

Physiotherapy Rehabilitation for Dementia in Elderly Population

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Abstract: *Dementia can be broadly defined as depletion in cognitive performance which makes a person unable to meet multiple intellectual demands of daily life. Dementia is acquired, persistent impairment not by delirium in multiple areas of intellectual function. Some dementia types are progressive but others may be persistent or plateau. Sometimes in cases, the onset can be insidious, as is generally the case in AD, but in many cases, whether something develops after head trauma or stroke, the onset of dementia may be acute, particular. While most dementias are the result of changes in the brain structure, infections and metabolic causes can be treated with success. We are confronted with a diagnostic criterion as we delve into the area of dementia and the increasingly expanding area of dementia research.*

Keywords: Dementia, Physiotherapy, Old age

1. Introduction

The word dementia comes from the Latin *de* meaning “without” and *mens* meaning “mind”. Dementia is a significant loss of intellectual abilities such as memory capacity, severe enough to interfere with social or occupational functioning. It mainly affects memory, language, perception, behavior and cognitive skills such as judgment and abstract thinking. Dementia usually first appears as forgetfulness. But as the dementia progresses and become worse, symptoms are more obvious and interfere with the ability of individual to take care of themselves and ADL’s (Activity of Daily Living). Depression affect 20-30% of people who have dementia, and about 20% have anxiety.

The incidence of dementia increases with age, doubling every 5-10 year. Epidemiological studies in India suggest about one-third of prevalence of dementia and Alzheimer’s disease, as compared to the United States and other developed countries. Even with lower prevalence rate, AD and other aged related dementias would affect very large portion of the elderly population.

A recent survey is done by Harvard university school of public health and the Alzheimer’s Europe consortium revealed that the second leading health concern (after cancer) among adults is dementia. Prevalence of dementia increase with the age over the age of 65, its prevalence is 5-10% and at 85 it is 25-50%.

1.1 Types of Dementia

- *Cortical Dementia:* Where the brain damage primarily affects the brain’s cortex or outer layer. It tends to cause problems with memory, language, thinking and social behavior.
- *Sub cortical Dementia:* Part of the brain below the cortex is affected. It tends to cause changes in emotions and movement in addition to problems with memory.

- *Progressive Dementia:* It gets worse overtime, gradually interfering with more and more cognitive abilities.
- *Primary Dementia:* That does not result from any other disease e.g. Alzheimer’s disease, vascular dementia, lewy body dementia, HIV associated dementia.
- *Secondary Dementia:* That occur as a result of a physical disease or injury e.g. progressive supra nuclear palsy, Multiple Sclerosis, ALS (Amyotrophic Lateral Sclerosis) Dementia. [1, 2]

1.2 Risk Factors of Dementia

The following risk factors can increase a person’s chance of developing one or more kinds of dementia.

- *Age:* The risk goes up with advanced age.
- *Alcohol use:* Most studies suggest that drinking large amounts of alcohol increases the risk of dementia, while drinking a moderate amount may be protective.
- *Atherosclerosis:* The accumulation of fats and cholesterol in the lining of arteries, coupled with an inflammatory process that leads to a thickening of the vessel walls (known as atherosclerosis), can hinder blood from getting to the brain, which can lead to stroke or another brain injury. For example, high levels of low-density lipoprotein (LDL, or “bad” cholesterol) can raise the risk for vascular dementia.
- *Down syndrome:* Many people with Down syndrome develop early onset AD, with signs of dementia by the time they reach middle age.
- *Genetics:* One’s likelihood of developing a genetically linked form of dementia increases when more than one family member has the disorder. But in some cases, such as with CADASIL, having just one parent who carries a mutation increases the risk of inheriting the condition. In other instances, genetic mutations may underlie dementias in specific populations. For example, a mutation of the gene TREM2 has been found to be common among people with a form of very early onset frontal temporal dementia that runs in Turkish families [3-8]

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- *Hypertension*: High blood pressure has been linked to cognitive decline, stroke, and types of dementia that affect the white matter regions of the brain.
- *Mental illness*: Depression has been associated with mild mental impairment and cognitive function decline.
- *Smoking*: Smokers are prone to diseases that slow or stop blood from getting to the brain.

