REDUCING AGITATION IN LONG-TERM CARE: A VIRTUAL REALITY INTERVENTION FOR DEMENTIA

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ABSTRACT

As the Baby Boom generation ages, the number of older adults with a form of dementia (or major neurocognitive disorder) will rise. Agitation behaviors are frequently associated with dementia, which can have negative consequences for the individual and the nursing staff in long-term care (LTC) facilities. Often, pharmacological treatments are used to manage behavioral and psychological symptoms of dementia (BPSD), but the medications prescribed often come with a myriad of side-effects. Nonpharmacological interventions hold great promise to manage BPSD. Interventions that incorporate sensory stimulation (i.e., techniques aimed at stimulating one or more senses with the goal of reducing agitation) have been successful at treating BPSD in individuals with dementia. Virtual reality (VR) technology may be thought of as sensory stimulation technique that is gaining in popularity as an assessment tool with older adults, but little research exists as to how VR can be used to reduce BPSD. The present study used a single-case research design with an ideographic approach to reduce agitation behaviors in two female participants. A blended single case experimental design was used combining the multiple-baseline design across individuals with a reversal design to examine the effects of VR nature scenes on agitation. Visual analysis was used to determine changes in mean, level, and latency of the behaviors. For both participants, a significant decrease in their respective agitation behaviors was observed during intervention phases. More research is
needed to further investigate the utility of VR technology, but this study lends evidence for a brief, effective intervention to reduce agitation behaviors in LTC facilities.

Keywords: dementia, older adults, nonpharmacological, virtual reality
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CHAPTER I

INTRODUCTION

With the rise of the Baby Boom generation, an increasing number of individuals will suffer from dementia. Presently, thirty-five million individuals have a diagnosis of some form of dementia (Ballard & Corbett, 2013) and this number can be expected to rise as the population continues to age. In fact, between the years 2012-2060 the United States population is projected to grow from 314 million to 420 million (Colby & Ortman, 2014). By the year 2030, individuals aged sixty-five and older will account for 20% of the population, which represents a 7% increase from the year 2010 (Colby & Ortman, 2014). This trend can be expected to continue given that the oldest Baby Boomers started turning sixty-five in 2011 and will peak in 2029. Approximately 5.5 million Americans currently have a diagnosis of Alzheimer’s disease (AD), with 5.3 million of them being over the age of sixty-five (Mild Cognitive Impairment: Signs, Symptoms, & Diagnosis, 2017). As the Baby Boomers continue to age, the number of AD diagnoses, as well as other forms of dementia, can be expected to climb.

Dementia almost always requires full-time care and monitoring once the disease reaches a certain level. As a result, long-term care facilities are necessary to provide the level of care required by individuals with dementia if care cannot be provided in the home. Residents with dementia can require near constant observation by nursing home staff (or 1:1 staffing), leading to high levels of burnout as a result of frustration and stress. Coupled with the challenging behaviors that some individuals with dementia
exhibit, such as aggression and agitation, the stress level of the nursing staff can grow exponentially. Finding a way to reduce and manage these behaviors in long-term care settings is necessary so the nursing staff can provide high levels of care without the additional struggle of trying to manage and control their patients’ challenging behaviors.

The purpose of this manuscript is as follows: 1) to provide an overview of the types of dementia; 2) review the literature on agitation behaviors in long-term care settings and how these behaviors manifest; 3) review the literature on behavioral interventions to reduce agitation behaviors with a brief overview of pharmacological interventions and a more in-depth look at nonpharmacological interventions; 4) introduce sensory stimulation interventions and techniques as a way to reduce agitation behaviors; 5) introduce virtual reality (VR) technology as a way to implement sensory techniques and an overview of the literature pertaining to ways VR is currently being used; and 6) describe the methods and results of a study assessing the use of VR as a relaxation technique to reduce agitation behaviors for individuals with dementia.

**Forms of Dementia**

Dementia is an umbrella term used to describe the outward expression of symptoms (i.e., phenotype) and does not speak to the underlying etiology. Thus, dementia can take many forms. Generally speaking, dementia can be defined as “a decline in memory, language, problem-solving and other thinking skills that affect a person's ability to perform everyday activities” (Alzheimer’s Disease Facts and Figures, 2019 p. 1). Physical changes to the brain are associated with cognitive decline and behavioral symptoms. *The Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5)* classifies dementia into mild or major neurocognitive disorder. To
receive a diagnosis of major neurocognitive disorder, an individual must have a significant decline in cognitive functioning from a previous level of functioning in one or more cognitive domains. This can be reported by the individual, an informant, or the clinician. Additionally, the individual’s cognitive deficits must interfere with independence in everyday activities. These symptoms cannot be present in the context of a delirium nor can they be explained by another mental disorder. The criteria for mild neurocognitive disorder are similar but require less severe symptoms. Mild neurocognitive disorder is marked by a modest cognitive decline from a baseline level of functioning in one or more cognitive domains. The decline does not interfere with daily functioning. While Alzheimer’s disease tends to most readily come to mind when the lay public think about dementia, other common forms of major neurocognitive disorder include vascular dementia, dementia with Lewy bodies, and frontotemporal dementia (described in the following sections). Dementia can also arise from progressive degenerative diseases such as Huntington’s disease and Parkinson’s disease. The DSM-5 outlines criteria for each of these subtypes of neurocognitive disorders to aid in diagnosis.

Alzheimer’s disease is the most common form of dementia and is seen in approximately 60-80% of dementia cases (Alzheimer’s Disease Facts and Figures, 2019). The National Institute of Neurological and Communicative Disorders and Stroke and the Alzheimer’s Disease and Related Disorders Association (NINCDS-ADRDA) criteria (McKhann et al., 1984) are commonly used to diagnose AD (Varma et al., 1999). The NINCDS-ADRDA criteria state that a diagnosis of probable AD needs to consist of a dementia diagnosis confirmed by a neuropsychological test, deficits in two or more areas of cognition, progressive worsening of memory and other cognitive functions, no
disturbance of consciousness, onset between ages 40 and 90, and the absence of other diseases that could cause progressive deficits in memory and cognition (McKhann et al., 1984). Common symptoms include struggle with memory and recall for day to day events (e.g., to remember names and past events), as well as, confusion and behavioral changes such as wandering, aggression, and repetitive vocalizations (Alzheimer’s Disease Facts and Figures, 2018). Social skills can remain fairly well preserved (Varma et al., 1999). AD is a progressive disease that will worsen overtime. Currently, medications exist to help slow the progression, but no cure exists.

Vascular dementia (VaD) is the second most common form of dementia and accounts for 15-20% of dementia cases (Haaland & Swanda, 2008). VaD typically arises from ischemia, hemorrhage, or hypoxia-ischemia (i.e. brain injury caused by lack of oxygen) (Haaland & Swanda, 2008). Large artery disease, cardiac events, or small vessel disease characterize the primary vascular mechanisms related to VaD (Erkinjuntti & Pantoni, 2000). Different from AD, early signs of vascular dementia are less memory based as VaD tends to impair executive functioning (e.g., difficulties with planning, decision making, and impaired judgment) (Alzheimer’s Disease Facts and Figures, 2018).

Dementia with Lewy bodies (DLB) occurs when toxic proteins aggregate in the brain (Smith & Bondi, 2008). Lewy bodies are toxic neuronal inclusions comprised of a protein known as alpha-synuclein. DLB tends to present as a delirium-like state with confusion, attention deficits, and psychiatric symptoms, including visual hallucinations, and can lead to changes with motor control and sleep (McKeith, 2000). LBD accounts for about 10-30% of all dementia cases (Smith & Bondi, 2008). It is possible for Lewy bodies to be present with a diagnosis of AD and are often seen if an autopsy is performed
(Smith & Bondi, 2008). Compared to AD, greater cognitive deficits are seen in neuropsychological testing with attention, letter fluency, and visuospatial skills (Smith & Bondi, 2008).

Lastly, frontotemporal dementia (FTD) arises from the progressive loss of nerve cells in either the frontal or temporal lobes of the brain (Frontotemporal dementia, 2018). FTD is typically differentiated from AD based on the age of onset; FTD tends to present at a younger age (prior to age sixty-five) (Smith & Bondi, 2008). Symptoms associated with FTD tend to be characterized by behavioral and personality changes that can lead to disinhibition and language disorders (Mann, Neary, & Snowden, 2000).

It is also possible to have multiple etiologies accounting for the dementia phenotype (DSM-5, 2013). This would occur if an individual meets criteria for a major or mild neurocognitive disorder with evidence from the history, physical examination, or laboratory findings that the disorder can be accounted for by more than one etiology (e.g., Alzheimer’s disease and vascular neurocognitive disorder) (DSM-5). Research tends to focus on AD given that it is the most common form of dementia, but it is important to be aware of the other forms of dementia as the symptomatology presents differently.

**At-Risk population.** Women in particular are a vulnerable, at-risk population for developing dementia. Currently, nearly two-thirds of AD diagnoses are comprised of women (Alzheimer’s Disease Facts and Figures, 2018). Women have a one in six chance of developing AD whereas men have a one in eleven chance (Women and Alzheimer’s disease: Factsheet). Many statistics exist that highlight the higher rates of dementia amongst women, but more research is needed to understand the mechanism(s) for why this occurs. One explanation is that women may have risk factors such as obesity and
diabetes at higher rates than men, which may increase the likelihood of developing a form of dementia (Vina & Lloret, 2010). Another explanation is that the ApoE4 gene associated with AD more commonly affects women than men (Giannattasio et al., 2008). Additionally, women seek health care services more frequently than men, for both physical and mental health concerns, so it is possible that women are simply getting diagnosed more frequently due to increased doctor contact (Thompson et al., 2016). While more research is needed to better understand the link between women and higher rates of dementia, the fact remains that women may have a greater need for targeted treatments.

**Behavioral and Psychological Symptoms of Dementia**

Individuals diagnosed with a form of dementia almost always require full-time care and monitoring once the disease reaches a certain level of severity. As a result, long-term care (LTC) facilities can become important settings to provide the level of care required by individuals with dementia. Memory care units are becoming more common so that individuals receive the level of care required by these diseases. With dementia, sometimes troubling behavioral symptoms can arise.

Behavioral and psychological symptoms of dementia (BPSD) is an umbrella term used to encompass troubling symptoms resulting from dementia. BPSD symptoms can include delusions, hallucinations, and aggression (Wang et al., 2016). BPSD symptoms can be characteristic of the type of dementia. For example, visual hallucinations may be more common with Lewy body dementia, whereas aggression can be seen more frequently with frontotemporal dementia (Zuidema, Koopmans, & Verhey, 2007).
Agitation is a type of behavioral disturbance that can be particularly taxing on nursing staff.

**Agitation**

Agitation is a distressing behavioral disturbance that affects the quality of lives of the individual as well as the LTC environment. Approximately 40-60% of dementia patients in LTC exhibit at least one agitation behavior (Ballard & Corbett, 2013). One way to operationally define agitation is the “inappropriate verbal, vocal, or motor activity that is not judged by an outside observer to result directly from the needs or confusion of the agitated individual” (Cohen-Mansfield, Marx, & Rosenthal, 1989, p. 77). Due to the disruptive nature of these behaviors and the strain they can place on caregivers and nursing staff, many researchers have tried to better understand the cause, extent, and meaning behind agitation behaviors.

Agitation behaviors can have many negative consequences. Caregivers can experience high levels of burnout (Cipriani, Vedovello, Nuti, & Di Fiorino, 2011), symptoms of depression (Fauth & Gibbons, 2014), and an overall lower quality of life (Ballard & Corbett, 2013). Cohen-Mansfield and colleagues (1989) were some of the earliest researchers who identified a need to better understand agitation behaviors. They observed that agitation behaviors are typically treated with medications, physical restraints, increasing number of staff members attending to the individual (i.e., increasing staffing as part of behavior plans), and also by making changes to the environment. Cohen-Mansfield et al. (1989) desired to shift the treatment of agitation behaviors from pharmacological methods to understanding why and how the behaviors manifest in the first place.
Cohen-Mansfield et al. (1989) studied 408 residents in suburban nursing homes (316 female, 92 male, $M_{age} = 85$). All participants had varying degrees of cognitive decline, which is a diagnostic criterion of dementia. The Cohen-Mansfield Agitation Inventory (CMAI) was used to capture agitation behaviors. The CMAI consists of twenty-nine items that capture the span of agitation behaviors (e.g., hitting, pacing, throwing things). The CMAI was created based on previous literature reviews as well as nurses’ reports. Based on rater reports, most agitated behaviors occurred during the daytime hours as opposed to at night. The most common agitated behaviors were restlessness, pacing, repeating sentences, requesting attention, complaining, being negative, and cursing. Ninety-three percent of the residents studied displayed at least one agitated behavior. Cohen-Mansfield et al. (1989) performed a factor analysis and grouped agitated behaviors into three categories: aggressive behavior, physically nonaggressive behavior, and verbally agitated behavior. The CMAI long-form further divides the verbally agitated behavior into verbally aggressive and verbally nonaggressive.

