

*Mixed Methods Research*

# The Impact of Robotic Companion Pets on Depression and Loneliness for Older Adults with Dementia During the COVID-19 Pandemic

Donna M. Fogelson, DNP, MSN, MA, APRN, AGCNS-BC, CDP   
 Carolyn Rutledge, PhD, FNP-BC  
 Kathie S. Zimbardo, PhD, RN   
 Old Dominion University, Virginia Beach Higher Education Center, University Drive

jhn

Journal of Holistic Nursing  
 American Holistic Nurses Association  
 Volume 40 Number 4  
 December 2022 397–409  
 © The Author(s) 2021  
 Article reuse guidelines:  
[sagepub.com/journals-permissions](http://sagepub.com/journals-permissions)  
 10.1177/08980101211064605  
[journals.sagepub.com/home/jhn](http://journals.sagepub.com/home/jhn)



**Purpose:** Differences in depression and loneliness, during the COVID-19 pandemic, for older adults with mild to moderate dementia living in residential care after interacting with a robotic companion dog or cat were explored. Experiences of family members and professional caregivers were also examined. **Design:** This study used a mixed research design with pre- and post-questionnaires on depression and loneliness. **Method:** Quantitative data exploring the impact of companion pets on depression and loneliness were collected from participants pre-intervention and at 3- and 6-week intervals. Qualitative data were collected during the 6-week study period, permitting researchers to explore the impact of robotic companion pets on participants, family members, and professional caregivers. **Findings:** Results indicated depression ( $\chi^2 F(2) = 21.29, p < 0.001$ ) and loneliness ( $\chi^2 F(2) = 21.11, p < 0.001$ ) improved. Moreover, participants were engaged with their companion pet, providing meaningful, activity and positive experiences. **Conclusions:** Robotic companion pet therapy, a holistic, nonpharmacologic animal-assisted therapy (AAT), changed the AAT landscape at the study site and provided an alternative option to live pet therapy during COVID-19. Participant interactions with their robotic companion pets enhanced their well-being and quality of life, especially during stringent COVID-19 restrictions and social isolation.

**Keywords:** *older adults < group/population; cognitive impairment < specific conditions; animal assisted therapies < healing modalities; alternative/complementary therapies < common themes; COVID-19; loneliness; depression; robotic companion pets*

## Introduction

Dementia is not a single disease but is a disease broadly characterized by progressive declines in cognitive, social, and physical functioning (Gustafsson et al., 2015), affecting 6 million Americans (Alzheimer's Association, 2021) and 50 million individuals worldwide (Wang et al., 2020). Behavioral and psychosocial symptoms include agitation, depression, and loneliness (Hu et al., 2018; Jennings, 1997; Klimova et al., 2019). Symptoms are managed with medications, but effectiveness varies, and side effects persist (Gaugler et al., 2019). Recently, the

United States (US) Food and Drug Administration approved Aduhelm™ a new pharmacological therapy for Alzheimer's disease (Cavazzoni, 2021). However, physicians warn the impact may be limited (Walker, 2021). Moreover, not all patients are eligible, and those that are, may incur substantial out-of-pocket costs exceeding \$10,000 annually

---

Author's Note: Donna M. Fogelson, Old Dominion University, Virginia Beach Higher Education Center, University Drive, Virginia Beach, VA 23456, 7 Still Road, West Hartford, CT 06117-1216, United States.  
 Email: [dfoge001@odu.edu](mailto:dfoge001@odu.edu)

(Walker, 2021). Animal-assisted therapy (AAT), a holistic, nonpharmacological practice using live animals and robotic pet technology, may be an alternative treatment therapy to enhance quality of life for this vulnerable population (Gustafsson et al., 2015; Klimova et al., 2019; Scales et al., 2018), especially when family visitation is restricted. Further, AAT poses less risk than pharmacological interventions (Hu et al., 2018).

In 2016, 41.9% of individuals in the US diagnosed with Alzheimer's disease or other dementias lived in residential care (Center for Disease Control & Prevention [CDC], 2021). Approximately 47.8% of the individuals residing in nursing homes using long-term care services have dementia (CDC, 2021). Family visits often lessen the effects of loneliness, anxiety, and depression for these residents and are central to their well-being (O'Caoimh et al., 2020). However, deaths among this population increased 16% during the COVID-19 pandemic (Alzheimer's Association, 2021). Moreover, visitor restrictions and shelter-in-place orders were enforced to protect residents from virus transmission, enhancing social isolation (LeVasseur, 2021). Family gatherings for birthdays, holidays, and other special occasions were canceled. Social activities such as walks, visiting other residents, entertainment, group activities and communal meals were also canceled (Simard & Volicer, 2020). Sequestering residents in their rooms limited social interaction to brief encounters when professional caregivers entered their rooms to deliver medications or perform wellness checks. Unintended consequences of this enhanced social isolation include increased feelings of sadness, depression, loneliness (LeVasseur, 2021), and lack of companionship.