2. Diagnosis

Doctors first assess whether the individual has an underlying treatable condition such as depression, abnormal thyroid function, drug induced encephalopathy, normal pressure hydrocephalus, or vitamin B12 deficiency. Early diagnosis is important, as some causes for symptoms can be treated. In many cases, the specific type of dementia that a person has may not be confirmed until after the person has died and the brain is examined. An assessment generally includes:

Patient history: Typical questions about a person's medical and family history might include asking about whether dementia runs in the family, how and when symptoms began, and if the person is taking certain medications that might cause or exacerbate symptoms.

Physical exam: Measuring blood pressure and other vital signs may help physicians detect conditions that might cause or occur with dementia. Such conditions may be treatable.

Neurological evaluations: Assessing balance, sensory function, reflexes, vision, eye movements, and other functions helps identify signs of conditions that may affect the diagnosis or are treatable with drugs. Doctors also might use an electroencephalogram, a test that records patterns of electrical activity in the brain, to check for abnormal electrical brain activity.

Pout Reflex: Tap lip with tendon hammer a pout response is observed.

Glabella reflex: Patient cannot inhibit blinking in response to stimulation (tapping between the eyes).

Grasp reflex: Stroking palm of hand induces grasp.

Palmomental reflex: Quick scratch on palm of hand induces sudden contraction of mentalis muscle in face.⁴

The following procedures also may be used when diagnosing dementia:

Brain scans: The main findings in the MRI scan include diffuse cortical atrophy that is the most prominent in temporal and parietal lobe, in addition to enlarged ventricle, sulci and fissure due to overall atrophy of brain. Although the presence of atrophy in the temporal and parietal lobes is a helpful diagnostic clue, it is not present in early AD.

MRI Scan

Cognitive and neuropsychological tests: These tests measure memory, language skills, math skills, and other abilities related to mental functioning. For example, people with AD often show impairment in problem solving, memory, and the ability to perform once-automatic tasks.

Scales Used in Dementia:

MMSE (Mini- mental status examination) is a comprehensive scoring scale used for this assessment. MMSE is a 30-point questionnaire that provides a crude assessment of general cognitive function. A score of 24 or less is generally considered as abnormal. Based on the points scored on the MMSE scale, the clinician is able to precisely state the degree of cognitive decline.

Functional Assessment Staging Test (FAST): The FAST scale is a functional scale designed to evaluate patients at the more moderate-severe stages of dementia when the MMSE no longer can reflect changes in a meaningful clinical way. In the early stages the patient may be able to participate in the FAST administration but usually the information should be collected from a caregiver or, in the case of nursing home care, the nursing home staff. The FAST scale has seven stages:

- 1) Which is normal adult?
- 2) Which is normal older adult?
- 3) Which is early dementia?
- 4) Which is mild dementia?
- 5) Which is moderate dementia?
- 6) Which is moderately severe dementia?
- 7) Which is severe dementia?

Monteral Cognitive Assessment (MOCA): It was conceived as a fast screening method for moderate cognitive impairment. This tests different cognitive areas: focus and concentration, executive function, memory, vocabulary, visual construction skills, analytical thought, estimation, and orientation. The time needed to administer the MoCA is around 10 minutes. The total score possible is 30 points: a score of 26 or higher is considered average.

Cornell scales for depression in dementia: The scale rating should be based on symptoms and sign occurring during the week before interview.

Laboratory tests: There are several tests which help to rule out certain conditions. They involve calculating sodium and other electrolyte levels in the blood, a full blood count, a blood sugar test, urinalysis, vitamin B12 levels screening, cerebrospinal fluid analysis, drug and alcohol monitoring, and thyroid function analysis. Rapid plasma In patients living in areas known as endemic or high-risk for syphilis, recover (RPR) and fluorescent treponemal antibody (FTA)

Psychiatric evaluation: This will help determine if depression or another mental health condition is causing or contributing to a person's symptoms.⁵

Treatment Strategies Are: -

- Medical treatment
- Physiotherapy management
- Behavior modification technique
- Reality orientation therapy
- Environmental design
- Care and equality
- Psychological intervention

Medical treatment: Cholinergic stabilize cognitive decline for up to 3-6 months. neurotrophins, antioxidants, statins, non-steroidal anti-inflammatory drugs(NSAIDS) are also used for treatment.

