ALTERNATIVE TREATMENT OF ALZHEIMER'S DISEASE:
FAMILY INTERVENTIONS IN THE HOME

By
KAYCEE SUZANNE MUTSCHLER

A project submitted in partial fulfillment of
The requirements for the degree of:

MASTER OF NURSING

WASHINGTON STATE UNIVERSITY
College of Nursing

JULY 2011
To the Faculty of Washington State University:

The members of the Committee appointed to examine the project of KAYCEE SUZANNE MUTSCHLER find it satisfactory and recommend that it be accepted.

Chair: Dawn Rondeau, DNP, ACNP, FNP

Melody Rasmor, RN, MSN, FNP

Julie DeWitt-Kamada, DNP, PMHNP, BC
ALTERNATIVE TREATMENT OF ALZHEIMER'S DISEASE: FAMILY INTERVENTIONS IN THE HOME

Abstract

KAYCEE SUZANNE MUTSCHLER

Washington State University

July 2011

Chair: Dawn Rondeau

Alzheimer’s disease is a progressive illness affecting both the patient and the patient’s family. Along with debilitating memory loss, Alzheimer’s disease also causes other symptoms. Such symptoms can include: sleep disturbances, agitation, depression, cognitive limitations, and physical deterioration. There is no cure for Alzheimer’s disease, however there are medications that can treat symptoms and there are also alternative therapies that can be implemented to help treat these symptoms. This paper focuses on exercise therapy, music therapy, and light therapy research that has been conducted in Alzheimer’s or dementia patients. With the analysis of the research, recommendations are made to help those dealing with Alzheimer’s disease, whether it is the patient or the family, identifying methods to help control the symptoms and maintain improved quality of life and function.
<table>
<thead>
<tr>
<th>TABLE OF CONTENTS</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>6</td>
</tr>
<tr>
<td>Epidemiology</td>
<td>6</td>
</tr>
<tr>
<td>Pathophysiology</td>
<td>7</td>
</tr>
<tr>
<td>Diagnosis Process</td>
<td>9</td>
</tr>
<tr>
<td>Current Treatment</td>
<td>11</td>
</tr>
<tr>
<td>Search Strategies</td>
<td>12</td>
</tr>
<tr>
<td>Music Therapy</td>
<td>13</td>
</tr>
<tr>
<td>Exercise Therapy</td>
<td>18</td>
</tr>
<tr>
<td>Light Therapy</td>
<td>21</td>
</tr>
<tr>
<td>Implications for Practice</td>
<td>25</td>
</tr>
<tr>
<td>Conclusion</td>
<td>27</td>
</tr>
<tr>
<td>References</td>
<td>34</td>
</tr>
<tr>
<td>TABLE OF CHARTS</td>
<td>Page</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Recommendations Table</td>
<td>29</td>
</tr>
<tr>
<td>New Recommendations Guidelines</td>
<td>30</td>
</tr>
<tr>
<td>Global Depression Scale</td>
<td>32</td>
</tr>
<tr>
<td>BEHAVE Scale</td>
<td>33</td>
</tr>
</tbody>
</table>
INTRODUCTION

According to the Alzheimer’s Association Alzheimer’s disease (AD) is currently the 5th leading cause of death in the United States of America (2011). As a leading cause of death in the United States it is also the only disease which is not preventable, curable, or amenable to significant slowing of the progression (Alzheimer’s Association, 2011). Dementia is defined as the progressive decline of intellectual capability from a prior attained level (Goroll & Mulley, 2009). AD is classified as a form of dementia. In the United States there are treatment options including: medications, therapy, and non-pharmaceutical interventions to slow the progression of the disease. It is estimated nationwide that there are more than 1 million elderly patients who have AD, or a related dementia, reside in a care/assisted living facility or a nursing home (Sloane, 2005). The purpose of this paper is to review non-pharmaceutical interventions that can be implemented by families and caregivers in a home setting to slow the progression of AD symptoms and promote improvement within activities of daily living and memory competency. In this paper the main focus will be reviewing exercise therapy, light therapy, and music therapy research for application to AD impaired individuals.

EPIDEMIOLOGY

AD emerged as a major illness affecting members in society beginning in the 1970’s and has continued to become more prevalent thus requiring social and behavior interventions (Zarit & Leitsch, 2001). AD affects approximately 5.4 million people in the United States and 15 million people worldwide (Alzheimer's Association, 2011 & Goroll & Mulley, 2009). AD has been shown to be the most prevalent cause of severe cognitive dysfunction in older individuals (McCance & Heuther, 2006). With such a high prevalence the annual cost of AD in the United States is estimated at $183 billion dollars, with about $31 billion being paid out of pocket.
There are numerous contributing factors to the costs of this disease including: caregiver wages, skilled nursing facility costs, home health care, medical costs due to other co-morbidities, and medications/treatment. Along with AD, patients usually have other co-morbidities requiring medical attention and potential hospital admission. The most common co-morbidities with AD are coronary heart disease, diabetes mellitus, congestive heart failure, and cancer (Alzheimer’s Association, 2011).

**PATHOPHYSIOLOGY**

The exact cause of AD is not fully understood at this time; however there are several theories that are under investigation. These include the loss of neurotransmitter stimulation due to choline acetyltransferase, mutations affecting the encoding of an amyloid precursor protein, alterations in the apolipoprotein E that binds beta amyloid, and also pathologic activation resulting in an influx of excess calcium. This influx of excess calcium can be linked to the resultant plaques that are found in the brain tissue and blood vessels in post-mortem AD patients.

