

Human Journals

**Review Article**

December 2021 Vol.:20, Issue:2

© All rights are reserved by Samuel P. Abraham et al.

## The Effects of Alzheimer's Disease on Behavior

 **IJSRM**  
INTERNATIONAL JOURNAL OF SCIENCE AND RESEARCH METHODOLOGY  
An Official Publication of Human Journals 

**Marisa N. Fassero<sup>1</sup>, Cameron C. Mannion<sup>1</sup>, Logan P. Manning<sup>1</sup>, Samuel P. Abraham<sup>2\*</sup>**

*<sup>1</sup>Bronson School of Nursing, Western Michigan University, Kalamazoo, Michigan, USA*

*<sup>2\*</sup>Associate Professor of Nursing, Bethel University School of Nursing, Mishawaka, Indiana, USA*

**Submitted:** 23 November 2021  
**Accepted:** 28 November 2021  
**Published:** 30 December 2021



[www.ijsrm.humanjournals.com](http://www.ijsrm.humanjournals.com)

**Keywords:** Alzheimer's disease, dementia, behavioral changes effects, intervention, health-promotion

### ABSTRACT

**Background:** Alzheimer's disease (AD) is becoming more relevant in the progressive aging population. AD, a form of dementia, is a major neurocognitive disorder characterized by cognitive and functional impairments along with behavioral and psychological symptoms of dementia (BPSD). **Purpose:** The purpose of this review was to explore the effects of AD on behavior and the impact this has on the overall quality of life (QOL). **Method:** Various scholarly sources such as scholarly articles, peer-reviewed journals, and statistical analysis were analyzed to obtain this information. **Findings:** Behavioral changes are one of the key markings in later/more severe stages of AD. Behavioral changes, such as agitation and depression, majorly impact relationships with family or caregivers and quality of care **Conclusion:** There is no suitable treatment for AD because it is a progressive neurodegenerative disease that up until recently, has largely been held back by technology of our time. More research is being done to explore options for diagnosing and treating behavioral changes in AD.

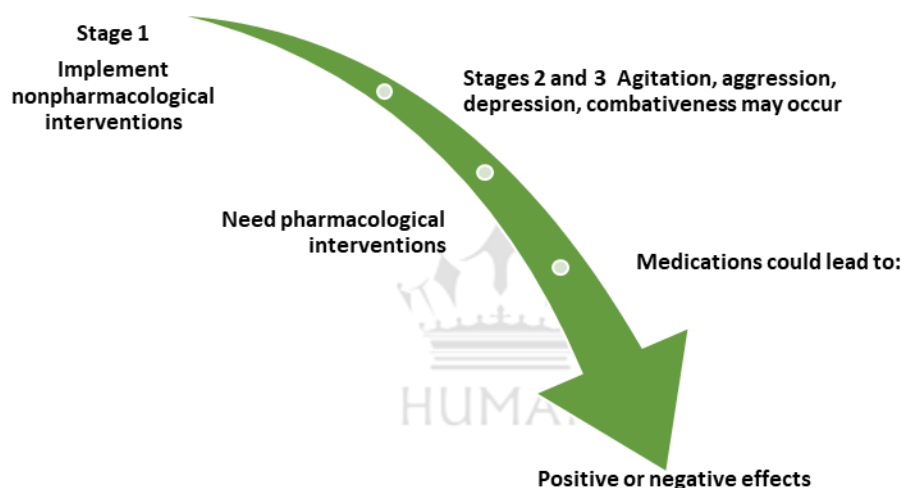
## INTRODUCTION

Alzheimer's Disease (AD) has progressive impairment on cognitive function. As of 2015, 110,561 individuals died of Alzheimer's disease, making it the 6<sup>th</sup> most common cause of death [1]. In 2019, Alzheimer's disease and other forms of dementia ranked as the 7th leading cause of death [2]. AD is categorized into stages based on the severity of symptoms. In stage 1 (mild), patients have difficulty with memory, impaired learning, apathy, and depression. Stage 2 (moderate) AD patients experience visual or spatial and language deficits, psychotic features, agitation, and wandering. In stage 3 (severe), gait disturbance, poor judgment, disorientation, confusion, incontinence, and difficulty speaking, swallowing, and walking occur. Organizations such as The Alzheimer's Association emphasize the chief cause of behavioral changes is the progressive deterioration of brain cells, however, medications, environmental influences, and medical conditions can cause symptoms or make them worse [3]. Behavioral changes cause major consequences for the patient and their caregiver, which in all causes much of their suffering. Therefore, it is vital as a healthcare worker to understand the effects behavioral changes can have on a patient with AD and their caregivers. The focus of the literature review was to explore various interventions to control behavioral changes, as well as enhance the quality of life (QOL) for patients suffering from Alzheimer's disease. Research Question: Does the effects of Alzheimer's disease on behavior impact the overall type and quality of care a patient receives?

## BACKGROUND

The type of behavioral changes experienced by a person with AD and interventions to treat symptoms are dependent on the stage of the disease [4]. As the disease progresses, cognitive and motor functions can be lost which indicates the need for caregivers for their daily needs. AD patients require an intense level of care which is often stressful for the caregiver due to the major changes the person may experience. Research regarding behavioral and psychological symptoms of dementia (BPSD) has become more relevant due to its severe consequences for the patient's QOL, as well as their caregivers [5]. It is believed that these behavioral and cognitive changes progress along with the disease, which can cause great concern for the patient and their caregivers in the early stages. Because of this, it is important as a healthcare worker to educate

the patient and their caregiver about appropriate interventions before the cognitive impairments become overwhelming. Treatment modalities are dependent on the stage of the disease and the symptoms present. In stage 1, it is appropriate to implement nonpharmacological interventions (see Figure 1). Nonpharmacological interventions include environmental changes and behavioral modifications [6]. As patients progress to stage 2 and 3, they can experience aggression, agitation, depression, and combativeness, which indicates the need for pharmacological interventions. Implementing pharmacological interventions can have positive and negative effects on the patient [6]. As a healthcare worker, it is essential to stay up to date on new research regarding interventions and what is most effective.