The work of Cohen-Mansfield and colleagues created the foundation for future researchers to study the manifestations of agitated behaviors in LTC residents with dementia. Across the literature, disagreement is present amongst researchers as to whether aggression should fall under the umbrella term of agitation. For the purpose of this paper, aggression will be treated as a category of agitation, following the Cohen-Mansfield framework.

From a behavioral perspective, behavior is viewed as a product of the interaction between the person and the environment (Bijou, 1995). Thus, behavioral assessment is one way to study agitation behaviors. This method involves “an analysis of the context in
which a behavior occurs and provides information regarding the ‘reason’ for its occurrence” (Fisher, Harsin, & Hayden, 2000, p. 181). It involves assessing the *topographical features* and the *functional context* of a behavior. The CMAI can be considered a *topographical* assessment, that is an inventory that assesses the topography of the behavior (what it looks like) without attention to the function or cause of the behavior. The functional context examines the context in which the behavior occurs and tries to determine factors that maintain or perpetuate the behavior (Fisher et al., 2000).

From a behavioral perspective, these researchers (and others within the field of behavior analysis) believe that combining both of these factors can lead to the design and implementation of behavioral interventions tailored to individual needs.

A behavioral contingency consists of antecedents, behaviors, and consequences (ABC) (Skinner, 1953). The ABC model represents antecedents (stimuli, actions, or events that led up to the behavior), behaviors (target behavior of interest), and consequences (actions or responses that follow a behavior). Understanding what leads up to a problem behavior and the resulting consequence (e.g., reinforcer), can offer valuable information about what perpetuates the unwanted behavior and suggest an avenue for intervention.

Agitation behaviors have been widely studied by other researchers due to the impact they have on nursing staff, other residents, and on the overall quality of life of individuals experiencing them. Aggressive behaviors can be particularly difficult for caregivers to manage. Cipriani et al. (2011) considers aggressive behavior to be a neurobiological dysregulation that can be made worse with environmental factors. Aggressive behaviors are believed to occur in anywhere from 30-50% of dementia
patients (Ballard, O’Brien, James, & Swann, 2001). However, physically aggressive behaviors have been reported to occur in as many as 86% of individuals with dementia (LeBlanc, Raetz, & Feliciano, 2011). Aggressive behaviors are more likely to occur in individuals with depression and/or in patients with impairments in activities of daily living (Lyketsos et al., 1999). They can be a response to a perceived threat or unpleasant event in the environment and are often times preceded by an antecedent (e.g., task demands or physical contact with caregiving staff during ADLs) (LeBlanc et al., 2011). Often when patients exhibit these types of behaviors in LTC, there can be negative consequences for the individual such as higher rates of antipsychotic prescriptions, use of physical restraints, greater health care costs, and, in more extreme cases, elder abuse (Cipriani et al., 2011).

Fisher and Buchanan (2018) studied aggressive behavior using a single-case design approach. The study included one participant (female, age = 88) with a diagnosis of Alzheimer’s disease who displayed several aggressive behaviors (e.g., slapping, pushing, scratching, and crying). The researchers implemented an ABAB reversal design which included a baseline phase for observations, followed by an intervention, return to baseline, and a second intervention phase. A stimulus preference assessment was performed so that the participant could choose a stimulus that she liked (baby video). During the intervention phase, her nurses were trained to orient her continuously to the stimulus during the time she expressed her agitated behaviors (evening while getting changed for bed). A 69% reduction was seen with the participant’s verbally aggressive behaviors between the first baseline phase and the first intervention phase with a 61% reduction in physically aggressive behaviors. Increases in both verbal and physical
aggression were seen in the second baseline phase, followed by a 75% reduction in verbal aggressive behaviors and a 70% reduction in physical aggression in the second intervention phase. Fisher and Buchanan (2018) concluded that incorporating a preferred stimulus with LTC residents exhibiting aggressive behaviors may lead to a reduction in unfavorable behaviors making the caregiving environment more manageable. The researchers believed that this finding is important because aggressive behavior was reduced without the use of restraints and pharmacological intervention. Additionally, it was inexpensive, required little training, and allowed for the participant to have access to pleasurable stimuli. Often it is difficult in LTC to incorporate personally meaningful activities either because the individual has language deficits, and therefore does not voice a preference, or the staff does not have time to engage in this personalized manner (Fisher & Buchanan, 2018). The stimulus preference assessment is one way to assess preferences in those with language impairments.

Some researchers have studied the verbal signs of agitation in dementia patients. Verbal outbursts, such as screaming, can be considered agitation and can be categorized into either verbally aggressive or verbally nonaggressive behavior. Examples of verbally nonaggressive behavior include continuous talking, moaning, or complaining whereas verbally aggressive behavior could take the form of screaming or abusive language (Beck et al., 2011). Verbally agitated behaviors have also been labeled as problematic vocalizations (Beck et al., 2011) or disruptive vocalizations. Sloane et al. (1999) found that problematic vocalizations can occur in around 11-30% of LTC residents with dementia. Beck et al. (2011) conducted a study to better understand factors that contribute to verbally disruptive behaviors. The study included seventeen nursing homes
throughout central Arkansas with 138 participants (74.6% female, 25.4% male, all over 65 years of age) all of whom had a diagnosis of some form of dementia in their chart. Participants were videotaped at fourteen different time points to capture the problematic vocalizations and tapes were coded by two research assistants. Personality traits were measured using the Neuroticism Extroversion Openness Five Factor Inventory adapted for informant use. Five factors were found that influenced the vocalizations. Having the personality trait of agreeableness led to higher rates of verbally nonaggressive behaviors and having a background of conscientiousness led to lower overall rates of problematic vocalizations. Increased age also led to lower rates of vocalizations. Factors that increased problematic vocalizations included being female and having poorer overall health. The work of Beck et al. (2011) emphasizes the need for caregivers to gain an understanding of the factors that contribute to problematic vocalizations so that they can be better understood and lead to more effective interventions.

Another study attempted to gain a better understanding of verbally aggressive behavior, specifically screaming in LTC. Bourbonnais and Ducharme (2010) conducted a qualitative study with seven participants (4 female, 3 male, $M_{age} = 81.0$) all with a dementia diagnosis. Along with the help of the patient’s primary caregiver, researchers collected sociodemographic information and used descriptive questionnaires, direct observation, semi-structured interviews, informal conversations, and field notes for data collection. The collected information was analyzed to extract themes as to why the participants exhibited screaming behaviors. Seven themes emerged including dissatisfaction, satisfaction, pain, emotional expression, physical needs not being met, desire to change one’s environment, and uncertainty. Keeping these in mind may help
staff determine the underlying cause of one’s screaming, which can lead to targeted interventions. Bourbonnais and Ducharme (2010) also found that consistency in caregiving staff led to higher levels of trust and therefore reduced the screaming behaviors. Additionally, having a family member present caused the behavior to stop for three out of the seven participants. It can be concluded that verbally aggressive behaviors can occur for an assortment of reasons and trying to pinpoint the cause can lead to the most effective treatment options.

As difficult as verbally aggressive behaviors are to manage, it can be even more troubling when agitation behaviors present as physically aggressive behavior in residents with dementia. Isaksson, Graneheim, Astrom, and Karlsson (2011) studied 309 residents (29.1% male, $M_{age} = 82.13$) in Swedish nursing homes. Structured interviews were used to gather information with the staff that spent the most time with the resident. Staff were asked to report physically aggressive behaviors from the past week. It was found that ninety-eight residents displayed at least one physically aggressive behavior in the past week (about 31.7%). They were more commonly exhibited by males, with residents on an antipsychotic medication, and those who struggled with disorientation.

A study by Lachs et al. (2013) looked at staff ratings of aggression over a two-week period. Residents ($N = 1,552$) with dementia were included in the sample throughout the New York City area and 282 nursing assistants were interviewed. Structured questionnaires were used to gauge the presence or absence of aggressive behaviors. Out of the nurses’ interviews, 15.6% of nurses reported at least one aggressive behavior whether it was physical (2.8%), verbal (7.5%), sexual (0.5%), or both verbal and physical (4.8%). The behaviors were most likely to occur in a resident’s room.
(77.2%) and in the morning hours (84.3%). Compared to Isaksson et al. (2011), the rates of physical aggression were found to be lower in Lachs et al. (2013) study, which may be due to methodological differences and/or different operational definitions of aggression. For example, Isaksson et al. (2011) used an interview format to gather information, which may have allowed for broader inclusion of what qualifies as “aggressive” versus a questionnaire format. Despite the differences, the studies present a need to better understand aggressive behaviors given the negative impact they can have on residents’ quality of life and the lives of the caregiving staff. Being exposed to these types of behavior can lead to apathy, depression, and agitation in caregivers (Fauth & Gibbons, 2014).

**Pharmacological Interventions**

Agitation has been established as a problematic behavior that can arise as dementia progresses. Often, LTC facilities will rely on pharmacological options to manage unwanted behaviors. The effectiveness and safety of medication options for BPSD reduction has been questioned by researchers and policy makers. Three common classes of drugs used to manage these symptoms include antidepressants, anxiolytics, and antipsychotics (Treatments for Behaviors, 2018). Antipsychotics are most commonly used to manage hallucinations, delusions, aggression, agitation, hostility and uncooperativeness (Treatments for Behaviors, 2018). Commonly used drugs from this category include risperidone, olanzapine, clozapine, and aripiprazole.

It is well established in the literature that pharmacological treatments for dementia carry substantial risks and may not be effective, yet they continue to be prescribed. For example, the Clinical Antipsychotic Trials of Intervention Effectiveness-Alzheimer’s
Disease Study (CATIE-AD) was a large-scale study involving 42 sites ($N = 421$) and found that cognitive performance decreased for dementia patients receiving an atypical antipsychotic medication when compared with controls (Vigen et al., 2011). The FDA issued black box warnings for these medications, which were found to reduce the rate of new prescriptions, yet had no effect on the overall number of prescriptions (Valiyava, Herrmann, Rochon, Gill, & Anderson, 2008). In addition to potential negative effects on cognition, antipsychotic medications like risperidone can increase the risk of cardiovascular accidents, osteoporosis, hypotension, and increase the risk of falls (Wang et al, 2016). Additionally, a review article by Douglas and Smeeth (2008) revealed that strokes increased for patients taking an antipsychotic medication (1.9%) compared to placebos (0.9%). Despite the warnings and risks involved with pharmacological treatments for dementia, these medications remain in usage. Approximately 23.9% of nursing home residents receive at least one antipsychotic medication (Atypical Antipsychotic Medications: Use in Adults, 2011). In addition to antipsychotics, other drug classes have been utilized (off label) to attempt to reduce agitation in individuals with dementia.

Drye and colleagues (2012) designed a study to determine if an antidepressant, citalopram, was effective for agitation behaviors. Previous studies have shown mixed success. Two hundred participants were randomized into one of two conditions: citalopram (30 mg/day) or placebo (Drye et al., 2012). The intervention lasted for a period of nine weeks. The results of the study were reported in a later article (Rosenberg et al., 2015). Results showed a significant reduction in agitation behaviors, measured by the CMAI, three weeks into the intervention with positive outcomes maintained
throughout the nine weeks. Rosenberg et al. (2015) acknowledged that those individuals with higher baseline agitation scores showed the greatest improvement, which may simply reflect regression to the mean. Cognitive performance was also measured at pre and post intervention using the Mini-Mental State Examination (MMSE). Average scores reflected an increase from 14.4 to 15.7, an increase that is statistically significant but is not clinically significant. Although the study provides an example of how an antidepressant medication can be used to help with agitation behaviors, the improvements are slight, and no long-term results were measured. Additionally, researchers may find statistically significant results, but lack clinically meaningful results.

Another study performed by Dutcher et al. (2014) looked at four classes of medications (antidementia, antipsychotics, antidepressants, and mood stabilizers) to determine the effect on physical functioning and cognition on 18,950 LTC residents with dementia (76% female, 24% male, $M_{age} = 83.6$). The study was longitudinal, lasting over two years. Researchers found that 15% of participants were being treated with an antidementia medication, 13% with an antipsychotic, 40% with an antidepressant, and 3% with a mood stabilizer. Over the two-year study, researchers observed slower rates of decline with physical and cognitive functioning, but results were not clinically significant. Dutcher et al. (2014) concluded that the results were not strong enough to justify the use of these medications with dementia patients.