Acetyl cholinesterase inhibitors: Acetyl cholinesterase inhibitors are used as symptomatic treatment of cognitive and behavioral manifestation in mild to moderate dementia of Alzheimer's type.

Aim of Physiotherapy

- To improve physical function (mobility, balance, coordination and strength).
- To reduce risk of falls - changes in judgment and spatial control contribute to tendency to fall. Exercises improve balance and reduce the fear of falling.
- To lift mood, ease stress and add calm – Exercises help to reduce the incidence of depression, agitation and aggression symptoms that are common with dementia patient
- To improve general cardiovascular health.
- To pass time in enjoyable way-provide a sense of accomplishment from the person with dementia.
- To improve sleep - sleep disorders are common in dementia patients. Exercise can help them get into normal sleep routine.

Recall strategies:

Mnemonics strategies: - mnemonics are learning technique that aid information retention. Useful mnemonics strategies include linking visual imagery, stories, poems or acronyms to information to be remembered. Preferably mnemonics are combined with other methods such as spaced retrieval/repeated presentation.

Cueing: -providing relevant cues at recall can aid retrieval and can be useful when teaching information particularly face name recall or number recall. Two type of cueing are vanishing cues and forward cues.

Chunking: -chunking information together into categories or small groups can be helpful when a person needs to remember lists or greater amount of information. Organizing information into small, relevant, simple chunk or categories means that there is less information to remember.

Method of Loci: - The item to be remembered in this mnemonic system are mentally associated with specific physical location.

Aerobic Exercises: aerobic training helps in improving cardiovascular health, strength the hormones immune system. As physical activity decreased beta-amyloid proteins leading to decreased amyloid plaque. Neural disruption, hence improving brain health. Aerobic exercise includes jogging, cycling, swimming or any physical activity that rejuvenate the patient's pulmonary and cardiac capacity. For maximum benefits 30 minutes session thrice a week is advised. Patients can start with 10-20 minutes sessions depending on fitness levels and can progress accordingly. Alternative exercise form such as dancing could be included in aerobic exercises. It is good for people who find standard

exercises and weight training boring. It can help dementia patient in reducing some of the mobility problems that arise due to other ailments.

Flexibility exercises for Musculoskeletal System: Exercises increases joint range of movement and muscle strength making daily tasks easier. It includes,

- 1) **Both active and passive ROM (Range of Movement) exercises:** Exercises should focus on strengthening the patient weak elongated extensor muscles while ranging the shortened tight flexors muscles. ROM exercise should be also emphasizing restoring range in the neck and trunk and can be performed in combination with rotational exercises to promote relaxation.
- 2) **PNF (Proprioceptive Neuromuscular Facilitation) Pattern:** Muscle inhibition techniques Hold Relax or Contract Relax. Contract Relax is the preferred technique because it combines autogenic inhibition from isometric contraction of the tight agonist muscles with active rotation of the limb. **Traditional Stretching Techniques:** Gentle stretching of elbow flexors, hip, knee flexors and ankle plantar flexors. Stretching can be combined with joint mobilization techniques to reduce tightness of the joint's capsule or of ligaments around a joint. • Auto stretching or Self-stretching. Maintain the stretch force at least 15 – 30 seconds. Ideally the stretches are repeated at least 3-5 times. Ballistic stretches (high intensity bounding stretches) and aggressive stretch should be avoided.
- 3) **Balance Training:** It is important in patients with dementia to improve confidence and reduce the risk of falling. As balance is position specific so both standing and sitting balance exercises are encouraged. Right movement and frequency of exercises are suggested by trained physical therapist. They help the patient in improving general body coordination and provide better sense of surrounding space and environment. The balance training always begins from lower COG (Centre of Gravity) to higher COG.
- 4) **Strength Training:** It helps in building lean muscle mass, increasing metabolism, controlling blood sugar levels. Ideally 10-15 repetitions of 8-10 exercises should be performed thrice a week. Resistance may be applied with Therabands, light weight dumbbells etc.
- 5) **Gait Training:** Gait re-education helps in improving mobility and functional ability without support. The major goals are to lengthen stride, broaden BOS (Base of Support), improve stepping, improve heel-toe gait pattern, increase contralateral movement and arm swing and provide a program of regular walking.
- 6) **Improve urinary incontinence:** Etiology of incontinence in dementia is multi-factorial. Comprehensive assessment of factors within and outside the urinary tract is essential. Management techniques include toileting, medication, physiotherapy, surgery, and other devices. Physiotherapy includes pelvic floor muscle exercises, bio feedback, and electrical stimulation

Other treatment

Behavior Modification Techniques: BMT is a psychotherapy that seeks to extinguish or inhibit abnormal or maladaptive behaviour by reinforcing desired behaviour and extinguishing undesired behaviour.