**Figure No 1. Interventions and possible outcomes as Alzheimer's disease progresses.**

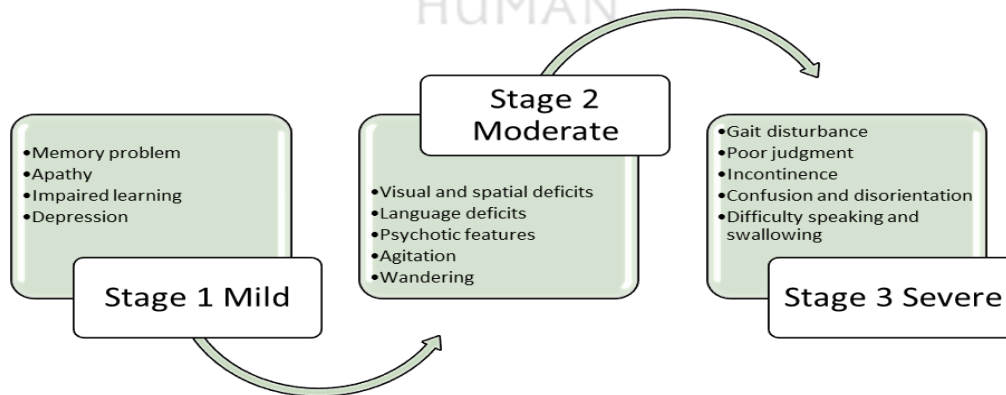
### Cause of Behavioral Changes

AD is a progressive disease that has no preventative treatment. A lot of research has been done on the cause of behavioral changes and why there are various changes in each person with AD. The manifestation of irritability anxiety, aggressiveness, hallucinations, delusion, indifference, disinhibition, and abnormal motor behavior tended to upsurge in the later stages, but that of sleep disorders, depression, eating disorder, and elation and mania tended to be stable [7]. In individuals with dementia living in the community, the combined prevalence of apathy, depression, anxiety, irritability, aggressiveness, sleep disorders, and eating disorders was higher than 20%, while that of disinhibition and elation, and mania was lower than 10% [7]. Another

study found that behavioral and psychological symptoms of dementia (BPSD) have been shown to increase by a certain number of factors such as the combination of neurodegenerative lesions, somatic comorbidities, iatrogenic effects, psychological vulnerability, caregiver, and environmental factors [5]. The cause of AD is dependent on the person which is why it can be difficult to treat their various symptoms.

### Characteristics of Behavioral Changes

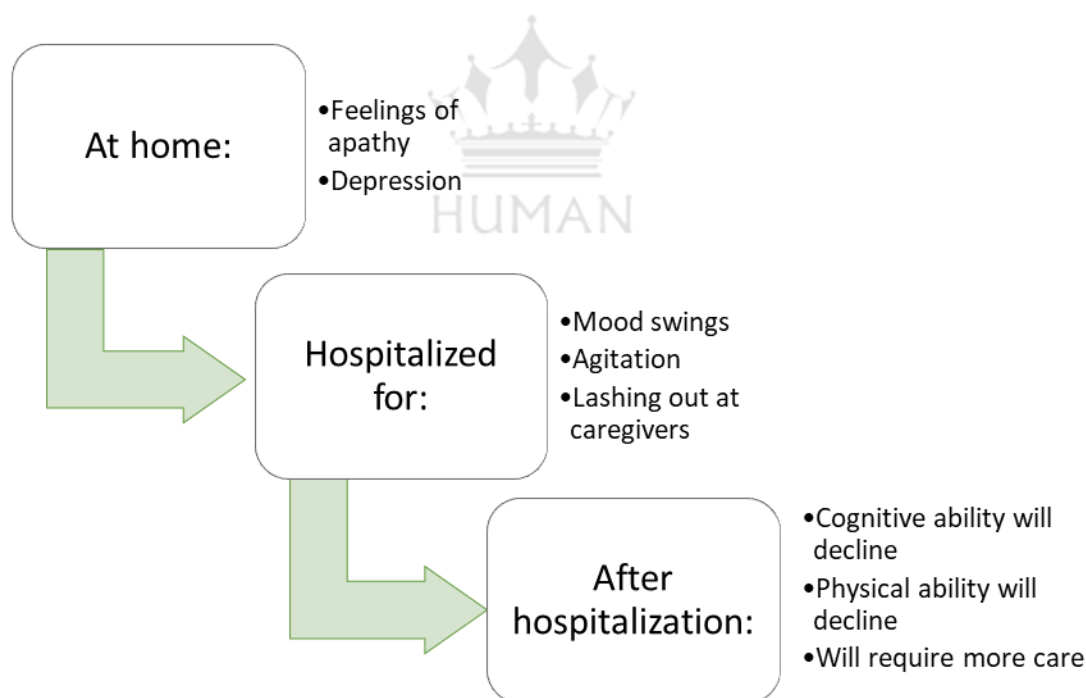
Characteristics of changes that may occur are highlighted in Figure 2. Diagnostic criteria for the stages of AD are dependent on the symptoms present. In stage 1 (mild), patients have difficulty with memory, impaired learning, apathy, and depression. Stage 2 (moderate) AD patients experience visual/spatial and language deficits, psychotic features, agitation, and wandering. In stage 3 (severe), gait disturbance, poor judgment, disorientation, confusion, incontinence, and difficulty speaking, swallowing, and walking occur. People in stage 2 may experience behavioral symptoms that reduce their QOL, are distressing to them and their caregivers, and may lead to institutionalization [8]. As a healthcare worker, it is vital to understand the various stages of AD and how it can impact a patient and their caregiver.