In early onset Familial Alzheimer’s disease (FAD) there are three gene defects which are present: amyloid precursor’s protein gene on chromosome 21, presenilin 1 on chromosome 14, and presenilin 2 on chromosome 1. Late onset FAD has been linked to a defect in the apolipoprotein E gene on chromosome 19 (McCance & Huether, 2006). In a more basic definition AD is a progressive and irreversible cortical disconnection syndrome, resulting in a diminished cerebral cortices of neurons found in the brain and thus resulting in generalized cortical atrophy, widened cortical sulci, and enlarged ventricles in the brain. With AD the neurons in the brain most affected are those neurons that utilize the neurotransmitter acetylcholine. The most impacted areas of cortical depletion include the hippocampus,
amygdalae, temporal cortex, olfactory system, and corticocortical connections (Dunphy, et al., 2007).

In an AD brain there are two major pathologic lesions. One pathologic lesion found is called neuritic plaques, or also known as ‘senile plaques’, and are macroscopic spherical lesions throughout the cortex, hippocampus, and amygdale. The neuritic plaques contain an outside shell that is swollen with degenerating neurites and is enclosed with a layer of microglia and astrocytes with a core that is composed of B-amyloid. Neurofibrillary tangles are microscopic consisting of entwined cytoskeletal fibers that form within the neurons. With these microscopic tangles you can visualize the density which inadvertently can correlate with the degree of a patient’s dementia. Within these neurofibrillary tangles is an atypical form of tau protein, which in a well individual would stabilize the microtubules, however when AD is present the tau proteins are found in elevated concentrations in the cerebrospinal fluid. The theory is the neurofibrillary proteins in AD affect normal functioning by immobilizing a neuron’s normal dynamic cytoskeleton and result in cell death. These tangles are insoluble and will remain even after the neurons have degenerated. Another pathology noted particularly in AD is the excess of beta-amyloid peptides in the affected brain. The theory is that abnormalities in the functioning of the secretases cause this over-production of the beta-amyloids. Along with this effect, one theory proposes that the beta-amyloid deposition is the main issues in AD and that the intracellular neurofibrillary tangles are the outcome of toxic effects that beta-amyloid have on the neurons (Dunphy, et al., 2007).
DIAGNOSTIC PROCESS

Most clinical manifestations leading to an investigation of a diagnosis of AD include forgetfulness; this forgetfulness can progress over time with particular characteristics including forgetting of recent events, emotional upset, memory loss which increases as the individual becomes more confused and disorientated, decreased concentration, inability to problem solve, poor judgment, restlessness, anxious, depression, wandering, mood swings, difficulty finding words or anoma, and trouble with typical daily activities. The most common initial complaint from patients is a memory problem (Goroll & Mulley, 2009 & Dunphy, et. al., 2007). According to the Alzheimer’s Association there are ten major observable signs in recognition of AD including memory loss disrupting the individuals daily life, challenges in planning or solving problems, difficulty with completing familiar tasks at home/work/leisure, confusion with time or places, trouble understanding visual images and spatial relationships, new problems arising with words in speaking or writing, misplacing things and losing the ability to retrace steps, decreased or poor judgment, withdrawal from work or social activities, and noted changes in mood and personality in the individual (2011). There are typically no physical symptoms that can be diagnostically helpful, however there can be some frontal lobe signs or extrapyramidal features that may be demonstrated (Goroll & Mulley, 2009).

A thorough medical history is necessary when evaluating the potential diagnosis of AD. A complete history would include personal and family medical history, especially of dementia or AD in particular and documentation of any pertinent signs or symptoms (Alzheimer’s Association, 2011 & Dunphy, et. al., 2007). With a complete history collected and documented a physical exam should be obtained on the patient. The physical exam should include a complete neurological exam, as well as a basic physical assessment (Dunphy, et. al., 2007). A useful tool
when evaluating the suspicion of AD is the Mini Mental Status Examination (MMSE); this test assesses a range of mental skills (Alzheimer’s Association, 2011). The MMSE with an individual can score between 0 and 30, with a score between 20 and 25 indicating early stage AD, a score between 10 and 19 indicates middle-stage AD, and a score that is below 10 indicates late-stage AD (Dunphy, et. al., 2007). Another useful tool that has been utilized in evaluating patients with AD is the Global Depression Scale; which can signify depressive illness in the dementia patients (Svansdottir & Snaedal, 2006). The National Institute of Aging and Alzheimer’s Association has revised and updated the previous 1984 Alzheimer’s disease criteria. The new guidelines are fairly recent and haven’t been fully adapted to practice yet, however the published updates have been attached in the end of this paper. The Alzheimer’s Association and American Neurology Association have similar diagnostic criteria.

Other diagnostic testing would include laboratory tests, such as a CBC, BMP, Blood glucose, serum calcium, and TSH in order to rule out other diagnoses (Dunphy, et. al., 2007). About two-thirds of patients with moderate to severe AD do not have any other medical illness or disease that can cause dementia, such as hypothyroidism or cerebral vascular disease (Goroll & Mulley, 2009). The only definitive diagnosis occurs as a postmortem examination. Along with laboratory studies in the diagnostic process, imaging studies, such as an MRI and/or a CT scan is usually incorporated into diagnosis AD. Both can reveal abnormalities such as blood clots, strokes, brain tumors, normal pressure hydrocephalus, and acute brain injury findings (Hill, 2008). Some diagnostic features that can be seen would include enlarged ventricles and cortical atrophy seen on an MRI or CT scan (Goroll & Mulley, 2009). According to the Alzheimer’s Association both an MRI and a CT scan can be used to diagnosis AD and typically is the preference of the practitioner (2011 & Hill, 2008).
CURRENT TREATMENT REGIMENS/RECOMMENDATIONS