If pharmacological interventions produce small, short-term effects with sometimes (or often) adverse side effects, it begs the question as to why they are being commonly prescribed. The severity and type of BPSD symptoms seems to have a moderating effect on rate of prescriptions. Bonner et al. (2015) conducted a widespread
study gathering 200 residents from twenty-six nursing homes who were being treated with an antipsychotic for dementia. Data were gathered via medical records and open-ended interview responses from nursing staff. Antipsychotics were most commonly prescribed for individuals with verbal agitation behaviors ($n = 91$), followed by aggressive behaviors ($n = 85$), and lastly, individuals who struggled with daily care ($n = 51$). Out of the 466 interviews conducted with nursing home staff, only 60 instances occurred where a staff member reported that an individual had a psychiatric diagnosis (12.9%). It is problematic that antipsychotic medications are being prescribed at high rates to treat non-psychotic conditions. Given that serious risks are involved with this group of medications (e.g., premature death) (Bonner et al., 2015), the use of these medications needs to be more carefully monitored.

New legislation was passed in May 2017 outlining tighter monitoring of the prescribing of unnecessary drugs (Unnecessary Medications, Psychotropic Medications, and Medication Regimen Review Critical Element Pathway, 2017). The legislation outlines what is an unnecessary drug and broadens the class of what is considered a psychotropic. It also limits the amount of time a psychotropic medication can be prescribed PRN to 14 days. Beyond 14 days, an additional prescription and in-person evaluation is required to justify the use of the medication. It is too early to determine whether this new legislation will have the intended effect of decreasing new prescriptions through tighter monitoring and required re-evaluation. However, what is clear is that the overprescribing of unnecessary drugs, many for behavioral control, remains an issue in long-term care settings.
One reason why medications with potential for serious side effects continue to be prescribed is because of the potential improvement on caregiver burden. A meta-analysis conducted by Schoenmakers, Buntinx, and De Lepeleire (2009) looked at whether pharmacological treatments for BPSD could reduce family caregiver burden \((k = 8)\). The researchers found that caregivers supported the use of medications because they believed it reduced their burden as they spent less time supervising their care recipients. This may be due to the sedation effect that some of these medications produce (Newell et al., 2015). Another article speculated on reasons why these medications are being frequently prescribed. Thompson (2011) wrote that families are not likely to protest the use of these medications for a loved one in LTC. Most will trust the doctor and go along with the orders. Additionally, physicians may feel like it is the best solution because nursing homes tend to be understaffed and nurses are not trained specifically in nonpharmacological interventions (Thompson, 2011). Even though clear risks have been established, medications are widely viewed as an effective fix to make day-to-day caregiving responsibilities more manageable.

Another option needs to be available to more appropriately treat agitation behaviors associated with dementia. Finding a way to reduce and manage challenging behaviors in long-term care settings is necessary so the nursing staff can provide high levels of care without the additional struggle of trying to manage and control their residents’ disruptive behaviors. Nonpharmacological options exist that may hold the answer to reducing these behaviors while maintaining quality of life and resident safety.
Nonpharmacological Interventions: Sensory Stimulation

Nonpharmacological interventions are interventions that do not rely on medications to reduce unwanted behaviors. The literature on nonpharmacological interventions is vast and aims to reduce a wide range of ailments and challenging behaviors. Of particular interest to the reduction of agitation behaviors associated with dementia are nonpharmacological interventions that rely on sensory stimulation. While other types of interventions have been implemented to help with agitation behaviors, sensory interventions are gaining traction and are highly relevant to the study at hand.

Sensory stimulation refers to a technique aimed at stimulating one or more senses with the goal of reducing agitation by increasing alertness and hopefully improving quality of life (Lykkeslet, Gjengedal, Skrondal, Storjord, 2014). In order to be most effective for those with dementia, sensory stimulating activities should be engaging and meaningful for the individual (Robertson, 1987). Common types of sensory stimulation include music, light therapy, massage, and aromatherapy (Strom et al., 2016). Bauer, Rayner, Koch, and Chenco (2012) posit that older adults with dementia are “more vulnerable to the effects of sensory deprivation,” which can lead to maladaptive behaviors (p. 3062). Sensory interventions, and especially those that engage senses in a meaningful way, are believed to both stimulate individuals with dementia and also create a relaxation effect (Bauer et al., 2012). The literature on the effectiveness of these interventions is mixed; however, they may be helpful in mitigating agitation behaviors. A review of the literature on sensory stimulation interventions follows.

Music interventions. Music is one form of sensory stimulation that incorporates multiple senses, in a meaningful, engaging way, to help reduce agitation behaviors. These
Interventions can take many forms such as individual versus group, live music versus recorded, and can be composed of different musical instruments. Cox, Nowak, and Buettner (2011) performed a music intervention over the course of four weeks with seven participants (4 females, 3 males, $M_{age} = 77.0$) living in a residential care facility. Participants were exposed to a live violin player (one-on-one) who played for eighteen minutes across three sessions. Using the CMAI, participants’ agitation behaviors were documented fifteen minutes prior to the intervention, during the intervention, and fifteen minutes following. A frequency count was used to capture participants’ agitation behaviors. Statistically significant decreases in agitation behaviors were found during and after the intervention, particularly pacing and aimless wandering. Cox et al. (2011) concluded that the intervention was successful, but that more research is needed. Long-term effectiveness of this music intervention cannot be drawn given that the post-intervention data was collected immediately following the intervention.

Another music intervention evaluated the effects of a group music intervention on agitated behaviors. Lin et al. (2011) used an experimental design with 104 participants, randomly assigned to either the experimental condition ($n = 52$, 53.06% female, 46.94% male, $M_{age} = 81.46$) or control ($n = 52$, 52.94% female, 47.06% male, $M_{age} = 82.15$). Participants were recruited from three nursing homes. The experimental group was exposed to twelve 30-minute group sessions, conducted twice a week for six weeks total. The intervention included playing instruments (glockenspiel), listening to recordings of music, and singing. The CMAI was used to measure agitation behaviors at baseline, session 6, and session 12 as well as one-month post-intervention. Results showed a significant reduction in agitation behaviors at all three time points including one-month
post-intervention for the experimental group (no statistical difference for the control group). Lin et al. (2011) believe the effects of the intervention are attributed to the relaxing nature of music and the feeling of calmness that seemed to result in participants. Another group intervention used percussion instruments to help reduce agitation and anxiety in older adults with dementia (Sung, Lee, Li, & Watson, 2011). This study also used an experimental, randomized design placing participants \( N = 55 \), 65.8% female, 34.2% male) in the experimental group \( n = 27 \), \( M_{age} = 81.37 \) or control group \( n = 28 \), \( M_{age} = 79.5 \). The CMAI was used to measure agitation behaviors and the Rating of Anxiety in Dementia (RAID) scale captured anxiety. The intervention was performed twice a week in the mid-afternoon and lasted for six weeks. Participants played percussion instruments to familiar music in a group setting for approximately three minutes at each session. The CMAI was delivered prior to the start of the intervention (baseline), week four, and week six. Results did not find a significant difference in agitation scores when compared with controls, but the intervention did significantly reduce anxiety.

Finally, a meta-analysis performed by Pederson, Andersen, Lugo, Andreassen, and Sutterlin (2017) pooled together data from twelve music intervention studies \( N = 658 \) to determine if these interventions have a significant effect on agitation behaviors. A random-effects model was applied due to the various methodologies in the primary studies. Using Cohen’s d as the effect size metric, the overall summary effect size was 0.61, indicating a moderate effect size. When examining meta-moderators, there was no significant difference between participants doing music alone or in a group setting.
Additionally, no significant difference was found for active versus passive involvement with the intervention.

Music interventions are a particularly important category of sensory stimulation interventions due to the meaningful engagement of the senses and the potential for social interaction. Research with music interventions is mixed, but overall, they suggest that having a focused activity to do, whether alone or in a group setting, may have some positive effect on behavior in the short-term.

**Bright light therapy.** Besides music interventions, other forms of sensory interventions exist to reduce agitated behaviors associated with dementia. For example, *bright light therapy* has been studied due to its low level of invasiveness and low potential for side effects (Chesson et al., 1999). Agitation has been linked to increased sleep disturbances due to the negative impact on one’s circadian rhythm (Cohen-Mansfield, Marx, & Rosenthal, 1990). A study by Burns, Allen, Tomenson, Duignan, and Byrne (2009) performed a bright light intervention to measure the effects on agitation for older adults in nursing homes. Participants (\(N = 48\)) were randomly assigned to the control group (\(n = 24\), 62% female, 38% male, \(M_{\text{age}} = 82.5\)) or the treatment group (\(n = 24\), 73.0% female, 27% male, \(M_{\text{age}} = 84.5\)). The intervention lasted two weeks with control participants exposed to standard fluorescent light (100 lux) and treatment participants exposed to a 10,000 lux light. A light box was used with a nurse present. Participants were exposed to the light for approximately two hours at the same time each day. Results showed that both groups improved on CMAI scores from baseline to post-intervention, with no significant between group differences. Despite the lack of overall significance, researchers argued that bright light therapy reduced agitation behaviors in
some participants (showing clinical importance) and may be an appropriate treatment alternative to pharmacological options.

A study by Barrick et al. (2011) created an intervention with ambient bright light to measure the effect on agitation behaviors. Participants with a charted diagnosis of dementia ($N = 66$, 35 male, 31 female) were recruited from two residential care facilities. Participants were exposed to all three experimental conditions: exposure to AM bright light, PM bright light, and all-day bright light. A baseline condition of standard light was also included. Each type of exposure lasted for three weeks to allow for participants’ circadian rhythms to adjust. It was found that exposure to bright light in all three experimental conditions increased agitation, especially with participants with mild to moderate dementia compared to severe dementia. The researchers concluded that bright light therapy may be over-stimulating to the senses. The importance of finding a balance when it comes to sensory stimulation is important to mitigate the effects of over-stimulation which may be overwhelming for individuals with dementia.

Due to the mixed results with bright light therapy, reviews have been performed to pool the existing literature and attempt to draw overall conclusions. A review by Strom et al. (2016) included eight bright light studies. Five of them specifically looked at reducing agitation behaviors associated with dementia. The methodologies varied greatly between the studies making it difficult to draw conclusions. The researchers concluded that bright light therapy has little effect on agitation behaviors.

**Massage therapy.** Another way to engage individuals in sensory stimulation is through *massage*. Massage is believed to work by inducing a state of calmness with a reassuring sensation, which can lead to the production of oxytocin to reduce discomfort
and agitation (Hansen, Jørgensen & Ortenblad, 2006). A pilot study performed by Moyle, Burne-Johnston, and O’Dwyer (2011) examined the effects of foot massage with 22 participants with dementia (17 males, $Mage = 84.7$) in long-term care. Massages were given by trained professionals on each foot for five minutes, once a day, for 14 consecutive days. The CMAI was given at baseline, immediately following the two-week intervention, and again two weeks after the completion of the intervention. Results showed a significant reduction in agitation immediately following the intervention, but no long-term effects at follow-up. This study shows the importance of continuous exposure to massage in order to achieve the desired effect, which poses practicality barriers.

**Animal-assisted therapy.** Other forms of sensory stimulation include exposure to animals. Animal-assisted therapy is believed to be effective because it provides pleasant tactile sensation and companionship, which tends to be interpreted as friendly and non-judgmental (Perkins, Bartlett, Travers, & Rand, 2008). Two recent studies were performed examining the effects of animal-assisted therapy on BPSD. One was a systematic review examining various types of animal therapies, and the other was a meta-analysis looking specifically at robotic animals.

Yakimicki, Edwards, Richards, and Beck (2019) performed a systematic review studying the relationship between animal-assisted interventions and BPSD. They included 32 studies in their examination: 27 studies looked at dog assisted therapy, two studies used fish, one used horses, one used cats, and one used both a cat a dog. Studies varied in the types of methodologies and settings in which the data were collected. Fifteen of the studies looked specifically at outcome measures capturing agitation behaviors, with nine of the studies seeing a significant decrease. Twelve studies
examined social behavior, with eleven seeing an increase in social interaction. Nine
studied depression, all having mixed (non-significant) results. Finally, four of the studies
examined quality of life, and three found significant improvements. Overall, the
researchers concluded that animal-assisted therapy has many benefits not only to older
adults with dementia, but may benefit staff as well. They propose future studies examine
the effects of having residents engaged in animal-assisted therapy on staff job satisfaction
and turnover rates.

Minmin and colleagues (2019) completed a meta-analysis examining the effects
of robotic pets on BPSD. Some health care workers fear that real animals may pose a
safety hazard for dementia patients (e.g., biting, scratching, allergic reactions), while
others worry that agitated individuals may frighten animals (Minmin et al., 2019). As a
result, some health care facilities prefer to use pet robots to minimize risk. Eight articles
were included for meta-analysis, all of which used randomized control designs.
Standardized mean differences were used to compare studies using different outcome
measures (or mean difference for those using the same). Results showed a significant
decrease in BPSD (especially agitation) for individuals receiving pet robot therapy. This
was observed in studies involving individual and group interventions. Researchers
concluded that pet robot therapies carry less risk than using real animals and should be
considered a useful tool in clinical practice.

