63 to mild 15/63 level of depression. The Mini-Cog score improved from 2/5 to 4/5, and the BBS score increased from 18/56 to 37/56. It is concluded that AOT along with usual physiotherapy intervention helps to reduce depression, improve cognition and balance of people with AD.

Keywords

Alzheimer's Disease, Action Observation Therapy, Physiotherapy Intervention

1. Introduction

Alzheimer's disease (AD) is characterized by cognitive decline, emotional problems, sleep disorders, behavior changes, severe physical disabilities, multi-organ failure, and brain death [1]. Decline in memory, decision-making, language, planning, problem solving, and other cognitive skills are features of AD [2]. In Bangladesh, the prevalence rate is more than 3% – 11% with definite rates [3]. More than five million people in the United States and about fifty million people globally are suffering from AD [4]. It is estimated that the number will be two times higher in 2050 [5]. AD may progress through three stages. In early-stage or mild AD, patients may function independently, but some memory loss is found. In middle-stage or moderate AD, there is increased memory loss, which may include personality changes and physical problems. The patient depends on the caregiver because of their decreased ability to communicate and increased physical impairment in severe AD or late-stage [6].

People with AD have to face huge burdens and challenges that require multi-dimensional services. They require medical attention, community facilities, physiotherapy, and psychological support. Currently, no disease-modifying intervention is established despite a huge amount of expenditure [7]. There is growing attention to finding the link between cognition and physical activity [8]. Physical exercises are beneficial for reducing or slowing down the process of dementia and improving the behavioral function and cognition of people with dementia-like symptoms [9].

Action Observation Therapy (AOT) is a multisensory cognitive rehabilitation technique that involves the observation of purposeful activities with the intention of imitating and then performing the same activities by patients [10]. There are two phases of AOT, one is the observation phase, in which the patient is asked to observe carefully the given motor task, or video clip, and another one the execution phase, which involves performing the observed motor task according to the patient's ability [11]. There is no definite rule for performing the motor task, but typically, an AOT rehabilitation session needs 30 minutes [12]. AOT combined with exercise training programs is an effective intervention to improve cognition and balance in the elderly with AD [13]. This study helps to give a primary idea regarding the effect of AOT combined with physiotherapy intervention on patients with AD. The study's findings help to broaden professionals' knowledge and reduce the practice gap. So, the study aimed to examine the effects of AOT along with usual physiotherapy interventions to reduce depression, improve cognition and balance of a patient with AD.

2. Methodology

2.1. Case Presentation

Mr. "X" 67 years old, was a retired bank officer suffering from memory loss and depression for the last two years. After consulting with a neurologist, he was diagnosed as a case of Alzheimer's disease with suffering from hypertension and diabetes for more than 10 years. Gradually, his condition was worsening than before. He couldn't walk independently due to a balance problem and became less communicative with the family members. His wife was very supportive regarding health care issues. After consulting, the doctor advised him for physiotherapy treatment regarding his present condition. His wife only took care of him because their two sons were living abroad. Day by day, he became depressed and did not want to talk to anyone. His wife was trying to motivate and brought him to the hospital for physiotherapy intervention three days a week. He had a history of falling several times. Previously, he was dependent on oral medication to control diabetes. Now he is taking insulin to control diabetes. He is also taking antihypertensive and some other medications. He never consulted with a physiotherapist before for his condition.

2.2. Measurement Tools

The Beck Depression Inventory (BDI) is a valid and reliable self-report rating tool to assess depression which consists of 21 items. Each item has a 4 point scale from 0 to 3, where 0 indicates the lowest score and 3 indicates the highest score, and a score > 10 is minimal depression, whereas a score >20 indicates clinical depression [14].

The Mini-Cog scale is used to measure the cognitive function of patients with dementia. It has two components, and the total score varies from 0 to 5. A score of 0 – 2 indicates positive dementia, and a score of 3 - 5 indicates negative dementia screening [15]. The Berg Balance Scale (BBS) is a reliable and valid scale for assessing balance in older adults. It has a 14-item list consisting of a five-point ordinal scale ranging from 0 to 4. A score of 56 indicates functional balance, and a score of < 45 indicates a higher risk of falling [16].