Currently there is no cure for AD; consequently the management of Alzheimer’s disease is focused on slowing the progression while preserving the functional, emotional, and physical health through the use of pharmaceutical medications and non-pharmaceutical interventions (Dunphy, et. al, 2007). There are approved U.S. Food and Drug Administration (FDA) medications currently being utilized in patients with AD to slow the progression and to treat associated symptoms. The FDA has approved the following drugs to be used in AD with the brand name in parenthesis: Donepezil (Aricpet) in all stages of AD; Galantamine (Razadyne), Memantine (Namenda), Rivastigmine (Exelon), and Tacrine (Cognex) which are used in mild to moderate stages. Cholinesterase inhibitors, including: Donepezil, galantamine, rivastigmine, and tacrine, act with cholinergic receptors and sodium and potassium ion channels effecting the uptake, synthesis and release of such neurotransmitters impacting AD (Hakansson, 2009).

Memantine is an N-methyl-D-aspartate receptor antagonist medication whose action includes the regulation of glutamate, which is a chemical messenger that plays a role in learning and memory of the brain. Memantine aids in protecting the brain cells from excess amounts of glutamate by partially blocking the NMDA receptor sites and thus decreasing the amount of harmful glutamate present (Alzheimer’s Association, 2011).

Treatments with antipsychotics are sometimes required for treatment of the disruptive, agitated, and physically aggressive behaviors associated with AD. Antipsychotics that are commonly used include atypical antipsychotics, such as Risperidone (Risperdal), Olanzapine (Zyprexa), and Quetiapine (Seroquel). However, when antipsychotics are utilized in a treatment regimen the patient should be monitored for any adverse effects, sedation, balance issues, and worsening confusion or agitation. It is also noted that Federal regulations require practitioners to
attempt a reduction in the dose of these medications at least every six months when the patient is living in a nursing home. This is regulated to reduce prescriptions in this patient population to the least amount of medications required and these psychotic medications can be deemed a form of restraint (Dunphy, et. al, 2007). Another main component that is important to include in the treatment regimen, a non-pharmaceutical component, including support and education for the patient as well as the family.

SEARCH STRATEGIES

The literature search was first conducted by utilizing the Google search engine to narrow non-pharmaceutical interventions currently being researched and implemented. Multiple interventions were found and were then further limited to three interventions with the largest quantity of research findings. Topics that arose during the search include: vitamins, exercise, light therapy, touch, music, and games. For this paper there are three interventions that will be reviewed, those three interventions are light therapy, music therapy, and exercise therapy. The next step for the search was the utilization of the Washington State University portal online and accessing the CINHAL database full-text. The first search used the keywords, Alzheimer’s and intervention, which produced 143 articles. The next search used the keywords, Alzheimer’s and music, which produced 28 articles. The key words for the next search included Alzheimer’s and exercise, this produced 71 articles. The final search included the keywords, Alzheimer’s and diet, this produced 91 articles. In addition to using the CINHAL database, Medline Plus database, Academic Search Premier, and Alzheimer’s Association research database were also accessed. Exclusion criteria included articles over 10 years, opinion based, and forum articles.
MUSIC THERAPY

A study conducted by Svansdottir & Snaedal researched the effects that music therapy had on behavior and psychological symptoms in patients that were diagnosed with moderate or severe Alzheimer's (2006). The study was conducted with 38 participants, all between the ages of 71-87 years of age, that lived in either a nursing home or a psychiatric ward (2 nursing homes and 2 psychiatric wards were utilized). Each participant was required to have a diagnosis of moderate to severe Alzheimer's disease with a corresponding score between 5-7 on the Global Deterioration Scale (GDS) to be eligible to participate (an example of the GDS is attached at the end of this paper). During recruitment, participants were excluded if they had any other form of dementia other than Alzheimer's. The group was then randomized into either a control group or a music group; the control group had 18 individuals and the music group had 20 participants. The music group contained 18 sessions, each 30 minutes long, three times per week for six weeks. During these sessions a variety of songs were initially selected by the administrating therapists and then from that selection the participants chose songs and therefore each song that was chosen was sung twice. The participants were encouraged to sing along, however some also held the books and listened. Instruments and dance movement were also incorporated throughout the sessions, with the participants interacting as they were comfortable. The control group had no changes in their care.

The study utilized the BEHAVE scale to evaluate Alzheimer's symptoms during the interventions (an example of the BEHAVE scale is attached in the end of this paper). The nurses in the settings were blinded and only involved in evaluating the symptoms throughout the course of the weekly sessions and at week four and ten. The reported results were a reduction in the symptoms of those participants in the music therapy group at the 6 week mark. The symptoms
that were reduced included: aggression, anxiety, and behavioral disturbances, with a reduction noted on participants' anxiety symptoms. At four weeks following the completion of the study, the benefits in reduction of symptoms had increased. In this small cohort of patients even a few short sessions a week can be a great advantage to reduce behavior and psychological symptoms in patients with moderate to severe Alzheimer's disease patients. A limitation to this study was formation about how the control group's routine care was provided when compared to the intervention group. However, a strong aspect of this research was that it strictly focused on including only those that had a diagnosis of Alzheimer's, rather than incorporation of other forms of dementia.