**Figure No 2. Characteristics of changes that may occur in Alzheimer's as the disease progresses.**

## CASE STUDY

For this case study, Patient A is discussed. Patient A is a 68-year-old single female diagnosed with Alzheimer's disease and a history of depression. She was hospitalized for increased mood swings, agitation, and episodes of lashing out at her caregivers. She has been experiencing increased difficulty in managing her symptoms in the last year, along with increased feelings of apathy and depression. Early on in her diagnosis, she did not experience as many problems, however, over time she began to experience vague symptoms, eventually becoming more forgetful and started having difficulty with memory recall and finding the right words she wanted to say; often leaving her frustrated and angry. In the last two years, she has begun to have trouble with her sense of time and numbers, often mixing up dates or people, and has challenges balancing her checkbook. She has become non-compliant with her medications and frequently forgets to take them or believes she doesn't need them, often resulting in arguments with her son or caregiver.



**Figure No 3. Behavior expected and noted in the case study of Patient A.**

At first Patient A was aware of her memory lapses, but over time her son reports she has become increasingly unaware of her impaired thinking and becomes agitated or aggressive when told

differently. Due to her increasing patterns of aggressive behavior, memory loss, and difficulty with daily tasks, she poses a safety risk to herself and others, so six months ago her son employed a part-time caregiver to assist her at home but is now wondering if she will need more care. As her Alzheimer's disease has progressed, she has gone from experiencing minimal symptoms to minor forgetfulness to more chronic memory loss and impaired judgment. Her emotional state has developed from depression and apathy to intense agitation and frustration at times. She will continue to require more care as her cognitive and physical abilities will continue to decline.

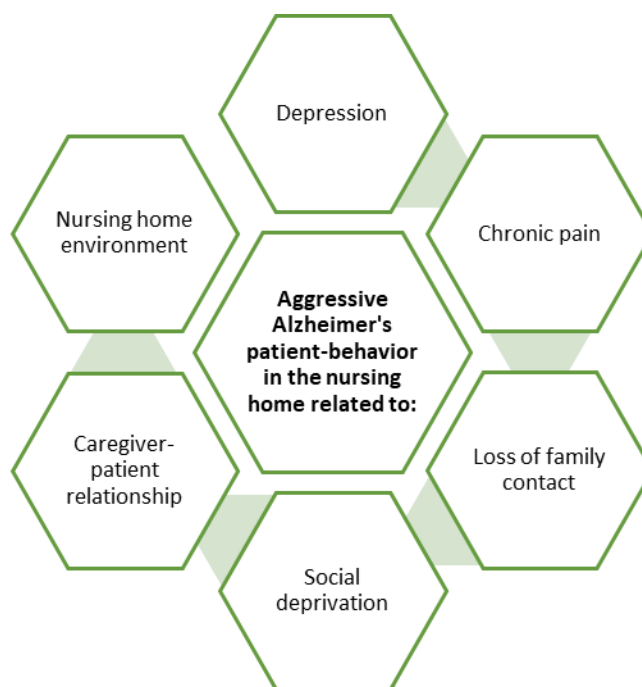
## **LITERATURE REVIEW AND FINDINGS**

While conducting the literature review, various sources including ProQuest Health and MEDLINE were used for sources from 2015-2021. Alzheimer's disease and its effects on behavior were discussed in various aspects including psychiatry, nursing, caregiver burden, and medicine. The literature review includes various interventions to help the behavioral changes and possible areas that need further research.

### **Aggressive Behavior in Common in Alzheimer's**

Behavioral changes, including aggression, have been known to be one of the more challenging behaviors to handle not only as a patient but also as a caregiver. The focus of another study [6] was to estimate the risk of aggressive behaviors in AD to aid the patient, caregivers, clinicians, and policymakers to facilitate planning for not only the patient but also public health policies. One of the main issues with preventing and treating aggressive behaviors in AD is that there is a lack of effective and safe treatment options. Pharmacological interventions, such as antipsychotics, are seen to be more effective in combating aggression but also have serious side effects. Nonpharmacological interventions, such as environmental changes and behavioral modifications, were a safer alternative but only for those experiencing less severe symptoms. As highlighted in Figure 4, It was found that depression, chronic pain, loss of family contact, social deprivation, caregiver-patient relationship, and nursing home environment are related to aggressive behaviors [6]. It was indicated that further research needs to be done to explore more effective nonpharmacological interventions to ensure patient safety. As a healthcare worker, it is

important to understand the relationship between the patient and their environment and how it can directly affect their behavioral changes.