**Exercise interventions.** Another category of sensory stimulation is performing
regular *exercise*. Exercise is adaptable and can be modified to fit individuals’ needs and
limitations. With older adults, exercise has been shown to promote relaxation
(Montgomery & Dennis, 2002) and enhance sleep (Reid, Glazer Baron, Naylor, Wolf, &
Zee, 2010), leading to an improved overall quality of life. A review article was written by Thune-Boyle, Iliffe, Cerga-Pashoja, Lowery, and Warner (2012) to determine the effects of exercise on behavioral symptoms associated with dementia. The review included six primary studies and ten previously written review articles. Variables such as exercise type, exercise duration, and exercise frequency were evaluated for effects on BPSD. Studies were not aggregated together, rather a critical interpretive approach was used. Essentially, each included study was individually critiqued, and qualitative conclusions were drawn. The researchers concluded that methodological shortcomings in the included studies prevented clear conclusions to be made about the effects of exercise on BPSD. They believe that new, more well-defined exercise interventions need to be designed with fewer variables in order to see what elements of exercise are beneficial (e.g., type, frequency, duration, etc.). Future research could focus on the relaxation aspects of exercise previously reported by Montgomery and Dennis (2002) to see the impact on BPSD.

**Nature interventions.** One specific category of sensory stimulation interventions contains those interventions that incorporate nature. Nature interventions tend to engage multiple senses, which may increase relaxation (Bauer et al., 2012). Bauer et al. (2012) used a computer-assisted telephone interview survey (CATI) across 416 residential sites to collect descriptive data on multi-sensory interventions already being used in LTC facilities. It was discovered that many residential sites already incorporate nature elements into the lives of their residents, even if they are not used in a formal intervention. A large percentage incorporated plants (62%), sunlight (60%), fish tanks (38%), and water features (36%) in places visible to residents (Bauer et al., 2012). Staff
reported the conditions under which they were most likely to use multi-sensory interventions, which included agitation behaviors such as restlessness (93%), wandering (85%), and aggression (74%) (Bauer et al., 2012). This questionnaire study demonstrates that even without the use of formal interventions, incorporating nature into the lives of residents with dementia may have a beneficial effect.

Formal interventions involving nature can also be used to help further reduce agitation behaviors and hopefully increase the quality of life for residents with dementia. Researchers have come up with creative ways to expose dementia residents to nature with minimal risk. Detweiler, Murphy, Myers, and Kim (2008) studied wander gardens as a way to incorporate nature while maintaining autonomy. Wander gardens are designed to be self-contained and safe so that residents can wander freely without the need for supervision. The study lasted for two years and consisted of a yearlong observation of residents before giving them access to the garden, and then an additional one year of observation of residents with the garden. Residents were all male ($N = 34, M_{age} = 80.71$). The CMAI was given at baseline and post-intervention. Residents who visited the garden more frequently (above the median number of days), had greater CMAI score decreases from baseline to post-intervention compared to those who visited the garden less regularly. Furthermore, staff and family members qualitatively reported noticing a decrease in agitation behaviors and an increase in quality of life for residents.

Showering and bathing are times when BPSD behaviors can be particularly high for dementia residents. Whall et al. (1997) incorporated natural elements into showering and bath time for late-stage dementia patients to see if they could mitigate the agitation behaviors. The study was conducted in five Midwest nursing homes with residents
randomly assigned to the treatment group \((n = 15)\) or the usual care group \((n = 16)\). The treatment extended over three bathing occurrences with a modified form of the CMAI used each time. Trained research assistants completed the CMAI through direct observation. The treatment condition consisted of a shower room that played recorded nature sounds (e.g., babbling brooks, birds) as well as nature pictures on the walls to accompany the sounds. The nursing aides were instructed to prompt the residents to notice the elements in the room. Results showed a significant reduction in the mean difference CMAI scores from baseline to post-intervention in the treatment group. More studies are needed to demonstrate long-term effects of nature interventions. A need also exists to use blinded studies or use of independent observers to reduce bias.

**Individualized interventions.** An important element of nonpharmacological interventions is to make them suitable for the individual. Interventions do not need to be perfectly tailored to each individual, but it is helpful to take into account the person’s preferences and needs. For example, Bedard, Landreville, Voyer, Verreault, and Vezina (2011) completed a needs-based pilot study to reduce agitation behaviors in dementia patients. Twenty-six participants (61.5% female, 38.5% male, \(M_{\text{age}} = 84.54\)) were included from six nursing home sites. A single group repeated measures design was implemented using four phases: baseline, intervention, removal of each intervention, and follow-up. The intervention phase lasted for thirty minutes and occurred six times over the course of two weeks. The intervention was implemented by trained therapists and consisted of three components: comfort, attention, and stimulation. The therapist would build rapport with the patient, identify and correct sources of discomfort around the patient, discussed patient’s interests, and provided a sensory stimulation activity such as
music or reading. Therapists were given a variety of sensory stimulation activities to choose from and the goal was to choose something salient to the patient based on conversation. A research assistant observed the sessions and recorded both the duration and frequency of the behavior. It was found that approximately 54% of patients displayed a significant reduction in agitation behaviors (Bedard et al., 2011). These positive changes were maintained at follow-up, which occurred four weeks after the end of the intervention.

Another study used a patient’s life history and family interviews to generate a list of appropriate activities to match their interests (Bharwani, Parikh, Lawhorne, VanVlymen, & Bharwani, 2012). Bharwani et al. (2012) argue that given that the research is mixed for individual and group nonpharmacological interventions, person-centered nonpharmacological interventions may be the best option. The researchers created a Behavior-Based Ergonomic Therapy program (BBET) to try to reduce stress and agitation behaviors in dementia patients. The program outlined over one-hundred intervention options for caregivers to choose from based on the patient’s interests and needs, many of which required only a few minutes to implement (e.g., playing music, working on a small puzzle). Eighteen participants (54% female, 46% male, $M_{age}$ 82.54) were included in the study that lasted six months. To increase ecological validity, staff were made aware and trained on BBET, but were not told how often or when to use it. Over the first month, 111 interventions were performed, which continued for about four months before dropping off. A marked reduction in agitation was observed, as well as fewer falls, which was attributed to an increase in staff contact time. This study demonstrates that staff are capable of implementing brief interventions, but they will
likely need continued support so as not to overwhelm their workload. Additionally, providing options to patients has the potential for better results. Long-term follow-up data were not included.

**Barriers to intervention implementation.** A barrier to implementing nonpharmacological interventions is lack of resources, particularly having enough staff with the available time to do them. Bharwani et al. (2012) showed that staff are capable of doing interventions, but issues such as staff turnover can derail progress. Van der Ploeg, Mbakile, Genovesi, and O’Connor (2012) addressed a potential solution to this barrier. They pointed out that most residential facilities have volunteers who lend their time regularly and form relationships with the residents. Semi-structured interviews were conducted with staff members and volunteers at seventeen care facilities to gain insight into how to best utilize volunteers. Most staff members perceived volunteers as assets to the sites, however volunteers were being underutilized and were not always being used in structured ways. Volunteers expressed a desire to learn new ways to better connect with and help the residents. Additionally, most volunteers were retired ($M_{age} = 67.0$) and capable of devoting the time to being more involved. Given that nonpharmacological interventions are time-consuming, this demonstrates the importance of utilizing all capable workers in residential sites to help implement them. Volunteers are a logical starting place due to their willingness and desire to be helpful.

Sensory stimulation interventions have offered somewhat promising results for reducing agitation and improving the quality of life for dementia patients, but more research is needed. While many studies are promising, overall interventions can be resource intensive and may not be readily available to older adults in LTCs. Long-term
results are limited and often interventions are too cumbersome to maintain long-term. However, given that they carry less risk than pharmacological treatments, they are worthy of further study. Developing brief, affordable, and easy to implement interventions are necessary for long-term use. Fortunately, new solutions may be available for this long-standing problem.

**Virtual Reality**

Technology is being developed at rapid rates. The integration of technology into nonpharmacological interventions is becoming increasingly popular as technology offers novel, cutting-edge ways to improve and expand upon existing interventions. Virtual reality (VR) “surrounds the person in images and sound so that they may feel physically present in the virtual world” (Moyle, Jones, Dwan, & Petrovich, 2017, p. 479). It is believed that being immersed in a VR interface can increase engagement for viewers (Slater & Steed, 2000). The use of virtual reality (VR) interventions to treat behaviors associated with dementia is an under-developed area of research that holds great potential.

To date, there are relatively few published VR studies with older adults with a dementia diagnosis, but researchers are beginning to speak to the potential benefits. VR has the ability to be adjusted and customized to meet the needs of each participant (Garcia-Betances, Jimenez-Mixco, Arredondo, & Cabrera-Umpierrez, 2015). People with dementia tend to engage more with stimuli that matches their interests and personal history (Manera et al., 2016). When compared to traditional paper and pencil tests for cognition, VR can offer higher levels of ecological validity, more engaging activities, and the ability to provide immediate feedback (Manera et al., 2015). The use of VR can offer
more accurate timing for testing administration, which will enhance the standardization (Zucchella et al., 2014). Additionally, VR can create a true immersive experience, which differentiates it from other forms of sensory experiences (Garcia-Betances et al., 2015). VR is also starting to be used in the area of assessment and cognitive testing.

Researchers have demonstrated the feasibility of VR with older adults. In a small study performed by Mendez, Joshi, and Jimenez (2015), participants (N = 5, 3 male, 2 female, \( M_{age} = 56.0 \)) with frontotemporal dementia were exposed to VR with a headset. They were monitored throughout for physiological changes and stress level. Throughout the trial, no participants reported feelings of nausea or disorientation, nor did anyone have a significant change in heart rate or worse stress ratings. The purpose of the study was to show the feasibility of using VR with a dementia population, but Mendez (2015) also noted that participants were more talkative and interacted more with the study interviewers while giving feedback, suggesting the potential for us in increasing social interaction.

VR has mainly been used in the area of assessment with older adults. Researchers have used VR to assess for instrumental activities of daily living (IADLs) and navigational abilities. Allain et al. (2014) created a study to measure a specific IADL, making a cup of coffee. A non-immersive VR approach used a computer. Participants either had a diagnosis of probable AD (n = 24, 10 male, \( M_{age} = 76.96 \)) or were healthy controls (n = 32, 7 males, \( M_{age} = 74.13 \)). After two training sessions, participants were exposed to the VR world where researchers measured time to completion, accomplishment score (percentage of steps performed correctly), as well as errors made. Compared to controls, AD patients scored lower in their ability to perform the task.
accurately. Performance of AD patients aligned with caregiver reports of their care recipient’s IADL functioning. Allain et al. (2014) concluded that VR may be an appropriate tool to assess for IADLs. This study provided a safe, highly controlled environment for assessment purposes with AD patients.

Issues with navigation and wayfinding can be common difficulties reported by individuals with dementia. Researchers have begun using VR technology to measure navigational abilities in dementia patients (Cushman, Stein, & Duffy, 2008; Morganti, Stefanini, & Riva, 2013). Cushman et al. (2008) used a VR condition that presented a 3D view of a hotel lobby to compare navigational abilities of young normal controls ($n = 35, M_{age} = 23.18$), older normal controls ($n = 26, M_{age} = 73.40$), MCI patients ($n = 12, M_{age} = 73.10$), and early-stage AD patients ($n = 14, M_{age} = 74.69$). Each participant completed both conditions and were randomly assigned. Following a four-minute exposure to the respective stimuli, participants were immediately asked to complete questions pertaining to the following: route learning, free recall, self-orientation, route drawing, landmark recall, photograph recognition, and video location. Results of the VR condition were compared with participants’ abilities to navigate a real-world hotel lobby. For each group, results were highly correlated between the VR condition and real-world conditioning. Cushman et al. (2008) concluded that VR can be a valid assessment tool for navigational abilities.

Morganti et al. (2013) performed a study to also see if VR can be used as a viable means of assessment. A VR-maze task and VR-road task was used to see how early-stage AD participants ($n = 26, M_{age} = 80.96$) compared to healthy controls ($n = 26, M_{age} = 77.23$) with orienting to a new environment through the encoding of novel spatial
information. As expected, AD participants performed worse than controls for each task, leading researchers to conclude that VR tools can be appropriate for orientation assessment purposes.