A music-related research study utilizing a qualitative content analysis focused attention on emotions using the influence of music and singing during the routine morning care and the effect on emotions was reported (Gotell, Brown, & Ekman, 2007). This study incorporated nine participants (seven female and two male) in a special care unit set in Sweden who had a diagnosis of severe dementia in the 80-90 year old category. Out of the nine participants only one was diagnosed with Alzheimer's disease and the other eight participants had a diagnosis of severe dementia. This study was done utilizing a qualitative content analysis method. The participants were divided up into three different situations and then analyzed by video recording the events. Each event recorded was analyzed three separate times. The three different situations included: a control group that kept their usual morning routine, one intervention group where the participants had recorded music in the background during their morning routine, and the second intervention group had the caregivers singing various songs to the patient during the morning routine (the caregiver did not have to have any type of experience with singing to participate). The analysis phase of this study incorporated five stages and was done by the first author only: 1.
the video was viewed several times, 2. during viewing documentation of verbal communication was performed, 3. transcribing words related to the participants’ emotion was done, 4. Categorization of the words were done in positive and negative emotions and 5. Integrations of these documents were completed for each participant with dementia and the caregivers and thus the researchers tied together common themes noted in all cases.

The results of this study found the following categories: with usual morning routines: disjoint and vitality, with background music: mutual vitality with playfulness, and with caregiver singing: mutual vitality infused with sincerity. With the analysis of each of the interactions it was apparent that when caregivers added background music to their morning routines it increased a sense of energy from the patient and the patient is more cognitively attentive with the caregiver. The patient also appeared more responsive to their environment when compared to the usual morning routine with the caregiver vocally attempting to give energy to coach the patient with response from the patient including listlessness, confusion, fear, and aggression. When the caregiver sings to the patient during morning cares, the patient responds reciprocally and has increased awareness to that caregiver; therefore more cooperative behavior from the patient was elicited. Both background music and caregiver singing was reported with an increase in witnessed positive emotions and moods with a mutual communication channel between the caregiver and the patient with dementia. Overall the study authors note that there is a connection between words, body, and emotion. This study is significant in the focus on the assessment of dementia patient’s emotional response to an intervention. A study limitation is the very small numbers of participants (nine total participants) included in the study and that results were based on the research administrator perceptions of the video accounts. Another limitation includes only
the first author analyzed the content of the patient accounts and did not include other perspectives during the analysis.

According to the literature review conducted by Ledger & Baker there have not been any long term effects of music therapy on agitation levels in patients with dementia (2007). The goal of Ledger & Baker’s research was to conduct a study with Alzheimer’s disease patients questioning if music therapy reduced the amount or severity of agitation over an extended period of time (2007). This study utilized a longitudinal repeated measures design that included an experimental and control group. The participants comprised a convenience sample from 13 nursing homes, two with a music therapy program in place. None of the study participants had been exposed to the music therapy. There were a total of 45 participants involved in the completed study between the ages of 71 to 96 years of age; 26 participants in the experimental group and 19 participants in the control group. Participants were eligible to participate in the study with the following inclusion criteria: primary diagnosis of Alzheimer’s disease, stage 4, 5, or 6 on the Global Deterioration Scale (GDS), and had cognitive impairment on the MMSE <23 or a score of >2 on the Mental Status Questionnaire (MSQ). Exclusion criteria for this study, as defined by the researchers, included poor health and if there was a concern that the participant would not survive the year length of the study. The experimental group consisted of the participants engaging in weekly group music therapy treatment for 30-45 minutes. The music groups met a total of 42 times in a one year time span. These participants listened to music, choosing some of their favorite songs, singing, playing musical instruments, moving to the music, and sharing emotions. The control group participants continued with their usual cares and no changes were made.
To analyze the effectiveness of the music therapy, the researchers utilized the CMAI-long form, which is utilized to measure the rate of occurrence of 29 different agitation behaviors. The CMAI score is categorized into four behavior subtypes: verbal non-aggressive, verbal aggressive, physical non-aggressive, and physical aggressive. The CMAI was scored by using a scale of “Never=0 to “Several times an hour=6”. Also included in the analysis phase were interviews of the nursing staff at the nursing homes. The music therapists that were conducting the music groups also kept journal logs describing pre and post session agitation behaviors. In the results, it was concluded that in regards to the range and frequency of participant behaviors there was no difference found between the control group and the experimental group when examined over an extended period of time. It was noted that in terms of the severity of the behaviors exhibited the experimental group appeared to remain more consistent in their expression of verbal aggressive behaviors than the control group. When analyzing the therapist’s observations of agitation levels, in the music therapy group agitation behaviors were less frequently observed and in several situations the participant’s agitation behaviors were not observed for a short period of time after the sessions concluded, suggesting that music therapy could play an impact in immediate relief of agitation behaviors.

This research suggests that as there were no differences noted between the groups over an extended length of time, music therapy may only provide short term benefits in reduction of agitation level in Alzheimer’s disease patients. In contrast verbal non-aggressive behavior with the music therapy group participants gradually increased over the first nine months during the study which supports the theory that music therapy can help improve the Alzheimer’s disease patients language functioning and increase the patient’s ability to be more expressive in a positive manner. With this it was also noted in the results section that the control group
participant's degree of verbal aggressive and verbal non-aggressive behavior decreased in the last six months of the studies time period, which can suggest that these participants could be losing their ability to express any agitation they are experiencing verbally (Ledger & Baker, 2007 & Koss, et al, 1997). However, it is noted that a possible theory could be that with the music group participants being encouraged to be more expressive utilizing singing or talking during the sessions, these participants may be sustaining their abilities whereas the control group is deteriorating in their expressive skills as they are not partaking in any such sessions. As the findings do seem to support that Alzheimer's disease patients can benefit from music sessions, these study results remain inconclusive. A study flaw included a control group with a higher degree of agitation at the beginning of the study and throughout the study conduction. The researchers suggest that a music therapy program where participants are able to express verbal skills may help patients maintain verbal skills versus those patients in the control group. A limitation of this study included that a majority of the participants were of the female sex and the small sample size. A positive aspect of this research was that only participants that were able to complete the entire year time span of the study were included in the analysis. Additional strengths in the study include that none of the participants had ever received any music therapy prior to enrolling in the study and that the music groups were conducted at varying hours of the day.