**Figure No 4. The behavior of aggressive Alzheimer's patients and its relationship in the nursing home setting.**

### **Increased Neuropsychiatric Symptoms**

It is important to understand the relationship between caregiver burden and the outcome of patient care in those with Alzheimer's disease. Many studies [9] have found that caregiver burden is associated with increased neuropsychiatric symptoms. These symptoms include anxiety, agitation, disinhibition, aggressive behavior, stress, and sleep disturbances. The study focused on the relationship between caregiver burden and neuropsychiatric symptoms in patients with AD and to raise awareness about the disease. They concluded, caregiver burden is associated with negative outcomes for both caregivers and patients with dementia such as a decline in their general health, decreased QOL, and increased risk for morbidities. Some general health issues include lower immunity, poor immune response to vaccines, more vulnerability to infections, slowed wound healing, and a high prevalence of chronic disease (diabetes, arthritis, ulcers, anemia). Neuropsychiatric symptoms cause high levels of stress which directly increase

cortisol level and norepinephrine-epinephrine. Therefore, stress causes an increased risk of cardiovascular disease, coronary heart disease, and impaired endothelial function in the blood vessels [9].

As a healthcare worker, it is important to understand that caregiver burden is extremely common when caring for patients with AD. Therefore, it is important to not only focus on the health of the patient but also their caregivers because there is a direct correlation between caregiver burden and the quality of care the patient receives [9]. Because of this direct relationship, it is important to provide interventions for both the patient and their caregiver. Interventions for patients with AD include pharmacological, behavioral, and family interventions. Interventions to alleviate caregiver burden include education, training, counseling, support groups, stress management, exercise, and health promotion, computerized telephone system, role play, environmental modification, practice, and schedule engagement in pleasant activities [9]. In all this review found that AD requires multicomponent interventions to not only treat Neuropsychiatric symptoms but educate about caregiver burden and implement the necessary interventions.

### **Nonpharmacological Treatment in Early Stages of Alzheimer's**

Although the most effective treatment for behavioral changes in AD is pharmacological, there are many side effects they can cause. It is important to implement nonpharmacological interventions in the early stages of AD to prevent the worsening of behavioral changes. In one study, a group of 35 people without Alzheimer's Disease (AD) were tested on their knowledge of AD and health-promotion lifestyle [10]. The study aimed to find if the disease can be prevented through nutrition, diet, activity, and mental activity. Overall, this study found education about health promotion and early signs of AD to be beneficial.

There have been studies on light therapy treatment and its effectiveness in AD patients experiencing behavioral disturbances and sleep and circadian rhythms. One study [4] performed a systematic review to identify the current knowledge of the effectiveness of light treatment on sleep, cognition, mood, and behavior in AD. It was found to be effective in improvements of sleep and circadian rhythm, cognition, and reducing agitation and other mood and behavioral changes [4]. Some studies had mixed results in positive and negative effects on mood and behavior. Overall, it was more effective in the early stages of AD compared to more severe



cases. As a healthcare worker, it is important to educate patients and their caregivers on this beneficial nonpharmacological intervention.

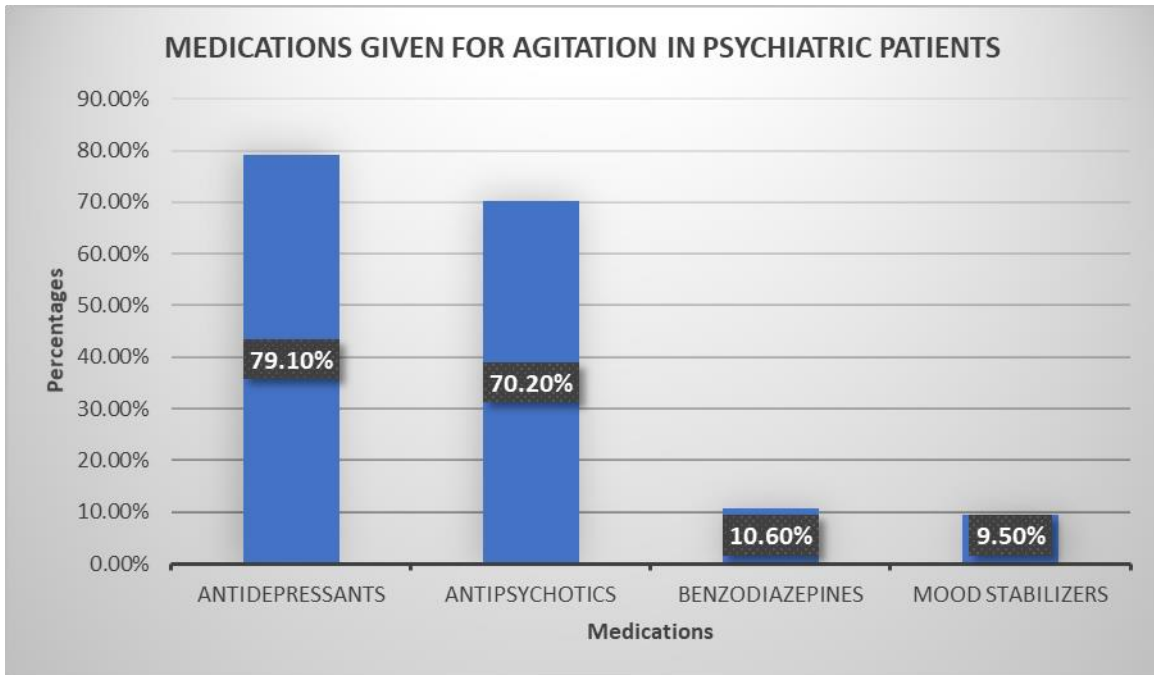
### **Pharmacological Treatment for Alzheimer's**

The purpose of another study [11] was the management of older adults with dementia who are presenting to emergency services with neuropsychiatric symptoms. The plan was to evaluate how these symptoms in patients with dementia can influence those older adults who are presenting in the emergency service settings. The retrospective cohort study pertained to the psychiatric and medical emergency departments of an academic medical center in which the participants were 65 years and older with dementia. There were a group of two subjects for this study, those who had neuropsychiatric symptoms and those who did not have these symptoms at which they were randomly selected from the group of dementia patients. These two groups were then compared based on their demographics, clinical, management, and disposition characteristics. Results from the study indicated that patients presenting to the emergency department who had neuropsychiatric symptoms would be more likely to undergo additional testing and would also be given psychotropic medications such as antipsychotics and benzodiazepines. There was a fluctuation in those who returned to these emergency services. Those with neuropsychiatric symptoms were less likely to return to the initial emergency department than those patients without those symptoms. Based on the presenting symptoms the patient's medications were then established [11].