Another way in which VR technology is being utilized is to distinguish between people with AD from healthy older adults (Fernandez-Montenegro & Argyriou, 2017). VR may provide a safe environment to look for early signs of decline. Parsons and Phillips (2016) proposed tools to safely assess for behavioral and cognitive deficits in older adults with AD with high ecological validity. For example, they described “The Virtual Environmental Grocery Store” which can expose participants to a VR store and have them do tasks of increasing difficulty. This may reveal difficulties with attention, concentration, problem solving, and memory. Another idea is to use a VR apartment simulation to see how individuals with AD perform in a home environment (Parsons & Phillips, 2016). Having increased ecological validity and high environmental control will keep participants safe while providing providers with valuable information.

There is a growing interest to use VR assessments in clinical settings and not just for research purposes. A common decline often seen early on with dementia is a reduction in spatial abilities. Serino, Morganti, Stefano, and Riva (2017) performed a VR study to detect early cognitive decline. Participants \(N = 16\) with either probable AD \(n = 8\), 2 female, 6 male) or cognitively healthy \(n = 8\), 4 female, 4 male) were exposed to traditional neuropsychological tests for spatial ability as well as a “mental spatial reference frame test” using VR. With the traditional tests, AD patients scored lower than cognitively healthy controls. Little difference existed between the AD and control group with the VR condition, which the researchers speculated was due to the tasks being too
difficult. The VR condition was performed on a computer and it was speculated that an all-immersive VR experience would be preferable for future studies. This study provides another example of the potential of VR technology as a useful assessment tool.

Researchers have started to explore the use of VR technology to improve mood states of older adults with dementia. Moyle et al. (2017) examined the effects of exposure to a VR forest on mood and engagement for dementia patients in long-term care. Participants ($N = 10$), family members ($N = 10$), as well as care staff ($N = 9$) provided data in the form of semi-structured interviews. Each participant was exposed to the VR forest (on a large television screen) for a maximum of 15 minutes. Video recordings were done pre-intervention, during the intervention, and following the intervention. Research assistants coded the video recordings to compare participants’ mood states and engagement following specific guidelines (used validated measures designed for observational research). Overall, family members, care staff, and participants reported that the intervention had a positive effect. Specifically, participants reported that being exposed to a bright, colorful, and vivid scene made the VR intervention engaging and enjoyable. Based on research assistants’ observations, participants experienced more pleasure and a higher level of alertness during the VR exposure compared to before or after the intervention (both reached significance). Researchers concluded that VR technology has the potential to improve the quality of life for older adults with dementia, but more research is needed.

Present Study

The research outlined earlier demonstrates a need to create new treatments to help with behavioral symptoms of dementia. Agitation behaviors are common and can reduce
the quality of life of both the individual and caregiver. Pharmacological methods carry significant risk and tend to be over-prescribed due to accessibility and potential short-term effects. Nonpharmacological interventions are vast and tend to offer promising results especially when implemented regularly. Sensory stimulation appears to be one form of nonpharmacological intervention with added benefits for agitation reduction.

Based on the amount of time nonpharmacological interventions can take to implement and the amount of resources needed, a need for quick and efficient nonpharmacological interventions exists. VR has been shown to be effective with older adults for several purposes, but more research is needed.

The purpose of this study was to create a nonpharmacological intervention for older adults with a dementia diagnosis using VR technology. Drawing on the sensory stimulation literature and feasibility of using VR headsets with older adults, a brief intervention was used to help reduce agitation behaviors by inducing a calming effect. While the utility of using a VR headset with older adults was previously demonstrated in one study, this study was novel in that it administered an intervention using a headset rather than a television or computer screen. The present study utilized VR headsets to create a more immersive intervention environment compared to past studies. It was hypothesized that compared to baseline, participants would experience a reduction in agitation behaviors as measured graphically and by the CMAI after exposure to the VR intervention.
CHAPTER II

METHOD

Recruitment

Participants were recruited from a long-term care facility located in Colorado Springs, CO. This facility offers multiple levels of care including independent living, assisted living, and memory care. Both participants were recruited from the memory care unit. A chart review was performed to collect basic demographic variables, medical diagnoses, and current medications. Participant nominations were based on the following inclusion criteria: 1) aged over 55 at start of intervention, 2) charted form of dementia, 3) lived at facility for at least two weeks, 4) female gender, 5) English speaking, 6) no active psychosis, 7) consent provided by legal guardian or power of attorney, and 8) assent provided by participant.

Nominations were provided by the memory care manager, who was highly familiar with the day-to-day care of the residents on the unit. The memory care manager based his nominations on recruitment criteria, his own personal experiences with the residents, as well as reported agitation behaviors from the staff. A Cohen-Mansfield Agitation Inventory (CMAI) Long Form (Cohen-Mansfield et al., 1989) was completed by the memory care manager for each participant so that the most troublesome/disruptive agitation behavior could be targeted by the research team. The memory care manager also helped serve as a liaison between the research team and the participants’ families in order to obtain consent. Paper copies of the informed consent were provided to the
memory care manager who obtained in-person consent from both participant’s power of attorneys (POA). Final participants included in this study had a returned consent form (POA) as well as verbal assent (resident) to acknowledge their willingness to be in the study. In exchange for participation in the study, the facility was gifted a new VR headset at the conclusion of the study.

Once consent was obtained, a chart review was performed to collect basic demographic information, medical diagnoses, and medications. This information is presented in Table 1.

Table 1

*Chart Review Information*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Age</th>
<th>Race/Ethnicity</th>
<th>Medical Diagnoses</th>
<th>Medications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mary</td>
<td>74</td>
<td>European American</td>
<td>Dementia, Hypertension, Chronic kidney disease (stage 3), Expressive language disorder, History of breast cancer, Hyperlipidemia, Depression with anxiety</td>
<td>Acetaminophen (500 mg/PRN), Fluoxetine HCL (20 mg/5 mL, daily), Miralax (8.5 gm, daily), Quetiapine fumarate (25 mg).</td>
</tr>
<tr>
<td>Anne</td>
<td>86</td>
<td>German American</td>
<td>Dementia</td>
<td>Lisinopril (5 mg, daily), Memantine HCL (5 mg/daily), Quetiapine fumarate (25 mg/2x daily), Senna Plus (8.6-50 mg), Xarelto (20 mg/daily), Lorazepam (0.5 mg, PRN), Oxygen (PRN).</td>
</tr>
</tbody>
</table>

*Note: Neither chart review documented a specified dementia etiology. Etiologies remained unknown after discussing with staff.*
Participants

Two female participants were recruited and given the pseudonyms Mary and Anne to maintain confidentiality. Mary was a 74-year-old, widowed, Caucasian female. She moved into the memory care unit in May of 2018. Prior to beginning the study, she was a resident for approximately two months. Consent for the study was provided by her daughter who had medical power of attorney. Anne was an 87-year-old, widowed, Caucasian Female of German descent. English was her second language, which she spoke fluently. She moved to the facility in October of 2017. Consent for the study was provided by her son, who had medical power of attorney.

Measures

Agitation behaviors. The Cohen-Mansfield Agitation Inventory (CMAI) Long Form was completed by the memory care manager for both target residents (see Appendix A). The CMAI assesses the type and frequency of agitation behaviors. Two versions of the long form exist; one includes expanded definitions for each behavior and the other does not. The CMAI Long Form with expanded definitions was used to provide further clarification about the behaviors. The CMAI consists of 29 items that is typically self-administered by a staff member or completed as an interview with a researcher. For the present study, the memory care manager self-administered the measure. The behaviors are rated along a 7-point frequency scale (1 = never, 7 = several times an hour). Frequency of behaviors are considered for the past two weeks. The CMAI was administered at baseline and at the completion of the intervention.

The CMAI Manual reports the following psychometric properties (Cohen-Mansfield, 1991): Inter-rater agreements were calculated for each behavior on the CMAI
using three sets of raters resulting in Cronbach’s alpha values of .92, .92, and .88, indicating high reliability. Interrater reliability values were .88, .92, and .92. An exploratory factor analysis revealed three factors of agitation in nursing homes: aggressive behavior, physically nonaggressive behavior, and verbally agitated behavior.

**Cognitive screen.** The Saint Louis University Mental Status (SLUMS; Tariq et al., 2006) Exam is an 11-item measure that primarily focuses on orientation, memory, executive function, and attention, allowing one to screen for dementia (see Appendix B). The SLUMS is typically easy to administer and takes approximately seven minutes to complete. The SLUMS has been tested in a sample of nonveteran older adults and was shown to be an effective screening tool (Feliciano et al., 2013). The intention was to administer during baseline as well as post-intervention. Unfortunately, the SLUMS was attempted, but neither participant was able to complete the measure due to the severity of dementia. The chart review was used to determine the diagnosis.

**Mood screen.** A quick and simple mood screen was used pre and post the VR intervention (see Appendix C). The Ottawa Mood Scale, with scores ranging from 0 to 10, was used to gauge mood (Cheng, 2011). The prompt, “How is your mood?” was used to introduce the scale and then participants were presented with the scale, which uses cartoon pictures of faces as anchors (0 = sad, depressed, down; 5 = in the middle, not happy nor sad; 10 = happy high, awesome, great). Although this scale has not been validated for research with older adults with dementia, its aim was to be used as a tool to quickly measure mood with minimal risk of agitating participants before or after the intervention.
Materials

Two virtual reality headsets were used for the duration of the study. The *Oculus Go* ($199) is a VR headset, released May 2018, that is designed to be lightweight and user friendly. It has a strap that circles around the user’s head and one that goes over the head to provide stability and comfort. The Oculus Go can also be worn over glasses, a useful feature for participants with visual impairments. It comes with a wide variety of free apps, but more can be purchased from the app store. The app used, “Guided Meditation VR” offers a wide variety of relaxing, nature scenes, one of which was used for the intervention. The scenes in the app were not static; rather they displayed movement (e.g., waves crashing on a beach). Turning one’s head in different directions provided extended views. For example, one scene displayed birds flying in the sky when looking up. Additional materials needed included data sheets, clipboards, and stop watches.

Participant 1

**Targeted agitation behavior.** Target behavior was determined for Mary using the CMAI report completed by the memory care manager. He indicated five out of 29 areas of concern: pacing (6), cursing or verbal aggression (5), hitting (2), grabbing onto people or things inappropriately (3), and making strange noises (6). Because two items were ranked as equally occurring, a discussion was had with the memory care manager to identify the most problematic. He stated that the strange noises made by Mary did not appear to be disruptive to staff or other residents. It was noted by other staff that Mary would often pace around the unit, which was reported as exhausting not only to Mary, but also to the staff monitoring. It was also reported that re-direction by staff was sometimes
met with resistance in the form of hitting and angry/inappropriate words. The pacing behavior sometimes made it difficult for Mary to sit at mealtimes long enough to complete meals. Given the associated stress/burden to Mary and staff, pacing was selected as the targeted behavior.

**Data collection.** A data collection sheet was created to best capture Mary’s pacing behavior (Appendix D). Pacing was operationally defined as “constantly walking back and forth, does not indicate normal purposeful walk” (CMAI, 1991). Research members (graduate level, clinical psychology students) were trained on recognizing the target behavior and using the data sheet prior to collecting baseline data. The training period lasted one week so that research members could practice using the data collection sheet and communicate with the primary researcher or supervisor any questions. This data was utilized for training purposes only and is not included in the analysis. Research members were asked to use stop watches to capture the duration of Mary’s pacing behavior in seconds. If Mary paused or sat down briefly (less than 60 s) and then continued pacing, the time was recorded without stop. If she paused or sat down for over 60 s, the timer was stopped, recorded on datasheet, and re-started when pacing resumed. A two-hour observation period was used each day (see “Procedure” section), and the total time spent pacing was computed at the conclusion of the observation period to obtain daily totals.

**Participant 2**

**Targeted agitation behavior.** The CMAI indicated fourteen out of 29 areas of concern for Anne: pacing (2), inappropriate dressing or disrobing (2), cursing or verbal aggression (2), constant unwarranted request for attention or help (6), repetitive sentences
or questions (5), hitting (2), grabbing onto people or things inappropriately (3), pushing (2), trying to get to a different place (6), complaining (2), negativism (3), making verbal sexual advances (2), making physical sexual advances or exposing genitals (2), and general restlessness (3). After conversing with the memory care manager, it was stated that the highest-ranking behaviors normally occurred concurrently. For example, Anne would seek out attention from staff by asking repetitive questions, often asking about leaving the facility to “go home.” To simplify, repetitive questions and statements asked of staff were identified as Anne’s targeted behavior.

**Data collection.** Anne’s vocalizations were best captured with a frequency count (Appendix E). Repetitive vocalizations were operationally defined as “repeating the same sentence or questions one right after the other” (CMAI, 1991). Research members were trained on recognizing the target behavior and use of the data sheet prior to beginning baseline data collection. The training period lasted one week and this data was not included in the analyses. Research members were instructed to record tally marks each time Anne engaged in repetitive vocalizations towards a staff member. Vocalizations directed at fellow residents were not recorded. Additionally, staff-initiated conversations with Anne were also not counted. At the end of the observation period, tallies were added to get a daily total.