EXERCISE THERAPY

It is estimated that up to 87% of AD patients have depression (Williams & Tappen, 2008). In a research intervention William and Tappen evaluated the effects of exercise training for depressive symptoms in AD patients residing in a nursing home (2008). This study was conducted by utilizing 3 groups with a total of 36 randomly assigned participants. In this quasi-
experimental design; one group performed a comprehensive exercise program, one group participated in supervised walking, and the last group intervention was social conversation only. The interventions groups lasted for a total of 16 weeks. The exercise sessions started out at just a few minutes in length to an end result of 30 minute long sessions. During these sessions the participants were allowed to rest as needed and/or use assistive devices during walking sessions. The social group participated in casual conversations for the same amount of time as the exercise groups. The patients were scored on the Cornell Scale for Depression in Dementia before and after the intervention periods to compare results. The reported results were that 35% of the participants in either the comprehensive exercise or walking exercise group had improved mood as compared to those in the social group who had a decreased score in the Cornell Scale for Depression in Dementia. A limitation of this study was the small sample size.

Agitation is very common in elderly dementia patients in nursing homes, with an occurrence rate of 70-90% (Gary, 2004). Aman & Thomas conducted a research study evaluating the short-term effects of an exercise program for agitation, aggression, and daily activities in patients with cognitive impairments living in a nursing home special needs unit (2009). The method was a prospective comparative study. A total of 50 patients were enrolled in this study, 40 patients participated in the exercise portion and 10 patients only spoke to the exercise coordinator. It consisted of three weeks of an exercise program in two different nursing homes. The exercise program included 15 minutes of aerobic exercise and 15 minutes of resistance and balance exercises for three days a week for three weeks, totaling nine exercise days. Included in the measurement was a 6-meter walk test that was performed before and after each participant’s completion of the exercise program. The results were measured using the Pittsburgh Agitation Scale (PAS), as well as the Cornell Scale for Depression to test for the reduction of depressive
symptoms in the participants due to the exercise program. The reported results were a reduction in participants’ agitation, especially disruptive behavior after the three weeks of structured exercise. It also uncovered that there was a decrease in the length of time for the 6-meter walk with a reduction of 2.4 seconds as a result of the exercise program, thus resulting in improvement in ambulation. These results are encouraging for a reduction in agitation symptoms, as well as improvement of physical endurance. A limitation of this study is that there was a small amount of participants that refused to take part in exercise, yet did take part in the conversational aspect. Another limitation of this study is that it only focused on dementia as a general diagnosis and not more specific dementia such as Alzheimer’s disease. A benefit of this study is the larger number of participants.

Rolland, et. al researched if an exercise therapy program would decrease the decline in Alzheimer’s disease patients activities of daily living (2007). In this research participants were studied over 12 months while living in a nursing home. Included were five different nursing homes with a total of 110 participants. The study was a randomized controlled, single blind methodology with two groups. Participants were selected by an Alzheimer’s disease diagnosis or having a MMSE score of less than 25. One group had participants in an exercise program and the other control group continued to receive their routine medical care as before. Each participant was screened at baseline and then at six months and twelve months (end of the study). The exercise group typically contained between two and seven participants each time based on their baseline physical performance scoring, the MMSE score, or their behavior disturbances. For the exercise group the participants began with more light intensity exercises and then gradually increased the intensity over the first month and continued throughout the study, no amount of time for the sessions was specified. Also included in the exercise program were balance training,
aerobic, strength, and flexibility exercises. In each session walking was mandatory in at least half of each session time. The sessions began by stretching and then walking briskly in order to achieve moderate breathlessness, but never to exercise to the point of exhaustion.

There were two measures including maintenance of the ability to participate in activities of daily living and the secondary measure was completed at 6 months evaluating outcomes in activities, nutrition status, behavior disturbances, and depression rates. Results with the exercise regimens of moderate exercise done at least twice a week showed a decrease, by one-third, in the decline progression of activities of daily living in Alzheimer's disease patients that live in nursing homes. This study also shows an improvement in the exercise participant’s increase in walking speed, but did not have any effect in nutritional status, behavioral disturbances, or depression measures.

LIGHT THERAPY

In Alzheimer's disease nighttime sleep can be disjointed with effects on daytime activities requiring multiple nap periods for these patients (Dowling, et al. 2007). The effects of bright light and supplemental melatonin to encourage a stable circadian rhythm thus increasing nighttime sleep and decrease daytime sleepiness were studied in Dowling, et al. (2008). For this study two large long-term care facilities were utilized. Study participants were selected if they had a diagnosis of Alzheimer's disease, rest-activity disruptions (such as insomnia, frequent nighttime waking, wandering at night, early morning waking, sun downing, and excessive daytime somnolence). Exclusion criteria included additional neurological diagnosis, such as Parkinson's, or were on a regular basis taking valerian, melatonin, or other sleeping type medications. The 50 participants were divided into three groups; two experimental groups and a control group. The average age of all participants was 86, with the ranges of age between 60 to
100 years. One experimental group received morning bright-light exposure in addition to evening melatonin doses of 5 mg and the other experimental group received morning bright-light exposure and a placebo drug containing lactose. In both groups the medications (lactose and melatonin) were administered to participants between 5:00 pm and 6:00 pm, with the patient’s bedtime around 8:00 pm. In the control group participants only received the usual indoor light. Each participant was randomly assigned to one of these groups. The study was conducted over 11 weeks. Those participants in the bright-light exposure groups received their light exposure in the morning, between the hours 9:30 and -10:30 am Monday thru Friday only for ten weeks with a goal of receiving >2,500 lux of bright light. The bright-light exposure consisted of activities in either a brightly light area outside or an indoor area with windows to allow enough natural light. When needed, APOLLO Brite Lite IV light boxes were utilized to supplement natural light exposure. The control group received the typical indoor light and continued their normal activities and usual areas in the nursing home.