The patients with neuropsychiatric symptoms who experienced motor disturbances likely received more psychotropic medications than those who did not experience them. In patients with depression or anxiety, they were psychiatrically hospitalized [11]. The findings of the study indicated there was a large significance in the differences for the management of dementia patients with and without neuropsychiatric symptoms present in the emergency services settings. There is potential that could lead to there being fewer psychotropic administrations if the correct method is developed and practiced in the management of patients with neuropsychiatric symptoms when presented in the emergency services department and outpatient facilities [11].

In a Brazilian study [12], as shown in Figure 5, the medications most used in patients with agitation were antidepressants (79.1%), antipsychotics (70.2%), benzodiazepines (10.6%), and

mood stabilizers (9.5%). Quetiapine was the most frequently prescribed antipsychotic medication (48.5%), Citalopram was the most widely used antidepressant medication (32.0%), Two or more pharmacologic agents were commonly used together to control aggression and agitation. Benzodiazepine was not frequently used [12].



**Figure No 5. Medications used together to control agitation and aggression.**

Citalopram is a selective serotonin reuptake inhibitor that is used in treating depression [13]. In patients with Alzheimer's disease citalopram has been proven to reduce the behavioral disturbances experienced. The goal of one study was to evaluate the effects of medications on other neuropsychiatric symptoms of patients, and if they were improved by citalopram in comparison to a placebo. In their study, the researchers investigated the effect of citalopram on 12 different neuropsychiatric symptoms. These symptoms were assessed by neuropsychiatric inventory (NPI) through the patient's caregiver. The caregivers then reported the NPI score for the patients who were receiving either the citalopram or the placebo [13].

The results revealed that at week 9, the patients who were administered citalopram were less likely to be showing any signs of delusions, behavioral aggression, or irritability [13]. It was also shown that at week nine, there were multiple differences in those who favored the citalopram or

the placebo. The overall conclusion for the citalopram was that the therapeutic effectiveness decreases the behavioral disturbances and aggression in those patients with Alzheimer's disease. The citalopram was also connected to reducing the patient's irritability, constant anxiety, and delusions. Although there was also a reduction in the hallucinations for patients taking the citalopram, there was an increase in sleep disorders of the patients [13].

### **Getting Lost Behavior in Alzheimer's**

Getting lost behavior (GLB) in the elderly population is thought to reflect impaired executive functions [14]. Those with Alzheimer's disease often experience a cognitive decline. In this study, the objective was to identify if the working memory and executive functions contribute to the relationship between visuospatial processing and GLB in those with Alzheimer's disease. The method of this research included 92 individuals with Alzheimer's disease and 46 age-matched controls who did not have AD. These participants then underwent a neuropsychological assessment, magnetic resonance imaging, and clinical interviews [14].

Both the healthy control group and the group of individuals with AD resulted in visuospatial processing deficits that were linked with GLB in those with the presence of a poor working memory [14]. In those with Alzheimer's, the GLB related to medial temporal atrophy was not strengthened by the low gray matter in the brain as previously predicted. In those with high frontal gray matter, the atrophy related to GLB was more prominent. The GLB was not found to be associated with other parts of the brain. This study showed that a top-down modulation deficit can lead to GLB in individuals with Alzheimer's and those who are healthy elderly patients [14]. Practices that highlight enhancements in the visuospatial deficits and working memory together for those with Alzheimer's and GLB can assist in cognitive advancements.

### **Treating Apathy with Methylphenidate**

In patients with AD, apathy is an overall common problem that has been discovered. The apathy in those with Alzheimer's has repercussions that include functional impairment, high caregiver burden, increased mortality, and higher use of services [15]. The objective of this research study was to examine the effects of methylphenidate on apathy in patients with Alzheimer's disease. The study method was a double-blind, randomized, placebo-controlled 12-week trial on

community-dwelling veterans with Alzheimer's. The outcomes that were prominent in this study were the effects on apathy, cognition, functional status, and overall improvement of the patient [15].

The participants were all men 77 years old with Alzheimer's. The study began with collecting baseline information from all the subjects. The group administered methylphenidate had shown significant improvement with apathy at the check-in weeks than the placebo group. The methylphenidate group has also shown improvements in their functioning, cognition, burdening of caregivers, and depression. The methylphenidate had improved the community-dwelling veterans with Alzheimer's [15].

### **Behavior Related to Executive Functioning**

Alzheimer's Disease is characterized by the co-occurrence of cognitive and functional impairment as well as behavioral and psychological symptoms of dementia. This study aimed to evaluate the association between cognitive functioning and the occurrence of behavioral and psychological symptoms of dementia (BPSD) in patients with Alzheimer's disease or AD [5].