AAT using live animals has demonstrated positive effects on quality of life (QOL) and has the potential

to reduce social isolation and loneliness for patients with dementia (Klimova et al., 2019). Interaction with live animals promotes sensory stimulation and socialization and enhances well-being (Scales et al., 2018). Physiological effects such as a decrease in blood pressure and an increase in neurochemicals have been realized. Depression in nursing home residents can be reduced when live animals are used during group activities (Majić et al., 2013). Dog-assisted therapy may impact QOL through socialization and communication, providing meaningful activity, and generating positive engagement (Pérez-Sáez et al., 2020). The type of animal used during AAT and the cognitive level of the person can affect interactions with the animal (Thodberg et al., 2016). However, the symptoms of depression had no effect on the type of animal used in the AAT intervention.

Prior to the COVID-19 pandemic, interaction between residents with cognitive impairments and live animals was encouraged. However, during the pandemic, there was a potential risk, although rare, of animals spreading the virus to humans (CDC, 2020), restricting live animal engagements. Additionally, in some settings, live animals were not permitted due to concerns related to infection control, allergies to pet dander, or fear of animal bites (Hung et al., 2019).

Robotic pet technology may provide feasible, effective alternatives to using live animals to manage dementia symptoms (Koh et al., 2021), especially during times when visitation is restricted. Koh et al. (2021) reviewed studies looking at the impact of robotic pets for older adults and people with dementia living in long-term care facilities and in the community setting. In these studies, various tools for measuring outcomes were used depending upon the study variables and included, but not limited to, the Cohen-Mansfield Agitation Inventory, interviews, clinical observation, diary entries, and the UCLA Loneliness Scale (Koh et al., 2021). Banks et al. (2008) found robotic and live dogs in the nursing home improved loneliness scores when residents encountered the live dog and robotic dog compared to the control group ( $p < 0.05$ ). The researchers used the University of California Los Angeles (UCLA) Loneliness Scale to measure loneliness (Banks et al., 2008). Jennings (1997) looked at the various studies by researchers exploring the potential health promotion benefits of owning a pet. Among the studies reviewed by Jennings (1997), one study mentioned the health benefits of pet ownership in decreasing loneliness and depression in which the researchers noted loneliness was associated with



**Figure 1.** *Joy for All™ Companion Pets*, reprinted with permission: © 2018 Ageless Innovation LLC.

depression. In the study, the researchers used the UCLA Loneliness Scale to measure loneliness. Gustafsson et al. (2015) explored the effects of an interactive robotic cat on social interaction, holding, petting, engagement, and emotional response in older adults with dementia. In this study, the outcomes were measured using the Quality of Life in Late-Stage Dementia scale, the Cohen-Mansfield Agitation Inventory instrument, and qualitative descriptions using an interview guide to collect narratives (Gustafsson et al., 2015). Experiences of family members and caregivers were also explored. Participants demonstrated less agitated behavior and a better QOL over a 12-week period. The authors noted alternative and complementary interventions for individuals with dementia are needed, with the robotic cat a feasible tool to improve dementia care. PARO®, a biofeedback robotic seal used to manage dementia-related symptoms, is another promising example (Petersen et al., 2017). In the Petersen et al. (2017) study, researchers measured the outcomes using various measuring tools including the Rating for

Anxiety in Dementia, Cornell Scale for Depression in Dementia, Global Deterioration Scale, pulse rate, pulse oximetry, galvanic skin response, and medication utilization. Resident use of psychoactive and pain medications was reduced following interaction with the seal. Robotic pets positively impacted mood and affect, social interaction, and overall well-being; however, more research is needed (Koh et al., 2021). Affordability of the robotic pets, ethical issues of attachment, and misrepresentation of the robotic pet as being a live animal are also potential concerns.

Robotic pet technology has demonstrated positive effects in AAT sessions without the negative effects of biting, allergic reactions, and infections people may experience with live animals (Klimova et al., 2019), but have not been fully integrated into AAT programs. Moreover, the impact of AAT using robotic pet technology during the COVID-19 pandemic on behavior and psychosocial symptoms for older adults with dementia has not been examined.