2.3. Physical Examination

Physical examination revealed that patient was oriented to time, place, and person, but his verbal response was poor while asking for perception of general health. In half lying, the radial pulse rate was 72 bpm, the respiratory rate was 17 bpm, and the resting blood pressure was 110/70 mm of Hg. Passive and active range of motion (ROM) of all extremities was within normal limits. The initial BDI score was 21/63, which indicates that he has a moderate level of depression, and the Mini-Cog score was 2/5, which indicates positive dementia. The BBS score was 18/56 at the initial assessment, which indicates a high risk of falling and is dependent on mobility. All transitional movements and activities of daily

living (ADL) needed moderate assistance. He had muscle weakness, kyphotic posture, and poor balance. As he couldn't walk, he used a wheel chair for ambulation. MRI revealed cortical atrophy, and cerebrospinal fluid (CSF) analysis showed low beta-amyloid 42 and elevated tau.

2.4. Diagnosis and Goal of Intervention

Based on the history and physical examination, the ICD-10 code G30.9 (Alzheimer's disease with dementia) was chosen for the physiotherapy diagnosis. The goals of physical therapy were to reduce depression, improve cognitive function and balance, reduce the risk of falling, and improve ADLs.

2.5. Intervention

AOT along with usual physiotherapy interventions, were designed according to the patient's clinical features, practitioner clinical experience, and supportive literature. Initially, the therapist motivated the patient regarding the exercise and then demonstrated the actions. Firstly, the patient observed actions and then tried to perform (Table 1).

Table 1. Intervention protocol in FITT analysis.

Types of Intervention	Frequency	Intensity	Time
Action observation therapy (AOT):			
1. Balance exercise: Demonstrate one leg standing and patient will perform it.		3 to 4 motor tasks in each session	
2. Balance training: Demonstrate walking on a straight line, toes and heel walking, and ball throwing at different angles and patient will perform it.	Patient should perform exercises three days a week	with 12 minutes of observation, 8 minutes of execution and a few minutes for motivate the patient.	30 minutes for each session for four weeks. Plata-Bello, [12]
3. Gait training: Demonstrate normal walking by a healthy individual and patient will perform it.			
Usual Physiotherapy Intervention:			
1. Stretching of lower back and major muscles of lower limb (Quadriceps, Hamstrings and calf muscles).	2 repetitions with 30 – 40 seconds hold of each exercises	2 sets in each stretching	Three days a week for four weeks Rojasavastera <i>et al.</i> [13]
2. Progressive resisted strengthening exercises of major muscles group (step-ups, heel raises, sit-to-stand movements, standing hip abduction exercises, and extension and rotation exercises).	8 – 12 repetitions for each set	3 to 4 motor tasks in each session with 12 minutes of observation, 8 minutes of execution and a few minutes for motivation.	Three days a week for four weeks Rojasavastera <i>et al.</i> [13]

Here are some pictures showing the AOT of balance and gait training exercises. **Figure 1** shows one leg standing practice by the therapist, which was observed by the patient. Then the patient was trying to perform one leg standing accordingly. The therapist was practicing ball throwing, which was observed by the patient. Then the patient was trying to perform ball throwing accordingly (**Figure 2**).



Figure 1. Patient is observing and performing one leg standing.



Figure 2. Patient is observing and performing ball throwing.

3. Results

AOT combined with physiotherapy included 14 interventions of 45 minutes each, provided three times a week for four weeks. After four weeks of intervention, the patient demonstrated significant clinically improvement in depression, cognition, and balance. The Mini-Cog score improved from 2/5 to 4/5 after four weeks intervention (**Table 2**). The BBS score increased from moderate (18/56) to mild (37/56) balance impairment (**Table 3**).

The BDI score declined from moderate (21/63) level of depression to Mild (15/63) mood disturbances (**Table 4**). Now, patient communicates better than previous, motivated and can walk without support.

Table 2. Comparison of Patient's Pre and Post-intervention Mini-Cog Scores.

Item	Description	Before intervention	After intervention
1	Recall three unrelated words	2/3	3/3
2	Clock Drawing Test (CDT)	0/2	1/2
	Total score	2/5	4/5

Table 3. Comparison of Patient's Pre- and Post-intervention BBS Scores.