To analyze the rest-activity patterns in participants the researchers collected data using an Actiwatch activity monitor, which is a compact, battery-operated activity monitor similar to wrist watches. These monitors store occurrences and the degree of movement-induced accelerations. For analysis purposes in this study daytime and nighttime were defined by the hours of 8:00 am and 8:00 pm. The nighttime outcomes variables in these patients included sleep time, wake time, and the average amount and duration of sleep and wakefulness. The reported results found that morning bright-light with the added dinner time melatonin helped increase daytime activity and decreased daytime somnolence in Alzheimer’s disease patients. The researchers suggest that with the decrease in daytime sleepiness more participation in physical and psychological activities in the patient is possible. It was also noted in discussion that it is a possibility that light therapy
alone is not influential for statistical significance, although light therapy when it is combined with melatonin increased the results to be statistically significant. A limitation of this study was the lack of documentation of agitation, aggression, or other symptoms unrelated to the nighttime/daytime sleep cycle.

Schindler, et. al researched the effectiveness of bright light therapy for AD patients with delusions or agitation symptoms (2002). This investigation included five patients who have Alzheimer’s disease. To test bright light effects the study participants were exposed to bright artificial light (a goal of 2,500 lux) for two hours a day from 10 am to 12 pm for a total of 14 days. The patients’ symptoms were scored using the Confusion Rating Scale. There were not inclusion or exclusion criteria for participants in this study, other than the requirement of a AD diagnosis. The results found that three of the participants had a reduction in delusions, one of the participants had no delusions before or during the bright-light therapy, and one patient had an increase in agitation during the therapy. The small sample size of this study prevents applicability; however it is an interesting early study with application for bright light therapy.

Sloane, et al. developed a research interest concerning long-term care facilities and providing areas of high-intensity lighting to its effects on dementia patients (2005). This study used two settings, a geropsychiatry institute and a dementia-specific residential care facility. There were a total of 101 participants; each participant was asked if they wanted to partake in the bright light therapy, but had the option to decline participation and those that did decline were kept out of the bright-light experimental areas and thus utilized in the control group portion of the study. In both of the site settings the researchers constructed specific areas with bright-lighting and also designating an area where non-consenting participants would spend their time. The bright-light intervention was a high-intensity, low-glare light therapy used during scheduled
times. The goal of the bright-light is to attain two target levels of light: 2,000 lux or more for the high-intensity lighting areas and 500-600 lux, which is industry standard, for the control group. An effort was done to reduce any glare as glare has been linked to cause the side effects. To test and ensure the light evenness and intensity the researchers implemented light meter readings in foot candles at each site. Data collected included the date, time of day, weather conditions, locations, and name of the person who recorded the measurements at each session. The lighting was gradually increased in the lux amount to accommodate the varying bright light intensity and to reach a goal target of lighting for the participants and the caregivers working in the facilities.

With each session the resident participant and the caregivers were asked to complete surveys that ask about possible associated side effects that can be related to high-intensity light therapy. In addition to this assessment on the first day that the intervention was conducted the staff that working in the area of the intervention were asked to complete a brief questionnaire asking about the presence of the symptoms that the staff themselves have experienced in the past three weeks. In the staff questionnaire, there was a question of agitation that was changed to anxiety and the residents were asked about agitation symptoms. The 11 possible side effects from the intervention: eyestrain, seeing spots, problems with glare, eye burning or irritation, eye redness, jitteriness, skin rash, on the face or arms, severe agitation, headache, dizziness, and nausea. The results showed that the incidence of potential side effects was not significantly higher during bright-light therapy than under control lighting. The most common side effects that were found in the research conducted at the North Carolina site included: headache, eye burning/irritation, eye redness, and issues with glare, however it was not reported that the amount of these symptoms was greater in either the high-light or control lighting situations. In the Oregon site the most common side effects included: nausea, face/arm rash, eye strain, and
headaches. In North Carolina there were an insignificant higher percentage of side effects, at 18.4% versus the Oregon site reporting a percentage of 5.3% and a higher percentage of side effects in the control lighting, at 11.1%. The conclusion by the researchers’ analysis that high-intensity lighting in a long-term care setting is achievable and that it does not particularly lead to significant side effects, in either the staff or participants. The researchers suggest that a site with higher ceilings and use of natural lighting is the ideal option when implementing light therapy, as well as controlling and eliminating any glare, as it tends to be associated with high side effects.

IMPLICATIONS FOR PRACTICE

With the research presented in the music therapy, exercise therapy, and lighting therapy, there are many non-pharmaceutical options for interventions to slow AD progression and treatment of symptoms. As each AD patient varies in their illness trajectory and presentation, each non-pharmaceutical intervention can also vary its effect, positive or negative, on their symptoms. In some patients, multiple varied interventions may be beneficial to aid in symptom management or maybe one simpler intervention would be sufficient. Such interventions are appropriate for AD patients that live in a nursing home, in their home, or with family/caregivers. Each intervention can be implemented by the caregiver or family of the Alzheimer’s patient to implement into their lives with some work and guidance.