**Procedure**

**Baseline phase.** Baseline observations occurred during the time points identified as the most troublesome by staff or caregivers, which was deemed in the early afternoon following lunch. The observational time was set from 1:00-3:00 pm for each participant, and data were collected Monday through Friday. Weekends were excluded due to
frequent family visitors, off-site trips, and a reduction in opportunity for target behavior to occur. At least one member of the research team completed the observations. On days when two members were present, observations were completed independently; one member served as the primary data collector and the other served as a secondary data collector to obtain inter-observer agreement. Data collected were individualized based on the topography of the agitation behaviors observed. Baseline observations continued until the researchers observed a predictable trend, as determined through visual analysis. Visual analysis requires daily graphing of behaviors to inform phase changes, thus behavior was graphed accordingly across phases. Baseline data collection continued for participant two as required by the research design (see Research Design section for specifics on multiple baseline design across participants) until the intervention was implemented across both baselines.

**Intervention phase.** The VR intervention phase began immediately following the baseline phase. This phase continued until a stable trend was observed, using visual analysis. The intervention was implemented before the participants’ agitation behaviors were most prominent, classifying it as an antecedent-based intervention. Observations occurred during and immediately after the intervention to record whether the targeted agitation behavior was present.

The participants were introduced to the VR headset by a researcher to demonstrate how it worked. The researcher put the headset on to model how it looks and works for the participant. In order to gauge interest and make the intervention personalized to each participant, researchers spoke to staff to see if a scene might be more appealing to each participant. A brief preference assessment was attempted with each
individual, consisting of offering two nature scene options. The purpose was to help increase participants’ interest in the study. Participants were briefly exposed to the scenes (e.g., beach scene, mountain scene) and then were prompted to voice their preference. The same scene was used across all exposures, but choice of scene differed by participant. Participants were encouraged to wear the headset, viewing the nature scene, for at least one minute. The duration of time during which the participant wore the headset varied each day during the intervention period (see Tables 2 and 4). If the participant was visibly agitated upon researcher arrival at facility and prior to implementing the intervention, the researcher waited for a 20 min period of time without agitation before approaching the participant to use the headset. The intervention was implemented each day at approximately 1:00 pm until a predictable trend was observed.

**Interobserver agreement (IOA).** Two members of the research team were present to record observations at least one time per week (i.e., 22% of study days for Mary and 23% for Anne). The research team was comprised of graduate students in psychology supervised by a licensed clinical psychologist. The researchers met weekly with their supervisor to discuss any concerns or problems that arose and used problem solving to work through any issues/concerns. Additional meetings were established for any issues that arose in-between scheduled meetings.

On days when IOA was performed, observations of participants were independently performed by two members of the researcher team. Both members were on-site to do the observations (direct observation). A standardized observation data sheet was used by the researchers. The data sheet was developed following participant recruitment so that the target behavior was known. It was important that the data sheet be
adapted to meet the specific behavior of each participant being observed. Following observations, the researchers computed IOA using the *point-by-point method*. In this method, the number of agreements was divided by the number of agreements plus disagreements, and then multiplied by 100 to provide a percentage. An acceptable IOA is met, when there is an agreement at a minimum of 80% across all trials. If IOA was not met, the plan was to have that day’s data thrown out, re-train the research assistant to criterion, and collect another data point. This plan was not enacted as all IOA met the minimum standard. Integrity averaged 99% for Mary and 94% for Anne.

**Research Design**

The present study used a single-case research design with an ideographic approach. This approach allows for an in-depth study of an individual while providing experimental control. Specifically, a blended single case experimental design was used combining the *multiple-baseline design across individuals* (MBL; also known as a time-lagged control design) with a *reversal design* (ABAB; also known as a withdrawal design) to examine the effects of VR nature scenes on agitation behaviors across participants sharing the same long-term care environment. This method allowed the intervention to be staggered over time, i.e., introduced to different baselines (each participant) at different points in time (Kazdin, 2011). According to this design, changes in the behavior observed in the baselines once the intervention was introduced (and only when the intervention was introduced) were attributed to the intervention and not to outside factors. The ABAB design allowed for a reversal phase (the second A), which provided further evidence that behavior change was due to the intervention (Kazdin, 2011). Although only one participant is required to demonstrate the intervention’s effect
in an ABAB design, having more than one participant increases the power of the study design through replication of the intervention effect (Hersen & Barlow, 1976). Additionally, the more replications completed that result in similar findings, the more convincing it is in generalizing the results to other subjects, thus strengthening external validity (Birnbrauer, Peterson, & Solnick, 1974; Gay, 1987). The blended design allowed for a replication of intervention effects both within and across participants and thus allows for a more powerful demonstration of effect than either design alone.

**MBL.** A *non-concurrent multiple baseline design* was used meaning that baseline observations began at different starting points for each participant. Agitated behaviors observed for each participant were recorded on a data sheet and graphed. Once a predictable pattern was established for a participant, the intervention was introduced for that individual. Baseline observations continued for each individual until a stable or predictable pattern in the graphed data was established. This process was repeated for the second baseline phase.

**ABAB.** Because an ABAB design was also used, following the initial baseline (A) and intervention phases (B), the intervention was removed to observe if behavior returned to baseline levels (A). Once observed baseline levels were stable, a second (and final) intervention phase was conducted in which the VR intervention was reintroduced to observe behavior change (B).

**Data Analysis**

**Magnitude.** Both mean and level of agitated behavior across phases was analyzed to capture magnitude using visual analysis of graphed data. Change in mean was analyzed by averaging agitated behaviors in the baseline and intervention phases and
comparing the difference. Due to fluctuations within phases, the standard error of the mean was computed and graphed as a way to standardize the variability. Level changes were visually observed by noticing the differences in location of the graphed data points, especially immediately following a phase change.

**Rate of change.** Rate of change was captured by examining latency. Latency was measured by observing the amount of time that passed before a change in agitation behaviors occurred between the baseline and introduction of the intervention phases. In other words, latency measured how long it took for the intervention to have an effect on behavior. Shorter latencies reflect more confidence that it was the intervention that was responsible for behavior change and not some other environmental variable. To make this determination, intervention data was compared to the variability range for baseline data to note when the behavioral change exceeded it.
CHAPTER III

RESULTS

Visual analysis demonstrated a reduction in both Mary and Anne’s respective agitation behaviors following the VR intervention. Figure 1 displays the frequency or duration data for agitated behaviors for each participant by day. Visual analysis revealed the reduction in agitation behaviors was replicated across both intervention phases for each participant, contributing to the strength of the intervention (Hersen & Barlow, 1976). When examining the multiple baselines across participants, the plotted data show a behavioral change with Mary after introducing the intervention with little to no change in Anne’s behavior while Anne remained in the baseline phase. Only when Anne was exposed to the intervention did a significant change occur with her agitation behavior. This replication of effect across the baseline (across individuals) increases confidence in the strength of the intervention (power).

Mary

Visual analysis. Mary’s initial baseline phase was extended to 23 days due to variability with her pacing behavior and the need to observe stability or predictability in trend. An examination of the data graph shows a reduction in Mary’s pacing behavior following the implementation of the VR intervention. The initial intervention phase lasted for 19 days at which point a stable trend was visually observed in the data. As per withdrawal design convention, the intervention was then removed and Mary’s behavior returned to near baseline levels over the course of 4 days. When the intervention was re-
introduced, her behavior once again reduced over the course of 5 days. The amount of time Mary spent wearing the headset each intervention day is displayed in Table 2.

![Graph showing behavior by day for Mary and Anne. The top graph represents Mary's behavior in seconds, while the bottom graph represents Anne's behavior in frequency count. Break lines indicate days researchers were unable to observe or implement the intervention due to the participant being unavailable (e.g., sleeping in a room, off unit with family, etc.).]

Figure 1 Agitation behavior by day for Mary (top) and Anne (bottom). Note that Mary’s behavior is plotted in seconds and Anne’s data is a frequency count. Break lines indicate days when researchers were unable to observe and/or implement the intervention due to the participant being unavailable (e.g., sleeping in a room, off unit with family, etc.).
Table 2

*Time Spent Wearing the VR Headset on Intervention Days (Mary)*

<table>
<thead>
<tr>
<th>Intervention Day</th>
<th>Time (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Intervention Phase</strong></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>86</td>
</tr>
<tr>
<td>25</td>
<td>39</td>
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<tr>
<td>26</td>
<td>240</td>
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<tr>
<td>28</td>
<td>293</td>
</tr>
<tr>
<td>29</td>
<td>254</td>
</tr>
<tr>
<td>30</td>
<td>160</td>
</tr>
<tr>
<td>31</td>
<td>300</td>
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<tr>
<td>32</td>
<td>301</td>
</tr>
<tr>
<td>33</td>
<td>309</td>
</tr>
<tr>
<td>34</td>
<td>276</td>
</tr>
<tr>
<td>35</td>
<td>573</td>
</tr>
<tr>
<td>36</td>
<td>420</td>
</tr>
<tr>
<td>37</td>
<td>450</td>
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<td>38</td>
<td>153</td>
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<tr>
<td>41</td>
<td>343</td>
</tr>
<tr>
<td>42</td>
<td>428</td>
</tr>
<tr>
<td><strong>Final Intervention Phase</strong></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>564</td>
</tr>
<tr>
<td>48</td>
<td>553</td>
</tr>
<tr>
<td>49</td>
<td>300</td>
</tr>
</tbody>
</table>

*Note.* Only intervention days when the headset was worn are displayed. Days 24-42 were in the initial intervention phase and days 47-49 represent the final intervention phase.

**Changes in level.** In order to demonstrate level changes, mean scores and standard errors were calculated for each phase (Table 3) and graphed (Figure 2). The error bars estimate the range within which the population mean likely falls (Kazdin, 2011). If the mean of one phase is outside the range of another phase (one standard error above or below the mean), then the means are considered different from one another (similar to confidence intervals) (Kazdin, 2011). The standard error bars overlap for baseline phases, demonstrating that Mary’s agitation behavior was similar in both baseline phases. Conversely, the initial intervention phase has no overlap with either
baseline phase, showing that her agitation behavior was significantly reduced with the intervention and subsequently increased with the removal of the intervention. The final intervention phase shows a reduction in behavior that exceeds the initial intervention phase. This indicates that the intervention was more effective when re-introduced.

Table 3

*Mean and Standard Error for Mary’s Pacing Behavior by Phase*

<table>
<thead>
<tr>
<th>Phase</th>
<th>Mean (standard error)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1163.18 (170.37)</td>
</tr>
<tr>
<td>B</td>
<td>567.61 (109.69)</td>
</tr>
<tr>
<td>A</td>
<td>953.50 (179.52)</td>
</tr>
<tr>
<td>B</td>
<td>138.40 (138.40)</td>
</tr>
</tbody>
</table>

*Figure 2.* Bar graph depicting means and standard error bars by phase for Mary’s pacing behavior.
**Latency.** Rate of change was examined by determining when a level change appeared with the agitation behavior following a phase change. Once introduced to the VR intervention, Mary had an initial sharp decrease with her pacing behavior. Variability existed with her agitation throughout the intervention phase, which may be due to numerous factors (see discussion). When the intervention was removed, Mary experienced an immediate increase with her agitation behavior, signifying that the intervention was helping to mitigate her behavior. Once the intervention was reintroduced, the behavior immediately reduced to a level even lower than what was observed during the initial intervention. The rapid rate of change (low latency) seen with Mary adds to the evidence of the effect of the intervention on Mary’s behavior.

**Additional observational data.** Mary was unable to verbalize her preference for a nature scene, but she reacted positively to a waterfall scene as evidenced by smiling and making encouraging sounds (e.g., laughter). This scene was used across all intervention days. The head straps were not used with Mary; rather, she preferred to hold the headset up to her face. Minutes spent wearing the headset varied by day. Typically, Mary wore the headset anywhere from one minute up to seven minutes. The Ottawa Mood Screen was attempted with Mary, but she was unable to verbalize a score (aphasia diagnosis) and was unable to point to a number scale when prompted due to the severity of her dementia.

Researchers qualitatively recorded her reaction to the nature scene. It was noted that throughout the course of the study, Mary showed increasing recognition of the research team members and showed excitement when presented with the headset. Research members noted that she would sometimes dance or sing when they arrived, which staff noted was a sign of a good mood. Mary would make positive vocalizations
while viewing the nature scene. On some occasions, she would respond with “wow!” or “ooo!” while wearing the headset and would move her head around to view all aspects of the nature scene, demonstrating active engagement with the intervention. Researchers noted that she would often smile while wearing the headset. On occasion, Mary became upset when researchers tried to remove the headset, suggesting that the headset functioned as a powerful reinforcer. Typically, researchers allowed her to continue wearing/holding the headset until she handed it back to prevent prompting agitation behaviors.