Reality Orientation Therapy: Reality Orientation Therapy (RO) is all about presenting information about time, place or person understand their surroundings and situation. This information is repeated at regular intervals.

Environmental design: Attention should be paid to: lighting, color schemes, floor coverings, assistive technology, signage, garden design, and the access to and safety of the external environment. Designing should comply with the Disability Discrimination Acts 1995 and 2005, because dementia is defined as a disability within the meaning of the Acts.

Psychological interventions: For people with dementia who have depression and/or anxiety, cognitive behavioural therapy, which may involve the active participation of their attend, may be considered as part of treatment. A range of tailored interventions, such as reminiscence therapy, multisensory stimulation, animal assisted therapy and exercise, should be available for people with dementia who have depression and/or anxiety [9-15]

3. Recent Advances in Cognitive Training

Virtual Reality: Virtual reality is a technology which allows a user to interact with a computer simulated environment, be it a real life learning and allow for increased intensity of training while providing augmented three-dimensional and direct sensorial feedback. Virtual reality refers to a high-end user interface that involves real-time simulate and interactions through multiple sensorial channels.⁷

Cognitive behavioral therapy (CBT): It is a collaborative psychological approach that addresses the interaction between people thoughts, feelings and behavior. The people with dementia can learn and develop skills, with suggest that CBT could be used for people with dementia as it has been with other impaired population including individual with intellectual disabilities. The medical research council guideline for developing a complex intervention and assessing feasibility in two phase. Phase 1 is developing a CBT intervention manual and phase 2 assess the feasibility of the intervention through a single blind, pilot RCT of CBT plus treatment as usual (TAU) versus TAU for people with dementia.

Serious games and educational applications of computerized games: Serious games are software or hardware applications developed with game technology and ideas but the objective of providing entertainment. Traditionally, this kind of games have a wide use for army training, including first person shooters games, role-playing games, vehicle simulations and games including command responsibilities.

More recently, serious games have gone beyond that and numerous companies have developed simulations that immerse the players into political systems by having them take political decisions. Democracy is a political game in which the player is the President or the Prime Minister and has to take decisions to govern his country. Based on a complex neural network, the game takes into account the motivations, loyalties and desires of different kinds of voters.

Games have also been developed with the aim of sensitizing players about humanitarian emergencies: Darfur Is Dying, developed by MTV about the crisis in the south of Sudan⁷, or Food Force, from the World Food Program of the United Nations⁸. The serious games company TruSim has also developed a division for humanitarian interventions training called Virtual Peace⁹, a multi-sensory game-based environment that simulates real disasters to learn necessary tools for sensitizing on crisis responses.

Use of computers in personnel training: Apart from military training, one of the main objectives of serious games is their use with health workers, mainly medical specialists such as surgeons (Rosser et al., 2007). Several games allow players to make appropriate decisions related to an urgent treatment, focusing on technical knowledge but also on the cognitive skills needed.

Simulation games are also used for this kind of training. A simulation game is a game that contains a mixture of skill, chance, and strategy to simulate an aspect of reality (e. g. The Sims). Pulse!! The Virtual Clinical Learning Lab¹⁰ (see Figure 1) is a virtual learning platform produced on the Texas A&M University and designed to simulate health-care facilities and procedures (Johnson & Whatley, 2005). It presents different pathologies, life-threatening patients and rare emergencies. Another field of simulation gaming for health professionals is the usage of virtual reality implemented on the distortions of reality perception that experienced the people who suffer from schizophrenia. For example, The UC Davis Health System has developed an application which allows experiencing hallucinations using Second Life.

Edutainment: Games as educational activities: An educational computer game is an electronic game with all the characteristics of a gaming environment but with educational goals. These types of games are called Edutainment because they combine education and entertainment. These games are created to improve different cognitive skills and to reduce time needed to learn. Hence it allows formal education to be centered around social concerns such as critical thinking or emotional intelligence.