Overall it appears that the incorporation of music, in some whether it be a radio, instruments, person singing as was demonstrated in Gotell, Brown, & Ekman research, can improve depression symptoms and increase cognitive involvement in an AD patient (2007). Svansdottir & Snaedal and Gotell, Brown, & Ekam’s research demonstrates that music that can be interactive and may help AD patient helps the AD patient express emotions and language with others (2006 & 2007). In both the Ledger & Baker and Svansdottir & Snaedal research reports
the effectiveness of music therapy at reducing patients’ agitation and aggressiveness is documented. A recommendation for implementation would include the incorporation of songs or beats that are familiar to the patient and attempt a variety of interventions until it is noticeable that cognitive signs improve and undesired effects are limited. As research demonstrated, music therapy is an ongoing intervention for the desired effects, as stopping the intervention tends to have no continuing beneficial effects after a short term period. Music therapy has been shown to be effective in decreasing agitation and improving patient cognitive skills on a weekly basis, bi-weekly basis, or even daily basis.

With exercise therapy the reported research indicates that most patients who can tolerate exercise do benefit, in some form, from an exercise therapy plan. In dementia patients exercise helps improve involvement in daily activities, physical exertion, and cognitive symptoms. Depression, a key cognitive symptom, as shown in Williams & Tappen’s research, can provide symptom relief and promotion of the sense of well being (2008). Recommendations for implementing an exercise regimen in AD patients would include walking and some light stretching for the patient. Incorporating more exercise and higher intensity as tolerated and exercise intensity progression has also been beneficial. It is also important to keep the exercise in acceptable range as the patient is able to tolerate it. Incorporating exercise as little as 15-30 minutes a couple times a week is beneficial for an AD patient. Both Aman & Thomas and Rolland et al. research provided the basis that exercise can help improve a patient’s physical strength with independent activities.

Light therapy can be beneficial to dementia and Alzheimer’s patients, but with more caution than the exercise and music therapy interventions. Light therapy, while being closely monitored, can be beneficial in Alzheimer’s patients to regulate their sleep-wake cycle and
promote more daytime wakefulness and less daytime napping, as shown particularly in Dowling et al. and Sloane et al. (2007 & 2005). However, it is noted that adding a melatonin sleep medications with bright light therapy was researched, so it becomes a question of needing to add a natural sleeping aid to the regimen to achieve the beneficial results in patients. In bright-light therapy patients need to be closely monitor for worsening symptoms, as research has shown that some individuals react oppositely to the therapy intervention and this is where close monitoring during initial stages of implementing the intervention is needed. Light therapy, even for a short time period during the day, even an hour, can be beneficial and even with the addition to melatonin a few hours before bed can increase the benefits even further. Schindler et al. does demonstrate through research how bright light therapy can help decrease delusional symptoms that have been seen in AD patients (2002), however more research is needed in this area as the study had small sample size. Recommendations for light therapy in AD patients can include a variety of strategies for brighter lighting than the natural provided light for at least a few hours a day. The addition of melatonin or other non-prescriptive sleep aids are added option, but just light therapy alone could be implemented first. If the light therapy alone does not fully achieved the desired benefits, then addition of sleep medication can provided added benefit.

CONCLUSION

The prevalence of Alzheimer’s disease will continue to grow as our population ages. It is even more important to focus and direct care to non-pharmaceutical options to help treat patient’s symptoms, particularly those strategies that may help AD patients who are at home with families. This paper focused on exercise, music, and lighting therapy, while there are other options that are available. Other options or interventions would include vitamins, mind games, and hand-eye coordination activities. There has been an increase in options for medication
management to assist with symptoms and the progression of AD. The addition of adjunct therapies with medication management may provide assistance in the treatment of symptoms and progression. As described, there is a need for further research in this field for available options and interventions.
### Table of condensed therapies:

<table>
<thead>
<tr>
<th>Therapy Intervention</th>
<th>Music Therapy</th>
<th>Exercise Therapy</th>
<th>Light Therapy</th>
</tr>
</thead>
</table>
| Cognitive Symptoms         | *Include ability to sing, chose songs  
                            *Caregiver singing during cares                                              | *Walking sessions as tolerated for depressive symptoms; goal of 3 times a week for 30 minutes  
                            *Include aerobic & balance exercises                                             |                                                                                                  |
| Sleep disturbances         |                                                                                | *No study reviewed, although regular exercise can promote nighttime sleeping       | *At least 1-3 hrs a day of bright light (light other than natural light) during the day  
                            *Addition of Melatonin 2 hrs before bed                                           |
| Agitation/Aggression       | *at least 30 min sessions 1-3 times a week of interactive music playing  
                            *Interactive with choosing songs, movement, and instruments  
                            *Adding background music or singing during cares/routines                      | *Walking sessions, goal of 30 minutes 2 times a week or as tolerated                  | *Mid day bright-light exposure at least 1 hr a day  
                            *Monitoring needed during initial stages                                           |
| Promote Independent Activities | *Caregiver singing or background music during cares and encourage involvement | *Walking 2 times or more a week (inside or outside settings)  
                            *Work up to a 30 min sessions as tolerated  
                            *Include aerobic & balance exercises throughout sessions or separate of the walking | *Been shown that regulate sleep cycles helps with daytime activities                  |
National Institute on Aging and Alzheimer's:
Criteria for all-cause dementia: (core criteria)