## Purpose

This study aimed to explore differences in depression and loneliness for older adults with mild to moderate dementia living in residential care after interacting with a robotic companion dog or cat. Experiences of family members and professional caregivers were also examined.

## Method

The impact of robotic companion pets on dementia symptoms, along with feasibility of integrating companion pets into AAT, specifically when live animals were prohibited, was explored. The intervention took place between October 2020 and December 2020. Quantitative data exploring the impact of companion pets on depression and loneliness were collected from participants pre-intervention and at 3- and 6-week intervals. Qualitative data were collected during the 6-week study period, permitting researchers to explore the impact of robotic companion pets on participants, family members, and professional caregivers.

## Robotic Companion Pets

Joy for All™ Companion Pets (Figure 1) offer an alternative to traditional live animal AAT therapy. These companion pets respond to touch, sound, and motion which allow interaction and engagement

**Table 1.** Descriptive Statistics of Personal Characteristics

Personal Characteristics	n	%
Robotic Animal		
Cat	8	44.4
Dog	10	55.6
Gender		
Male	2	11.1
Female	16	88.9
Ethnicity		
White	18	100.0
African American	0	
Hispanic	0	
Asian	0	
Native American/Pacific Islander	0	
Level of Care		
ALMC	9	50.0
MC	3	16.7
LTC	6	33.3
Dementia Stage		
Early	6	33.3
Moderate	9	50.0
Moderately Severe	3	16.7
Level of Education		
HS/GED	2	11.1
Some college	10	55.6
Bachelor's degree	1	05.6
Graduate degree	5	27.8

(Ageless Innovation, 2021). The cat purrs, meows, and moves whereas the dog barks when spoken to, turns its head toward the sound of one's voice, wags its tail, and when petted, has a heartbeat (Ageless Innovation, 2021). Companion dogs and cats appeal to the memories of the residents having previous pets (Gustafsson et al., 2015).

Joy for All™ Companion Pets are interactive and easy-to-care for, making them an attractive alternative to live AAT sessions in nursing homes (Ageless Innovation, 2021). Companion pets are battery operated and have the ability to mute sounds of the dog barking or cat meowing if participants wish a silent interaction. Companion pets have the potential to provide pleasure, comfort, companionship, and improve well-being and QOL for older adults with dementia. The pets are easy to handle and clean. Instituting facility infection control protocols for cleaning the robotic pets helps mitigate possible infection sources and cross-contamination.

## Setting

A 60-bed residential care facility in the northeastern US, caring for older adults with various stages of dementia, was chosen for this study. There were three neighborhoods at the healthcare facility with residents in assisted living memory care (ALMC), memory care (MC), and long-term care (LTC). Professional caregivers and family members were invited to participate.

## Participants

A convenience sample of participants was recruited for this study. English-speaking older adults, residing in the ALMC, MC, or LTC neighborhood, with a dementia stage of 4, 5, or 6 on the Global Deterioration Scale (Reisberg et al., 1982), and expressed an interest to volunteer were invited to participate. Participants with dementia stage 7 or those

who chose not to sign the informed or assent consent were excluded. Participants were informed of the study by their professional caregivers and research flyers.

The study sample included 18 participants (2 men and 16 women) completing the pre-intervention assessments, 14 participants completed the 3-week assessments, and 13 participants completed the 6-week assessments. Participant loss to follow-up included allergic reactions to the companion pet fur ( $n = 2$ ), the companion pet no longer in the participant's room ( $n = 2$ ), and participant demise ( $n = 1$ ). Participants were predominantly female (88.9%), white (100%), and had a high school education or some college (66.7%) (Table 1). About half resided in the ALMC neighborhood, with 83.3% diagnosed with early or moderate dementia. The companion dog, as opposed to the cat, was selected most often (55.6%) as the pet of choice. The mean age for participants in this study was 89.6 years ( $SD = 5.7$ ).