Item	Description	Before Intervention	After Intervention	Differences
1	Sitting unsupported	4	4	0
2	Transfers	2	3	1
3	Sitting to standing	2	3	1
4	Standing to sitting	2	4	2
5	Standing unsupported	2	4	2
6	Standing with eyes closed	1	3	2
7	Standing with feet together	2	3	1
8	Standing with one foot in front	2	3	1
9	Standing on one foot	1	2	1
10	Placing alternate foot on stool	0	2	2
11	Turning to look behind	0	2	2
12	Turning 360 degrees	0	2	2
13	Reaching forward with outstretched arm	0	1	1
14	Retrieving object from floor	0	1	1
	Total/56	18	37	19

Table 4. Comparison of Patient's Pre-and Post-intervention BDI Scores.

Item	Description	Before Intervention	After Intervention	Differences
1	Sad feeling	2	1	1
2	Discourage about the future	2	2	0
3	Feel like a failure	1	0	1
4	Satisfaction with usual things	2	2	0
5	Guilty feeling	0	0	0
6	Feeling of being punished	0	0	0
7	Disappointed feeling	2	1	1
8	Blaming own self for fault	0	0	0
9	Thoughts of killing own self	0	0	0
10	Episode of Crying	0	0	0
11	Feeling of irritation	2	2	0
12	Interest to other people	2	2	0
13	Decision making ability	3	2	1
14	Feeling of unattractive looking	0	0	0
15	Need of extra effort at doing something	2	2	0
16	Sleep and wake up pattern	2	1	1
17	Tiredness feeling	1	0	1
18	Appetite	0	0	0
19	Loss body weight	0	0	0
20	Worried about physical condition	0	0	0
21	Interest in sex	0	0	0
	Total/63	21	15	6

4. Discussion

This study aimed to assess the AOT combined with physiotherapy intervention reduces depression and improves the cognition and balance of a patient with Alzheimer's disease. A study [13] showed that the AOT group had significant improvements in memory loss and balance compared to the control group. One systemic review [10] found that the efficacy of AOT combined with conventional physiotherapy helps to improve motor function recovery in individuals with neurological and orthopedic conditions. Reference [11] reported that AOT is an effective intervention that has been successfully applied in the rehabilitation of stroke or Parkinson's disease patients for improving motor function. Interestingly, this approach helps to improve motor functions in post-surgical orthopaedic patients.

Another systemic review suggested that AOT combined with motor imagery training is effective for improving cognitive functions and skills [17]. Reference [18] revealed that AOT is an effective and easy treatment to improve gait among patients with Cerebro Vascular Accident (CVA). AOT combined with a dual task had a significant role in improving cognitive function in Parkinson's disease [19]. Another systemic review [20] suggested that AOT is an effective intervention for improving arm and hand motor function, gait, and daily activity among stroke patients. AOT is an effective treatment for improving gait in Parkinson's disease, stroke, knee, and hip replacement approach [21]. This study revealed that AOT combined with physiotherapy intervention is effective for a patient with Alzheimer's disease. AOT has a greater impact on the people with AD. But there is a lack of evidence regarding the combined use of AOT and physiotherapy for AD. The intervention protocol for this patient was developed based on the existing evidence from the literature regarding the rehabilitation of Alzheimer's patients with depression and memory problems. Further research with a large sample is necessary to ascertain the effectiveness of AOT combined with physiotherapy interventions in patients with Alzheimer's disease. A long-term follow-up study is needed to find out the long-term effect of AOT with physiotherapy intervention.

5. Conclusion

AD is a slowly progressive brain disease that affects the control of thoughts, memory, and language, where action through observation is helpful for recalling memory, thoughts, problem solving and function. This case study identified the effects of AOT on patients with AD. It is concluded that AOT, along with physiotherapy, helps to reduce depression and improve cognitive function and balance in people with AD.

Ethical Approval

The patient agreed to participate in this observational case-report study. The patient's consent has been given for the photograph to be published; his face is

blocked out for anonymity.

Author contribution

All authors contributed to preparing the write up, revising the article, and giving final approval of the version to be published. The authors consent to accept responsibility for all contents of the tasks.

Conflicts of Interest

The authors have no conflicts of interest to report.

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