Computerized cognitive rehabilitation and cognitive stimulation:

ELDER GAMES: Elder Games considers social engagement as one of the major areas that technology for older adults can be applied to. In this sense, the Elder Games interactive board is thought to integrate an alternative communication system. In addition to usability barriers specific for elder users, the project states to overcome linguistic barriers between different European languages, allowing on-line games between users from different European countries. Potential users, experts on ageing, and the engineers from AIJU and the University of Padova have started game sessions to evaluate the first version of Elder Games.

Vital Mind: It is dedicated to support the elderly population by means of developing brain fitness contents and providing Information Computer Technologies for them. Related to cognitive games, one of the most important aims of Vital

Mind is to create novel training programs based on scientific theories. Vital Mind designs tasks to train three cognitive functions supported by frontal regions that are particularly compromised by age: cognitive flexibility, fluency and regency judgments. It also includes four training components: a brain fitness component, a life-skill component, an integrated component and a personal memory and enrichment component. Each component contains activities which train each specific mental function separately and uniquely.

Brain Train software: Captain's Log, Sound Smart and Neuro feedback trainer: The Captain's Log cognitive brain training software system, produced by BrainTrain, was first released in 1985 to use with adults with traumatic injuries. It is divided into 7 modules in 3 training sets: Attention Skills Training Set (Attention Skill: Developmental; Visual motor skill and Attention Skill: The Next Generation); Problem Solving Skills Training Set memory skills; Logic skills), Memory Skills Training Set (Numeric Concepts whit Memory Skills; Working Memory).

Smart brain and Smart brain games: Smart brain Professional System (as called as Smart brain Pro) is a system developed for the treatment of cognitive impairment –Alzheimer's disease and other dementias, brain damage and so on. Its efficacy concerning the cognitive stimulation of patients with Alzheimer's disease has been demonstrated in a single-blind randomized study (Tárraga et al., 2006) comparing 12 patients receiving only pharmacological treatment

Working memory training: Cogmed: Cogmed Working Memory Training was first developed by a team of researchers at the Karolinska Institute in Stockholm, Sweden, and research has been continued since the foundation of the Company in 2004. Cogmed Working Memory Training was found to have an effect on brain injured patients after stroke. This includes effects on short-term memory tests, on a paced auditory serial-addition task and also on a selective attention task –to select numbers 2 and 7 with letters or numbers as distracters- choose as non-trained test because it is very close but not exactly identical to tasks in the program (Westerberg et al., 2007). After training with the software and increase in brain activity in the middle frontal gyrus and superior and inferior parietal cortices could be detected for healthy young adults.

Lumosity: It is a computerized cognitive training on cognitive decline in individuals with age associated memory impairment, mild cognitive impairment or dementia. It is committed to pioneering the understanding and enhancement of the human brain. Lumosity is a online and mobile programs are composed of wide variety of cognitive training task that are presented in a game like formats to train cognitive abilities including memory, attention, speed of processing, problem solving and mental flexibility.

Dakim brain fitness: Dakim brain fitness is a scientifically-based comprehensive, structured, brain training program, that cross- train in six essential cognitive domains to improve memory now and protect brain health long term. It can help revitalize mental acuity and has been shown in a

clinical trial to improve memory and strengthen attention, focus and concentration. Studies have also shown that cognitive exercise can delay the most serious memory loss of those already diagnosed with mild cognitive impairment. If your goals keep your brain healthy and fighting the threat of cognitive decline. You'll want a program designed to meet at least six specific objectives. Improving memory, building a protective cognitive reserve to defend against threat of dementia, cognitive decline and memory loss., Heightening attention, Enhancing focus, strengthening concentration, providing an enjoyable experience.⁸

4. Conclusion

Dementia is characterized by loss of intellectual abilities such as memory capacity, severe enough to interfere with social or occupational functioning. The prevalence of dementia increase with the age over the age of 65, its prevalence is 5-10% and at 85 it is 25-50%. The overall literature review state that cognitive training, aerobic exercise, physical exercise, balance and weight training, cognitive behavioral therapy and virtual reality are effective in treatment of dementia.

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