1. Interfere with ability to function at work or usual activities
2. Decline from previous levels of functioning and performing
3. Presentation not explained by delirium or major psychiatric disorder
4. Cognitive impairment detected/diagnosed by history-taking, objective cognitive assessment (mental status exam or neuropsychological testing)
5. Cognitive or behavior impairment involving at least a minimum of two of the following:
   a. Impaired ability to acquire and remember new information
   b. Impaired reasoning and handling of complex tasks, or poor judgment
   c. Impaired visualspatial
   d. Impaired language function
   e. Changes in personality, behavior, or comportment

Proposed Classification criteria for AD dementia:
Probable AD dementia (clinical setting diagnosis)
Possible AD dementia (clinical setting diagnosis)
Probable or possible AD dementia with evidence of the AD pathophysiological process (for use only in research purposes)

Probable AD dementia: (core criteria)

1. Meets criteria for dementia as described earlier with the following characteristics:
   a. Insidious onset: gradual onset of months to years
   b. Clear-cut history of worsening cognition by report or observation
   c. Initial and most prominent cognitive deficits are evident on history and examination in one of the following categories:
      i. Amnestic Presentation (most common presentation)
      ii. Nonamnestic presentation
         1. Language presentation
         2. Visuospatial presentation
         3. Executive dysfunction
      iii. Diagnosis of probable AD dementia SHOULD NOT be applied when there is evidence of either a substantial concomitant cerebrovascular disease, core features of Dementia with Levy bodies other than dementia itself, prominent features of behavioral variant frontotemporal dementia, prominent features of semantic variant primary progressive aphasia or non-fluent/agrammatic variant primary progressive aphasia, or evidence for another concurrent, active neurological disease or non-neurological medical co morbidity or use of medication that could have a substantial effect on cognition.

Probable AD dementia with documented decline:
Patient meets core clinical criteria for probable AD dementia, documented cognitive decline increases the certainty of the condition as being active and evolving, but it does not specifically increase the certainty that the process is AD pathophysiology.
Definition: Evidence of progressive cognitive decline on subsequent evaluations based on information from informants and cognitive testing in the context of either formal neuropsychological evaluation or standardized mental status examinations.
Probable AD dementia in a carrier of a causative AD genetic mutation:

Patient meets core clinical criteria for probable AD dementia, has evidence of a causative genetic mutation (in APP, PSEN1, or PSEN2) increases the certainty that the condition is caused by AD pathology.

*Work up noted that carriage of the e4 allele of the apolipoprotein E gene was not sufficiently specific to be considered in this category.

Possible AD dementia: (core criteria)

Diagnosis of possible AD dementia should be made with either of the above circumstances.

Atypical Course:

Patient meets core criteria in terms of nature of cognitive deficits for AD dementia, but does not have a sudden onset of cognitive impairment or demonstrates insufficient historical detail or objective cognitive documentation of progressive decline

OR

Etiologically mixed presentation:

Patient meets all core criteria for AD dementia, but has evidence of:

a. Concomitant cerebrovascular disease
b. Features of Dementia with Lewy bodies other than the dementia itself
c. Evidence for another neurological disease or a non-neurological medical comorbidity or medication use that could have a substantial effect on cognition

Probable AD dementia with evidence of the AD pathophysiology process:

Major AD biomarkers that have undergone major investigation can be broken into two classes which are based on their biology they measure. This is still in a research phase.

Dementia unlikely to be due to AD:

Patient does not meet clinical criteria for AD dementia. Regardless of meeting clinical core criteria for probable or possible AD dementia, there is sufficient evidence for an alternative diagnosis such as HIV dementia, dementia of Huntington’s disease, or other that rarely, if overlap with AD. Also regardless of meeting clinical criteria for possible AD dementia, this is the diagnosis if both AB and neuronal injury biomarkers are negative.
Global Depression Scale (GDS)

Choose the best answer for how you have felt over the past week:

Yes / No

1. Are you basically satisfied with your life?
2. Have you dropped many of your activities and interests?
3. Do you feel that your life is empty?
4. Do you often get bored?
5. Are you in good spirits most of the time?
6. Are you afraid that something bad is going to happen to you?
7. Do you feel happy most of the time?
8. Do you often feel helpless?
9. Do you prefer to stay at home, rather than going out and doing new things?
10. Do you feel you have more problems with memory than most?
11. Do you think it is wonderful to be alive now
12. Do you feel pretty worthless the way you are now
13. Do you feel full of energy?
14. Do you feel that your situation is hopeless?
15. Do you think that most people are better off than you are?

TOTAL GDS:

(GDS maximum score = 15)

0-4 normal, depending on age, education, complaints
5-8 mild
8-11 moderate
12-15 severe

Reproduced from Chan, 2011.
BEHAVE Scale

The Behavior Observation Pain Scale is appropriate to be used to assess pain in unresponsive or cognitively impaired patients.

1 - Facial Expressions 5 - Activity
2 - Vocalizations 6 - Distress
3 - Verbalizations 7 - Other
4 - Motor Activity

Observe all seven (7) behaviors. If they are Normal = 0 if they are Abnormal = 1

Add all the abnormal behaviors observed (there may be more than one under each category) and determine pain level.

Scale: 0 – 2 = Mild Distress 4 – 5 = Moderate Distress 6 – 7 = Severe Distress

Reproduced from Rutherford Regional Health System (2011).
References:


doi: 10.1016


DOI: 10.1111/j.1600-0404.1993.tb04245.x