The population is derived from the personality Alzheimer Comportment (PACO) cohort, including 237 patients with prodromal or mild AD. A neuropsychological tests battery exploring verbal and visual memory, language, attention, and executive functions was performed at baseline. BPSD were assessed at 6-, 12-, and 18-month follow-up with neuropsychiatric inventory [5]. The participants were recruited from 10 French hospital memory clinics during ambulatory visits. The patients met diagnostic criteria for AD according to NINCDS ADRDA criteria<sup>13</sup> at prodromal (CDR of 0.5) or mild dementia stage, (CDR 1) or 14 MMSE  $\geq 20$ , age over 50 years, ability to complete the clinical and neuropsychological evaluations, presence of a caregiver insufficient contact with the subject to be able to note the onset of changes in behavior. [5]. The study only focused on patients with BPSD who experience anxiety, depression, apathy, and eating or sleeping disorders. There were 10 screening tests used to assess various aspects of cognitive function including speed processing, memory, executive function, verbal and visual memory recognition, and language. The study concluded that poorer inhibition performance would be associated with a higher risk of 18-month BPSD occurrence, including anxiety,

depression, and apathy and suggests that lower executive functioning is associated with a higher risk of developing behavioral disorders in patients with mild Alzheimer's [5].

### **Changing Social Behaviors**

The neurodegenerative process underlying dementia through AD is a process that spans decades and involves a long preclinical phase that takes place well before symptoms of cognitive decline are seen [16]. The study states that subtle, largely undetected changes in mood, anxiety, and behavior may accompany this process. They were focused on identifying these changes and risk factors early in midlife of elderly Australian individuals at a predisposed genetic risk for AD, in hopes to halt or avert the neurodegenerative process, as opposed to most therapeutic trials which focus on those with established AD, and therefore, possibly irreversible neurodegeneration [16].

This prospective cohort study, "Prospective Imaging Study of Ageing: Genes, Brain, and Behaviour" (PISA) is a cohort study that utilizes genetic prediction to create a perspective and genetically rich cohort to follow longitudinally [16]. Online surveys and cognitive testing were used to characterize this Australia-wide sample with over 3800 participants. The study utilized data on functional, structural, and molecular changes of the brain along with neurocognitive testing to create their results. Funded by the National Health and Medical Research Council, PISA was not designed to test specific hypotheses regarding genetic risk, phenotype, and brain, but rather to complement other discovery-oriented cohort studies as a unique international resource and protocol that can offer broad significance for other studies such as those in dementia prevention [16].

Another study takes a unique approach to identify and understand changing social behaviors among individuals with dementia diagnoses [17]. Changing social behaviors can be symptoms of Dementia; therefore, it is necessary to learn how to identify these changes in real-world settings. However, this can be challenging for researchers to simulate objective ways of naturally assessing social interactions. In the study, the authors argue that the use of observation paradigms, the traditional method of investigating social behavior in dementia patients, is in stark contrast to day-to-day life, where situations are dependent on interactions with social partners, rather than mere observation [17]. The findings indicated that social cognition is

fundamentally different when people are in interactions with others as opposed to simply observing them.

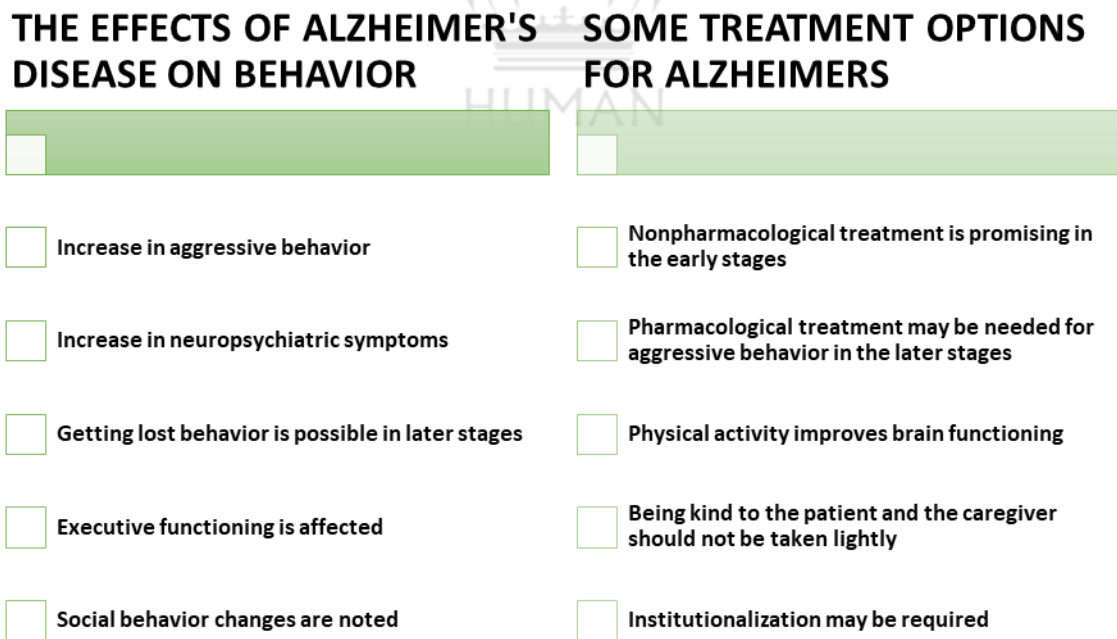
Video recordings of 10-minute conversations between 20 behavioral variants frontotemporal dementia (bvFTD) patients, 20 semantic dementia (SD) patients, and 20 AD patients and a behavioral neurologist were analyzed for socially engaging and disengaging behavior [17]. AD was used as the control group. Results demonstrated disease-specific profiles, with FTD patients showing less nodding and more looking away than AD, and SD patients showing more gesturing than AD. Results of the study revealed different profiles of engaging and disengaging behavior within groups. Specifically, FTD patients showed significantly more disengaging cues than engaging cues, whereas patients with SD and AD showed a similar amount of engaging and disengaging behaviors. AD patients showed an increased tendency to look away compared to FTD patients. FTD patients nodded significantly less than SD and AD patients during conversations. Unlike in FTD and SD, social cognitive processes remained relatively intact in AD [17].