## Intervention

The researcher educated professional caregivers on the mechanisms and functional abilities of the robotic companion pets as well as proper handling and cleaning. Additionally, an education storyboard was placed in each neighborhood to use as a reference guide and provided the researcher's contact information. The intervention was conducted in the privacy of the participant's room. Each participant received their own companion pet to enhance engagement and interaction, and to mitigate cross-contamination during the COVID-19 pandemic. The researcher explained the companion pet was an alternative to a living animal and not a live pet. Family members and professional caregivers were

**Table 2.** Descriptive Statistics: Loneliness and Depression

	Pre-intervention		3 Weeks Post Intervention		6 Weeks Post Intervention	
	Mean	SD	Mean	SD	Mean	SD
Loneliness	23.23	2.86	25.46	2.93	18.77	2.71
Depression	11.31	2.50	3.85	2.85	2.00	1.00

**Table 3.** Correlations Between Study Variables Pre-Intervention

Personal Attributes	Loneliness	Depression
Age	0.017	0.093
Education Level	0.042	-0.416
Dementia Stage	-0.111	-0.318

Note: \*  $p < .05$  \*\*  $p < .01$  \*\*\*  $p < .001$ . Dummy variables: education level (1 < 12<sup>th</sup> grade, 2 = HS/GED, 3 = some college, 4 = bachelors, 5 = graduate); dementia stage (4 = early dementia, 5 = moderate dementia, 6 = moderate/severe dementia).

educated not to give participants the impression that the companion pet is a live animal. The researcher demonstrated the functional abilities of the companion pet to each participant and demonstrated how to touch, hold, and stroke the pet. Each participant was given the opportunity to interact and engage with their companion pet for 6-weeks. The companion pet was not removed from the room unless requested by the participant or family. Participants were made aware the companion pet was theirs to keep even if they did not complete the 6-week study.

The researcher conducted a 45-min visit with each participant pre-intervention and at 3- and 6-week follow-up visits. These face-to-face visits were not videotaped, or audio recorded. During these visits, participants completed the self-report questionnaires on depression using the Geriatric Depression Scale (GDS)-15 and loneliness using

the UCLA Loneliness Scale (Version 3). The researcher assisted participants by reading the questions to them upon request. Some participants chose to complete the questionnaires in private.

## Theoretical Framework

The Health Promotion Model (HPM) by Nola Pender supports a positive, multidimensional nature of holistic health with the capacity to impact a person's health behaviors and QOL at all stages of life (Petiprin, 2016). The HPM focuses on behavioral lifestyle changes or modifications that can help improve an individual's health (Khoshnood et al., 2018).

The HPM has been used in previous nursing studies to guide the implementation of interventions to help explain human behavior and behavior change outcomes (Polit & Beck, 2017), and is based on the three constructs of individual characteristic and experiences, behavior-specific cognition and affect, and behavioral outcome (Petiprin, 2016). Individual characteristics and experiences include prior related behavior and personal factors in

**Table 4.** Comments from Participants, Family, and Professional Caregivers

Participants	<p>"I love having her. I put my cat near the window so she could see the snow that is coming"</p> <p>"She's beautiful. She keeps me company. I don't have to feed her, and I love it when she purrs"</p> <p>"This is the best dog! I had a dog growing up. Except with this dog, I don't have to feed him or clean up after him"</p>
Family	<p>"My mother was matter of fact about the cat at first. Then I called the next week and the cat was purring, and she had to go be with her cat friend"</p> <p>"My mom now goes and visits another resident that has a dog and they have developed a friendship"</p> <p>"She loves the cat, and it gives us something positive to talk about"</p>
Professional Caregivers	<p>"It was truly amazing how so many residents talked to their pets and cared for them as if they were real animals. Some residents would even take them for a stroll in the hallway"</p> <p>"It was so wonderful seeing residents so engrossed with their animals that they did not remember who I was! I never knew that I would have to take a back seat to a robotic dog and cat"</p> <p>"They love their animals! They take them everywhere. They talk to them and pet them"</p>



**Figure 2.** Participant with Joy for All™ Companion Cat, printed with permission.

categories of the biological, psychological, and socio-cultural (Petiprin, 2016).

Behavior-specific cognition and affect comprises several aspects. Perceived benefits of action are the positive outcomes that occur as a result of the health behavior intervention (Petiprin, 2016). Perceived barriers can include the costs, anticipated or real, involved in understanding the health behavior (Petiprin, 2016). Perceived self-efficacy involves the capability of the person to carry out the health promoting behavior (Petiprin, 2016). Activity-related affect is the individual's positive or negative response to the intervention which can occur before, during, or after the behavior-based intervention (Petiprin, 2016). Interpersonal influences include cognition-concerning behaviors, attitudes, and beliefs and can be influenced by others including health care team members, family members, and friends. Situational influences can include the setting or environment where the intervention is taking place and can have a direct or indirect effect on the health behavior (Petiprin, 2016). Immediate competing demands can involve environmental concerns the individual may not have control over whereas competing preferences include the behaviors in which individuals have a higher level of control over (Petiprin, 2016). Commitment to the action plan includes the tactic involved in implementing the health promoting behavior (Petiprin, 2016). The health promoting behavior is the positive expected outcome the action or intervention is directed towards (Petiprin, 2016).