**CMAI.** At the completion of the study, the memory care manager completed the CMAI. Responses indicated three areas of concern for Mary (versus 5 at the study onset, change score of -40%): pacing (3), cursing or verbal aggression (2), and making strange noises (3). A pre to post comparison of items, indicated that some of the agitated behaviors were eliminated over the course of the study and the remaining agitation behaviors were occurring at a lower frequency. Her targeted behavior was rated as occurring several times a day, prior to the study, and was decreased to once or twice a week at the study’s conclusion (change score of -50%).

**Anne**

**Visual analysis.** Anne’s initial baseline phase consisted of 25 days before the data was visually deemed as stable/predictable. The intervention was implemented for a similar length, 22 days. Anne also displayed a reduction in her agitation behavior (repetitive vocalizations) following the VR intervention. Following withdrawal design conventions, a return to baseline condition was implemented for 11 days, upon which the behavior returned to near baseline levels. The intervention was re-introduced for three
days (minimum number of datapoints needed to observe a trend) at which point the behavior was reduced to zero. The amount of time Mary spent wearing the headset each intervention day is displayed in Table 4.

Table 4

*Time Spent Wearing the VR Headset on Intervention Days (Anne)*

<table>
<thead>
<tr>
<th>Intervention Day</th>
<th>Time (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Intervention Phase</strong></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>60</td>
</tr>
<tr>
<td>30</td>
<td>130</td>
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<td>46</td>
<td>109</td>
</tr>
<tr>
<td>47</td>
<td>100</td>
</tr>
<tr>
<td><strong>Final Intervention Phase</strong></td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>146</td>
</tr>
<tr>
<td>60</td>
<td>129</td>
</tr>
<tr>
<td>61</td>
<td>105</td>
</tr>
</tbody>
</table>

*Note.* Only intervention days when the headset was worn are displayed. Days 26-47 were in the initial intervention phase and days 59-61 represent the final intervention phase.

Changes in level. Mean scores and standard errors were calculated for each phase (Table 5) and graphed (Figure 3). The standard error bars overlap for baseline phases, demonstrating that her agitation behaviors were similar in both baseline phases. Conversely, the initial intervention phase has no overlap with the initial baseline phase, demonstrating that the intervention helped decrease her agitation behavior. A slight overlap exists between the intervention phase and the reversal to baseline phase. After the
intervention was re-introduced, the agitation behavior did not present itself. This lends evidence that the intervention was even more effective when re-introduced.

Table 5

*Mean and Standard Error for Anne’s Repetitive Vocalization Behavior by Phase*

<table>
<thead>
<tr>
<th>Phase</th>
<th>Mean (standard error)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>16.32 (3.94)</td>
</tr>
<tr>
<td>B</td>
<td>7.40 (3.22)</td>
</tr>
<tr>
<td>A</td>
<td>17.20 (7.32)</td>
</tr>
<tr>
<td>B</td>
<td>0.00 (0.00)</td>
</tr>
</tbody>
</table>

*Figure 3.* Bar graph depicting means and standard error bars by phase for Anne’s repetitive vocalization behavior.

**Latency.** The rate of change of disruptive vocalizations once the VR intervention was introduced was rapid, immediately following the phase change. Variability existed across the first several days, and by day 10, the behavior was consistently lower than baseline levels. When the intervention was removed, Anne’s agitation behavior began increasing around day 4. Once the headset was reintroduced, the behavior was immediately reduced. This rapid change adds to the strength of the intervention.
**Additional observational data.** Anne’s language production abilities were intact, so researchers were able to discuss a scene preference with her. Anne’s affinity for Germany helped narrow down the search. A waterfall scene was settled upon due to its close resemblance to a waterfall that Anne was familiar with (Triberg located in Bavaria). Similar to the other participant, Anne preferred to hold the headset up to her face rather than wearing the headstrap. Anne had a tendency to take the headset off quickly (less than 30 s), so staff encouraged her to look left, right, etc. in order to take in the whole waterfall scene. She frequently made positive verbalizations such as “it’s nice” or “I like the birds.” Anne wore the headset anywhere between 30 seconds to 3 minutes, depending on the day.

The Ottawa Mood Screen was presented to Anne immediately before and after the intervention. Often times, little variability existed with her pre and post rating. On several days she refused to answer exhibiting suspicious thoughts about who wanted the information. On most days, Anne stated that she felt “happy” rating herself as a 10/10 before and after the intervention. Occasionally, an increase was seen with her rating. For example, she sometimes rated herself as a 5/10 pre-intervention and 10/10 post-intervention. No mood rating decrease was reported following the intervention.

**CMAI.** At the completion of the study, the memory care manager completed the measure (note: not the same pre-test rater; a new manager was hired mid-way through the study). Reported results indicated five areas of concern for Anne (a reduction from pre-test rating of 14, change score of -64%): pacing and aimless wandering (6), constant unwarranted request for attention or help (6), repetitive sentences or questions (6), grabbing onto people or things inappropriately (4), and trying to get to a different place...
(6). Anne’s targeted agitation behavior of asking repetitive questions increased from once or twice a day to several times a day based on the new memory care manager’s ratings (change score of +14%). Overall, the number of agitated behaviors displayed by Anne at the completion of the study were reduced on the CMAI, whereas her most problematic behaviors were deemed as relatively similar to the beginning of the study.
CHAPTER IV

DISCUSSION

The present study examined a brief, nonpharmacological intervention to reduce agitation behavior in older adults with a dementia diagnosis. Agitation behaviors were targeted due to their prevalence in long-term care facilities. Nonpharmacological interventions carry less risk and side-effects compared to pharmacological treatments and treatments involving sensory stimulation have been useful in reducing agitation behaviors in older adults. The present study investigated the use of nature scenery using VR technology. The present study hypothesized that compared to baseline, participants would experience a reduction in agitation behaviors as measured graphically and by the CMAI after exposure to a VR intervention. Given the novelty of using a VR headset to reduce agitation, a single-case design approach was utilized to provide an in-depth, ideographic approach with two participants.

With a single-case design, power is gained when the intervention effects can be replicated (Hersen & Barlow, 1976). Only one participant is required to show an effect using a withdrawal design (ABAB). With a multiple baseline design across participants design, a minimum of two participants is required, but more participants strengthen the overall results (greater numbers of replication of effects). Throughout the year spent at the facility working on data collection, only two residents were eligible for the study because many did not display an agitation behavior. This is largely due to the use of medications to subdue such behaviors. A third resident was eligible, but consent was not
obtained because she was in the process of relocating to a different facility. As a result, the decision was made to utilize a blended single case design to strengthen our findings. The results obtained are encouraging for the effects of a VR intervention on reducing agitation behaviors.

An examination of the results from these participants indicated that the intervention was successful at reducing their agitation behaviors. This data lends additive support to the work of Mendez et al. (2015) by demonstrating the feasibility of using a VR headset with older adults. While slight modifications were needed in regards to wearing the headset (e.g., removal of headstraps), the modifications did not disrupt the integrity of the intervention. The creation of a brief and effective intervention holds clinical utility as long-term care staff can implement this intervention in only a few minutes. Reducing these behaviors can provide staff with time to attend to other needs of residents or other work-related duties. For example, Anne’s repetitive vocalization behavior monopolized staff time for anywhere from minutes to an hour on high agitation days. It was observed that she would frequently interrupt their work with other residents. As short as a 30 s exposure to a relaxing nature scene had the ability to reduce or eliminate Anne’s agitation behavior for a two-hour stretch. With Mary, the brief exposure not only reduced her pacing, but also created a visible, positive affect change. This study provides preliminary data that the VR intervention can help reduce agitation behavior and hopefully increase the quality of life for both the staff and residents in long-term care facilities.
Data Variability

As demonstrated in Figure 1, variability existed within each phase for both participants. Although variability can make it more difficult to observe a trend in the data, it is also a common feature of behavior across settings (Kazdin, 2011). In other words, variability, to some degree, is expected, particularly in applied settings. Several reasons exist that can account for the displayed fluctuations. First, the setting in which the study was performed had environmental factors that influenced both participants’ agitation behavior. Even though this known source of variability existed, it was important for the intervention to be implemented in the same setting in which the behavior occurred to maximize the usefulness for staff. Trying to standardize the memory care setting would have disrupted daily operations and performing the intervention in participants’ rooms would have isolated them. Forcing a rigidity to the structure would result in a loss of generalization to the home environment.

One environmental factor that influenced both Mary and Anne’s agitation behaviors was interactions with other residents. Both Mary and Anne’s behavior increased when they seemed to be provoked by others. Occasions arose where other residents would talk to them or touch them, leading to an increase in agitation, possibly due to frustration. For example, Mary enjoyed holding a stuffed cat that sometimes other residents would try to take from her. This led to visible anger from Mary, thereby increasing her behavior on those days. In addition to the direct influence of other residents, Anne’s behavior was also triggered when staff had her sit on the couches near the main point of entry. Because Anne constantly requested to leave the unit to “go home,” watching people come and go triggered her repetitive vocalizations.
Outside of environmental factors, the health of the participants influenced their agitation behaviors. Notably, Anne had two different illnesses throughout the course of the study, resulting in her feeling tired and drowsy. On those days, the behavior was naturally reduced, and the intervention was not implemented on these days.

**Data “Breaks”**

As displayed in Figure 1, “breaks” exist in the graphed data. On days when researchers could not observe a participant or implement the intervention, breaks were placed on the graphed data. Breaks were needed for a few different reasons. Both participants had involved family members who would visit and often take them on outings. When activities were offered off the memory unit (e.g., a music performance), Mary often attended, so the researchers were unable to work with her on those days. Anne frequently visited the hair salon, making her unavailable to work with on her hair appointment days. Researchers did not observe participants off the unit as a way to keep the setting standardized.

**Limitations**

Some challenges to measurement arose during the study, which created a need to modify the methods to fit the needs of the two individuals. This is expected with an idiographic approach. One limitation of the study is that researchers were not able to obtain a measure of cognition (to obtain a pre and post study value) nor obtain mood measures from participants to assess impact of the intervention on mood. For example, participants were unable to complete the SLUMS. Because the individuals nominated for the study had more advanced forms of dementia, the questions were not understood. Participants often did not respond or responded with “I don’t know.” Furthermore,
completing a brief mood screen before and after the daily intervention proved difficult as well. Mary was unable to answer when presented with the measure, whereas Anne would provide a rating, but it was difficult to discern if she understood the task or if she was responding in a guarded fashion. Although completing measures were difficult for both individuals, to varying degrees, both met inclusion criteria for the study.

It is possible that some of the reduction in agitation behaviors may be accounted for by the benefits of social interaction. The nature of the intervention required at least one research member to interact with the participant. This included exchanging pleasant greetings and making polite small talk to introduce the headset each day. It is possible that the social exchanges combined with the relaxing nature exposure worked in tandem to reduce agitation. Attempts were made to control this potential interaction. During the intervention, researchers kept conversation to a minimum and kept comments relevant to the implementation of the intervention (e.g., encouraging participant to look up, down, etc.). After the daily intervention was complete, researchers did not engage in conversation with the participants during the observation period. On rare occasions when conversation was unavoidable (e.g., participant approached researcher), talk was kept to a minimum and attempts at re-direction were made. Future studies can attempt to further reduce the effects of social interaction on agitation reduction.

Lastly, the memory care manager changed mid-way through the study. With Anne, a different person completed the CMAI post-study (did not affect Mary). Although the new memory care manager rated Anne’s targeted behavior as slightly higher at the completion of the study, she was unaware what Anne’s behavior was like prior to the
study’s start. Given that two different people completed the CMAI for Anne, it is necessary to interrupt with caution.

Future Directions

Given that this is an initial foray into examining VR technology (using headsets), future studies should replicate the effects with another sample. With single-case design, the question of generalizability is often raised due to the small sample size (Kazdin, 2011). Typically, this concern is mitigated with replication of results and by diversifying the sample. For example, a future study can recruit male participants and/or individuals of different races. Each time the results are replicated, the ecological validity of the VR intervention increases.

While the current study demonstrated the effectiveness of the VR intervention, no conclusions can be drawn regarding how the VR nature scene compares to other forms of nature scene exposure. For example, past studies have found that exposure to nature pictures led to a significant reduction in agitation behaviors (Gamble et al., 2013; Whall et al., 1997). Designing a study that compares the utility of various methods of exposure may prove clinically useful. One possible way to compare the effectiveness is to utilize an ABAC design where participants are exposed to two different types of interventions and reduction of agitation behaviors is compared between the two. Because VR headsets can be expensive, if they are shown to be similarly useful to nature pictures, pictures would be a more economical, but less engaging, route.