### **Physical Activity Improves Brain**

Physical activity improves anxiety/depression and cognitive dysfunction which are growing concerns associated with aging. Given the aging of the population and the increasing prevalence of neurodegenerative diseases, there is an active research interest focused on the neurophysiological effects of exercise on the brain and behavior [18]. The systematic review concluded that exercise improved brain and behavior, neurogenesis in healthy and dementia models, reduced toxicity, and cerebral amyloid. However, evidence regarding inflammation, oxidative stress, and energy metabolism were scarce. Studies examining acute vs. chronic exercise, extreme training, and the durability of exercise benefits were rare. As the prevalence of neurodegenerative diseases continues to grow along with our aging population, understanding these deeper benefits of exercise will be important for educating our patients [18]. Exercise improves brain and behavior, neurogenesis in healthy and dementia patients, reduced toxicity, and cerebral amyloid [19].

## DISCUSSION

Based on the findings of the literature review, Alzheimer's disease negatively impacts behavioral changes in patients. Interventions are dependent on the stage of AD. Although interventions are mainly implemented to improve QOL for the patient, it is also important that the caregiver is educated and taught about interventions for themselves due to high rates of caregiver burden. Almost all cases of AD experience some sort of behavioral change, the degree of change varies. Some patients are more violent and aggressive, while others tend to wander, experience apathy and depression. As the disease progresses through the stages, increased dysfunction leads to decreased independence and feelings of frustration and anger. Socially cognitive processes can remain relatively intact in Alzheimer's disease for years, with minor changes in socially engaging and disengaging behavior such as the tendency to look away during a conversation, nod less, or use gesturing during social interactions [4.5.6]. There needs to be further research regarding the specific causes of aggressive behaviors and safe interventions to treat them. The effects of Alzheimer's disease on behavior and some treatment options are listed in Figure 6.



**Figure No 6. The effects of Alzheimer's disease on behavior and some treatment options.**

Interventions regarding this disease not only should be focused on the patient, but also the caregiver due to the findings that caregiver burden can worsen behavioral changes in patients [4,5,6,9]. It is important to include caregivers in the assessment and do a psychosocial assessment on them. Pharmacological interventions support measures for patients with moderate-severe AD. Although there are side effects, the disease is too far gone for nonpharmacological interventions in times of crisis. Nonpharmacological and dietary changes are important in the prevention and progression of the disease. It is also important to inform the patient and educate their caregivers on what caregiver burden is and how to prevent it. There is much potential in new research surrounding the preclinical phase of AD and how effective preventative interventions can be for those at increased genetic risk.

## CONCLUSION

Alzheimer's disease can contribute to an individual's cognitive impairment, language deficits, behavior, and physical functioning. Alzheimer's can be displayed differently in patients depending on what stage they fall into based on how far they have progressed through the disease. Although Alzheimer's does not have a cure, there is diagnostic testing that can establish a firm diagnosis to further plan in the preparation of cognitive-enhancing medications and independent interventions to relieve symptoms. The combination of today's rapidly aging population, the increased prevalence of neurodegenerative diseases in our society, and the recent advancements in technology and medical research make this disease process a focus of discussion in healthcare and offers potential for major advancements in treatment.

## REFERENCES

1. Zhang, X., Yu, R., Wang, H., & Zheng, R. (2020). Effects of rivastigmine hydrogen tartrate and donepezil hydrochloride on the cognitive function and mental behavior of patients with Alzheimer's disease. *Experimental and Therapeutic Medicine*, 20(2), 1789. <https://doi.org/10.3892/etm.2020.8872>
2. World Health Organization. (2020). The top 10 causes of death. *Fact Sheets*. <https://www.who.int/news-room/fact-sheets>.
3. Alzheimer's Association. (n.d.). Treatments for behavior. Alzheimer's disease and dementia. Retrieved November 19, 2021, from <https://www.alz.org/>.
4. Mitolo, Tonon, C., La Morgia, C., Testa, C., Carelli, V., & Lodi, R. (2019). Effects of light treatment on sleep, cognition, mood, and behavior in Alzheimer's disease: A systematic review. *Dementia and Geriatric Cognitive Disorders*, 46(5-6), 371–384. <https://doi.org/10.1159/000494921>