In this study, individual characteristics, and experiences included prior related behavior (dementia) and personal factors (age, gender, race, education level). The behavior-specific cognition and affect construct included perceived barriers to action (level of care) and situational influences (robotic pet therapy). The specific factors of the pet therapy included the robotic companion pet (cat or dog) which was the independent variable in this study. Under the behavioral outcome construct, the health promoting behavior outcome was aimed at attaining better health outcomes (depression and loneliness) using a holistic approach without the use of medications.

## Measures

The Global Deterioration Scale (GDS) was used to measure the stages of degenerative dementia

(Reisberg et al., 1982). The GDS uses a 7-stage rating scale: (a) Stage 1 and Stage 2 - subjectively and objectively normal; (b) Stage 3 - mild cognitive impairment (MCI); (c) Stage 4 - early dementia; (d) Stage 5 - moderate dementia; (e) Stage 6 - moderately severe dementia; and (f) Stage 7 - severe dementia (Reisberg et al., 1982). Each stage describes clinical traits usually exhibited by the individual. The GDS and social demographic data (age, gender, race, education level, and level of care) were collected during the pre-intervention visit.

The GDS-15 was used to measure depression (Sheikh & Yesavage, 1986; Yesavage et al., 1983). The Geriatric Depression Scale is a reliable and validated depression screening tool for use with older adults with dementia living in the community, in skilled nursing, or in long-term care facilities (Brown et al., 2015). The GDS-15 has good reliability, with Cronbach's alpha reported as 0.81, and test-retest strong correlations at 2-weeks ( $r = 0.84$  to  $0.85$ ,  $p < 0.01$ ) (Balsamo et al., 2018). Additionally, the GDS-15 has high sensitivity (92%) and specificity (89%). The scale consists of 15 questions where 10 questions indicate the presence of depression when answered positively; 5 questions indicate depression when answered negatively. Depression level is indicated by the total score on the GDS-15, with a score of 5 or higher suggesting depression. A sample question includes "Have you dropped many of your activities and interests?" Cronbach's alpha for the GDS-15 in this study was acceptable (0.77). Participants completed the GDS-15 pre-intervention and at 3- and 6-week follow-up visits.

The UCLA Loneliness Scale (Version 3) was used to assess loneliness in this study (Russell, 1996). The UCLA Loneliness Scale (Version 3) has been used in studies with the older adult population (Russell, 1996), including older adults with dementia (Sun et al., 2021). This scale has good internal reliability (Cronbach's alpha 0.89 to 0.94), and test-retest reliability over a one-year period ( $r = 0.73$ ). This 10-item, self-report tool uses a 4-point Likert scale (1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Always). Loneliness is calculated by summing the scores across the 10 items. The higher the score, the greater the degree of loneliness. A sample item includes "How much of the time do you feel you lack companionship?" Cronbach's alpha for the UCLA Loneliness Scale (Version 3) in this study was acceptable (0.70). Participants completed the

scale pre-intervention and at 3- and 6-week follow-up visits.

### Ethical Considerations

This study was approved by the local Institutional Review Board. The researcher obtained assent or informed consent from participants, their relatives, or legally authorized representatives. Questionnaires were placed in a locked box accessible only to the researcher. Participants' dementia level was staged, and ethical considerations maintained.

### Data Analysis

Descriptive statistics were used to characterize the study sample. Spearman's rank correlation coefficients were used to examine relationships between study variables. Friedman's ANOVA was used to test differences between measurement periods. Post hoc tests were completed using pairwise Wilcoxon signed-rank tests. Statistical significance for post hoc tests were evaluated against a Bonferroni-adjustment alpha level of 0.017 (0.05/3) since multiple pairwise comparisons were performed on the same dataset. SPSS Statistics for Windows version 26, SPSS Inc., Chicago, Ill., US, was used to analyze study data. Qualitative data were used to explore participants, family members, and professional caregivers' perceptions of the impact, use, and qualities of robotic companion pets in their environment.