The study did not utilize a social validity measure to formally capture staff members’ perceptions of the intervention. Anecdotally, research members were occasionally thanked by staff for helping (especially Anne). Sometimes on baseline days,
staff would ask researchers if the intervention could be administered to help calm down one of the participants. Future studies should aim to utilize a social validity measure in order to capture staff members’ thoughts and opinions on the practicality of the intervention.

Lastly, working with individuals who vary in degree of cognitive impairment would offer a new perspective. Because both Mary and Anne had pronounced impairment, data from outcome measures were difficult to collect. Working with people in earlier stages of dementia would allow for the incorporation of more outcome measures. Measures such as a formal mood screen (e.g., GDS) and a cognitive screen (e.g., SLUMS) would allow researchers to monitor the effects of the intervention on depression and cognitive functioning.

**Conclusion**

A need exists to create new treatments to help with behavioral symptoms of dementia without turning to pharmacological methods. Results showed that it is possible to reduce agitation behavior for individuals with advanced forms of dementia by implementing a brief VR intervention. This study has clinical utility given the brevity and effectiveness. Long-term care facilities can utilize this information to help improve the quality of life of residents and staff alike.
REFERENCES


APPENDIX A

COHEN-MANSFIELD AGITATION INVENTORY (CMAI) LONG-FORM

THE COHEN-MANSFIELD AGITATION INVENTORY - Long Form
with expanded descriptions of behaviors

AGITATION - SEE SCALE  Rate behaviors as they occur on your shift (during past two weeks).

Rating Scale for Agitated Behaviors

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pacing and aimless wandering</td>
<td>Never 1</td>
</tr>
<tr>
<td>Inappropriate dressing or disrobing</td>
<td>Once or twice a week 2</td>
</tr>
<tr>
<td>Spitting (including while feeding)</td>
<td>Several times a week 3</td>
</tr>
<tr>
<td>Cursing or verbal aggression</td>
<td>Once or twice a day 4</td>
</tr>
<tr>
<td>Constant unwarranted request for attention or help</td>
<td>Several times a day 5</td>
</tr>
<tr>
<td>Repetitive sentences or questions</td>
<td>Several times an hour 6</td>
</tr>
<tr>
<td>Hitting (including self)</td>
<td>Several times a day 7</td>
</tr>
<tr>
<td>Kicking</td>
<td>Never 1</td>
</tr>
<tr>
<td>Grabbing onto people or things inappropriately</td>
<td>Once or twice a day 4</td>
</tr>
<tr>
<td>Pushing</td>
<td>Several times a day 5</td>
</tr>
<tr>
<td>Throwing things</td>
<td>Never 1</td>
</tr>
</tbody>
</table>

8. Would be occurring if not prevented (e.g., would pace if not restrained)
9. Not applicable (e.g., cannot pace because cannot walk or move wheelchair)

If prevented part of the time, estimate how frequently it would happen if not prevented.

Do not include rare behaviors that are clearly explained by situational factors.

1. Pacing and aimless wandering - constantly walking back and forth, does not indicate normal purposeful walk, include wandering when done in a wheelchair
2. Inappropriate dressing or disrobing - putting on too many clothes, putting on clothing in a strange manner (e.g., putting pants on head), taking off clothing in public or when it is inappropriate (if only genitals are exposed, do not rate; see item # 28.) Do not rate person’s ability to dress/undress as in ADL’s
3. Spitting (including while feeding) - spitting onto floor, other people, etc.; do not include salivating of which person has no control, or spitting into tissue, toilet, or onto ground outside
4. Cursing or verbal aggression - only when using words; swearing, use of obscenity, profanity, unkind speech or criticism, verbal anger, verbal combativeness. Nonverbal will be marked under screaming
5. Constant unwarranted request for attention or help - verbal or nonverbal unreasonable nagging, pleading, demanding (indicate also for oriented people)
6. Repetitive sentences or questions - repeating the same sentence or question one right after the other (Do not include complaining - see item # 18; even if oriented and even if possibly warranted)
7. Hitting (including self) - physical abuse, striking others, pinching others, banging self/furniture
8. Kicking - strike forcefully with feet at people or objects
9. Grabbing onto people or things inappropriately - snatching, seizing roughly, taking firmly, or yanking
10. Pushing - forcefully thrusting, shoving, moving putting pressure against
11. Throwing things - hurl, violently tossing up in air, tipping off surfaces, flinging, intentionally spilling food
12. Making strange noises - including crying, weeping, moaning, weird laughter, grinding teeth
13. Screaming - loud shrill, shouting, piercing howl
14. Biting - chomp, gnash, gnaw (people, objects, or self)
15. Scratching - clawing, scraping with fingernails (people, objects, or self)
16. Trying to get to a different place - trying to get out of the building, off the property, sneaking out of room, leaving inappropriately, trying to get into locked areas, trespassing within unit, into offices, other resident’s room or closet
17. Intentional falling - purposefully falling onto floor, include from wheelchair, chair, or bed
18. Complaining - whining, complaining about self, somatic complaints, personal gripes or complaining about external things or other people
19. Negativism - bad attitude, doesn’t like anything, nothing is right
20. Eating or drinking inappropriate substances - putting into mouth and trying to swallow items that are inappropriate
21. Hurting self or other - burning self or other, cutting self or other, touching self or other with harmful objects, etc.
22. Handling things inappropriately - picking up things that don’t belong to them, rummaging through drawers, moving furniture, playing with food, fecal smearing
23. Hiding things - putting objects under or behind something
24. Hoarding things - putting many or inappropriate objects in purse or pockets, keeping too many of an item
25. Tearing things or destroying property - shredding, ripping, breaking, stomping on something
26. Performing repetitions mannerisms - stereotypic movement, such as patting, tapping, rocking self, fiddling with something, twiddling with something, rubbing self or object, sucking fingers, taking shoes on and off, picking at self, clothing, or objects, picking imaginary things out of air or off floor, manipulation of nearby objects in a repetitions manner
27. Making verbal sexual advances - sexual propositions, sexual innuendo, or “dirty” talk
28. Making physical sexual advances or exposing genitals - touching a person in an inappropriate sexual way, rubbing genital area, inappropriate masturbation, when not alone in own room or bathroom, unwanted fondling or kissing
29. General Restlessness - fidgeting, always moving around in seat, getting up and sitting down inability to sit still

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APPENDIX B

THE SAINT LOUIS UNIVERSITY MENTAL STATUS (SLUMS) EXAMINATION

VAMC SLUMS Examination
Questions about this assessment tool? E-mail aging@slu.edu.

Name: __________________________ Age: __________

Is patient alert? ________________ Level of education ____________

1. What day of the week is it?
2. What is the year?
3. What state are we in?
4. Please remember these five objects. I will ask you what they are later.
   Apple  Pen  Tie  House  Car
5. You have $100 and you go to the store and buy a dozen apples for $3 and a tricycle for $20.
   a. How much did you spend?
   b. How much do you have left?
6. Please name as many animals as you can in one minute.
   0-4 animals  5-9 animals  10-14 animals  15+ animals
7. What were the five objects I asked you to remember? I point for each one correct.
8. I am going to give you a series of numbers and I would like you to give them to me backwards.
   For example, if I say 42, you would say 24.
   87  649  8537
9. This is a clock face. Please put in the hour markers and the time at ten minutes to eleven o’clock.
   a. Hour markers okay
   b. Time correct
10. Please place an X in the triangle.
   Which of the above figures is largest?
11. I am going to tell you a story. Please listen carefully because afterwards, I’m going to ask you some questions about it.
    Jill was a very successful stockbroker. She made a lot of money on the stock market. She then met
    Jack, a devastatingly handsome man. She married him and had three children. They lived in Chicago.
    She then stopped work and stayed at home to bring up her children. When they were teenagers, she
    went back to work. She and Jack lived happily ever after.
    a. What was the female’s name?
    b. What work did she do?
    c. When did she go back to work?
    d. What state did she live in?

TOTAL SCORE

SCORING

<table>
<thead>
<tr>
<th>HIGH SCHOOL EDUCATION</th>
<th>LESS THAN HIGH SCHOOL EDUCATION</th>
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<tbody>
<tr>
<td>27-30</td>
<td>Normal</td>
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<tr>
<td>21-26</td>
<td>MNCD*</td>
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<tr>
<td>1-20</td>
<td>Dementia</td>
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</table>

* Mild Neurocognitive Disorder

APPENDIX C

THE OTTAWA MOOD SCALE

Mood Scale: How Is Your Mood?

Sad, Depressed, Down

In the Middle, Not Happy nor Sad

Happy, High, Awesome, Great

0 1 2 3 4 5 6 7 8 9 10
APPENDIX D

OBSERVATION SHEET

Date of Observation: ___________  Observation Start Time: ___________

Participant ID: _______________  Observation End Time: _______________

Target Behavior: _______________  Observer Name: _______________

Instructions: Start stopwatch when you begin observations. In the “Time Behavior Started” and “Time Behavior Ended” boxes, note the hour, minutes, and seconds on the stopwatch (not the actual time). In the “Time (s)” box, calculate the time in seconds that the behavior occurred.

<table>
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<tr>
<th></th>
<th>Time Behavior Started (hr:min:s)</th>
<th>Time Behavior Ended (hr:min:s)</th>
<th>Time (s)</th>
<th>Behavior Observed</th>
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APPENDIX E

OBSERVATION SHEET (FREQUENCY/DURATION)

Date of Observation: ___________ Observation Start Time: ___________

Partipant ID: ___________ Observation End Time: ___________

Target Behavior: ___________ Observer Name: ___________

Instructions: Start stopwatch when you begin observations. In the “Time Behavior Started” and “Time Behavior Ended” boxes below, note the minutes and seconds on the stopwatch (not the actual time). In the “Time (s)” box, calculate the time in seconds that the behavior occurred. Tally up the number of questions/disruptive vocalizations you hear the participant ask/say to the staff (sometimes GF asks many questions in a row and I will count this as the same occurrence). If more than a minute passes between questions/disruptive vocalizations, move on to the next number. Write a brief description of what was observed.

<table>
<thead>
<tr>
<th></th>
<th>Time Behavior Started</th>
<th>Time Behavior Stopped</th>
<th>Time (s)</th>
<th>Number of Questions (tally marks)</th>
<th>Behavior Observed</th>
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APPENDIX F

IRB APPROVAL

University of Colorado
Colorado Springs
Institutional Review Board (IRB) for the Protection of Human Subjects

Dates: 5/15/2019
IRB Review [APPROVED]

IRB PROTOCOL NO.: 18-166
Protocol Title: Reducing Agitation in Long-Term Care: A Virtual Reality
Principal Investigator: Allison Walden
Faculty Advisor if Applicable: Lelani Feliciano
Application: Renewal
Type of Review: Expedited
Risk Level: No more than Minimal Risk
Renewal Review Level: If changed from original approval
This Protocol Involves a Vulnerable Population: N/A (No Vulnerable Population)
Expires: 14 May 2020
*Note: if no expiration date is indicated, changes in the research need to be approved before implementation, and you need to report any adverse events. Requests for status updates may be sent by the IRB. In addition, the protocol may match more than one review category not listed.
Externally funded: Yes
OSP #: Sponsor:

Thank you for submitting your Request for IRB Review for renewal of an approved protocol. The protocol identified above has been reviewed according to the policies of this institution and the provisions of applicable federal regulations. The review category is noted above, along with the expiration date, if applicable.

Once human participant research has been approved, it is the Principal Investigator’s (PI) responsibility to report any changes in research activity related to the project:
- The PI must submit all protocol, recruitment, advertising, and consent form amendments/revisions to the IRB for approval.
- The IRB must approve these changes prior to implementation.
- If you are a student, please note that it is required to include the IRB approval letter in the thesis when you submit the dissertation/thesis.
- The PI must promptly inform the IRB of all unanticipated serious adverse events (within 24 hours). All unanticipated adverse events must be reported to the IRB within 1 week (see 45CFR46.108(a)(1)(ii)). Failure to comply with these federally mandated responsibilities may result in suspension or termination of the project.
- If requested, review the study with the IRB at least 10 business days prior to expiration.
- Notify the IRB when the study is complete

If you have any questions, please contact Research Compliance Program Director in the Office of Sponsored Programs and Research Integrity at 719-255-3903 or irb@uccs.edu

Thank you for your concern about human subject protection issues, and good luck with your research.

Sincerely yours,

Samantha Christiansen
Samantha Christiansen, PhD
IRB Committee Member

www.uccs.edu/irb
Version 11.18.2018
1420 Austin Bluffs Parkway Colorado Springs, CO 80910 719-255-3021 phone 719-255-3700 fax