5. Rouch, I., Padovan, C., Boublay, N., Pongan, E., Laurent, B., Trombert-Paviot, B., Dorey, J. (2020). Association between executive function and the evolution of behavioral disorders in Alzheimer's disease. *International Journal of Geriatric Psychiatry*, 35(9), 1043-1050. doi:10.1002/gps.5327
6. Yu, Topiwala, A., Jacoby, R., & Fazel, S. (2019). Aggressive behaviors in Alzheimer disease and mild cognitive impairment: Systematic review and meta-analysis. *The American Journal of Geriatric Psychiatry*, 27(3), 290–300. <https://doi.org/10.1016/j.jagp.2018.10.008>
7. Kwon, C. Y., & Lee, B. (2021). Prevalence of behavioral and psychological symptoms of dementia in community-dwelling dementia patients: A systematic review. *Frontiers in Psychiatry*, 12, 1–20.
8. Halter, M. J. (2018). *Varcarolis' foundations of psychiatric-mental health nursing: A clinical approach* (8<sup>th</sup> ed., pp. 28). St. Louis, MO: Elsevier
9. Isik, Soysal, P., Solmi, M., & Veronese, N. (2019). Bidirectional relationship between caregiver burden and neuropsychiatric symptoms in patients with Alzheimer's disease: A narrative review. *International Journal of Geriatric Psychiatry*, 34(9), 1326–1334. <https://doi.org/10.1002/gps.4965>
10. Du, & Hu, J. (2016). The effects of health education on knowledge about Alzheimer's disease and health-promoting behaviors of older Chinese adults in a nursing home: A pilot study. *International Journal of Nursing Practice*, 22(1), 31–42. <https://doi.org/10.1111/ijn.12349>
11. Silwanowicz, R. M., Maust, D. T., Seyfried, L. S., Chiang, C., Stano, C., & Kales, H. C. (2016). Management of older adults with dementia who present to emergency services with neuropsychiatric symptoms. *International Journal of Geriatric Psychiatry*, 32(12), 1233-1240. <https://doi.org/10.1002/gps.4599>
12. Oliveira, L. F., Camargos, E. F., Martini, L. L. L. Machado, F. V. (2021). Use of psychotropic agents to treat agitation and aggression in Brazilian patients with Alzheimer's disease: A naturalistic and multicenter study. *Psychiatry Research*, 295 <https://doi.org/10.1016/j.psychres.2020.113591>
13. Leonpacher, A. K., Peters, M. E., Drye, L. T., Makino, K. M., Newell, J. A., Devanand, D., Frangakis, C., Munro, C. A., Mintzer, J. E., Pollock, B. G., Rosenberg, P. B., Schneider, L. S., Shade, D. M., Weintraub, D., Yesavage, J., Lyketsos, C. G., & Porsteinsson, A. P. (2016). Effects of Citalopram on neuropsychiatric symptoms in Alzheimer's dementia: Evidence from the cited study. *American Journal of Psychiatry*, 173(5), 473-480. <https://doi.org/10.1176/appi.ajp.2016.15020248>
14. Yatawara, C., Lee, D. R., Lim, L., Zhou, J., & Kandiah, N. (2017). Getting lost behavior in patients with mild Alzheimer's disease: A cognitive and anatomical model. *Frontiers in Medicine*, 4. <https://doi.org/10.3389/fmed.2017.00201>
15. Padala, P. R., Padala, K. P., Lensing, S. Y., Ramirez, D., Monga, V., Bopp, M. M., Roberson, P. K., Dennis, R. A., Petty, F., Sullivan, D. H., & Burke, W. J. (2018). Methylphenidate for apathy in community-dwelling older veterans with mild Alzheimer's disease: A double-blind, randomized, placebo-controlled trial. *American Journal of Psychiatry*, 175(2), 159-168. <https://doi.org/10.1176/appi.ajp.2017.17030316>
16. Lupton, M. K., Robinson, G. A., Adam, R. J., Rose, S., Byrne, G. J., Salvado, O., Breakspear, M. (2021). A prospective cohort study of prodromal Alzheimer's disease: Prospective imaging study of aging: Genes, brain, and behavior (PISA). *NeuroImage: Clinical*, 29, 102527. doi:10.1016/j.nicl.2020.102527
17. Visser, M., Wong, S., Simonetti, S., Hazelton, J. L., Devenney, E., Ahmed, R. M., Kumfor, F. (2020). Using a second-person approach to identify disease-specific profiles of social behavior in frontotemporal dementia and Alzheimer's disease. *Cortex*, 133, 236-246. doi:10.1016/j.cortex.2020.09.011
18. Daniele, T. M., Bruin, P. F., Matos, R. S., Bruin, G. S., Chaves, C. M., & Bruin, V. M. (2020). Exercise effects on brain and behavior in healthy mice, Alzheimer's disease and Parkinson's disease model—A systematic review and meta-analysis. *Behavioural Brain Research*, 383, 112488. doi:10.1016/j.bbr.2020.112488
19. da Costa Daniele, T. M., de Bruin, P. F. C., de Matos, R. S., de Bruin, G. S., Maia Chaves C., de Bruin, V. M. S. (2020). Exercise effects on brain and behavior in healthy mice, Alzheimer's disease, and Parkinson's disease model—A systematic review and meta-analysis. *Behavioural Brain Research*, 383, doi: 10.1016/j.bbr.2020.112488

	<p><b>Marisa N. Fassero</b></p> <p><i>Bronson School of Nursing, Western Michigan University, Kalamazoo, Michigan, USA</i></p>
	<p><b>Cameron C. Mannion</b></p> <p><i>Bronson School of Nursing, Western Michigan University, Kalamazoo, Michigan, USA</i></p>
	<p><b>Logan P. Manning</b></p> <p><i>Bronson School of Nursing, Western Michigan University, Kalamazoo, Michigan, USA</i></p>
	<p><b>Dr. Samuel P. Abraham— Corresponding Author</b></p> <p><i>Associate Professor of Nursing, Bethel University, 1001 Bethel Circle, Mishawaka, Indiana, USA</i></p>

Conflict of Interest	No conflict of interest
Funding Information	None
Authors' Contribution	All 4 authors contributed equally. Manuscript was read and approved by all 4 authors.
Acknowledgement	None