## Results

### Quantitative Analyses

Descriptive statistics for loneliness and depression are presented in Table 2. Relationships between participant characteristics, loneliness and depression were not statistically significant (Table 3). Friedman's ANOVA showed a significant improvement in loneliness ( $\chi^2 F(2) = 21.11$ ,  $p < 0.001$ ) across the measurement periods. Post-hoc tests revealed loneliness was significantly reduced between pre-intervention and 6-weeks post-intervention ( $Z = -3.06$ ,  $p = 0.002$ ) and between 3-weeks post-intervention and 6-weeks post-intervention ( $Z = -3.07$ ,  $p = 0.002$ ). Significant changes in loneliness between the pre-intervention and 3 weeks post-intervention ( $Z = -2.37$ ,  $p = 0.018$ ) measurement periods were not realized.

Friedman's ANOVA showed a significant improvement in depression ( $\chi^2 F(2) = 21.29$ ,  $p < 0.001$ ) across the measurement periods. Post-hoc tests revealed depression was significantly reduced between pre-intervention and 3-weeks post-intervention ( $Z = -3.19$ ,  $p = 0.001$ ), between pre-intervention and 6-weeks post-intervention ( $Z = -3.06$ ,  $p = 0.002$ ), and between 3- weeks and 6-weeks post-intervention ( $Z = -3.07$ ,  $p = 0.002$ ) measurement periods.

### Qualitative Data

Study site leadership did not permit focus groups with participants, professional caregivers, and family members due to COVID-19 restrictions. Instead, the researcher conducted individual interviews to inquire about their perceptions of program impact on participant well-being. Perceptions provided by participants, family, and professional caregivers are presented in Table 4. Overall perceptions related to robotic companion pet experiences were very positive, with pets providing companionship for participants and improving communication. For example, one participant commented "I love having her. I put my cat near the window so she could see the snow that is coming" (Figure 2). Professional caregivers and family members also commented on the positive impact of robotic companion pets on participants' well-being. One family member commented "She loves the cat, and it gives us something positive to talk about" providing opportunities for meaningful conversation, especially during the pandemic when family visitation was restricted. A professional caregiver mused "It was so wonderful seeing residents so engrossed with their animals that they did not remember who I was! I never knew that I would have to take a back seat to a robotic dog and cat." Participants, professional caregivers, and family members indicated the program should be continued and expanded.

## Discussion

Findings for this study were not consistent with the literature (Banks & Banks, 2002; Klimova et al., 2019; Scales et al., 2018) at the 3-week interval as participant interaction with the companion pet did not have a positive impact on loneliness. It is important to note, this study was conducted during the COVID-19 pandemic when visitor restrictions and

shelter-in-place orders were enforced. Additionally, the live therapy dog was restricted from entering the facility due to concerns of virus transfer to residents. Moreover, participants were notified by professional caregivers during the 3-week data collection period that family visitation would not be permitted during the upcoming Thanksgiving holiday due to a rise in COVID-19 positivity rates in the community. Participants expressed dissatisfaction with the decision and indicated they would be lonely during the holiday. It is unclear to what extent this news negatively impacted study results related to loneliness at this time interval. The researcher spent at least an hour with each participant, at their request, to discuss the decision to restrict family visitation during the holiday.

Study results 6-weeks following program implementation were in concordance with the literature (Banks & Banks, 2002; Gustafsson et al., 2015; Klimova et al., 2019; Pérez-Sáez et al., 2020; Scales et al., 2018; Thodberg et al., 2016) in that reported depression and loneliness scores were significantly lower following interaction with the companion pet. Participants, family members, and professional caregivers were very positive about interactions with the companion pets. Family members noted new opportunities to engage their loved ones in meaningful conversations, which they found very satisfying.

In this study, infection control barriers to using robotic technology in AAT were consistent with those reported by Hung et al. (2019). Special infection control practices for cleaning the companion pets were required by the study facility, particularly given the COVID-19 pandemic environment. Professional caregivers were educated about infection control cleaning procedures prior to participants receiving their companion pets. Overall, companion pets required less care than live animals, were safe to use, particularly for people who may be allergic to pet dander or fear the animal may bite (Hung et al., 2019), and decreased the risk of zoonotic pathogens transmitted from animals to humans (CDC, 2015). Furthermore, with infection control practices in place, providing participants with their own robotic companion pet mitigated cross-contamination risk.

Cost barriers were consistent with those reported in the literature (Hung et al., 2019). Funding to purchase individual robotic companion pets was critical to program success. Intangible results of enhanced participant satisfaction, increased well-being, and QOL were considered essential benefits when the

cost-benefit analysis to secure funding was conducted. Additionally, AAT has the potential to be a cost-effective intervention by decreasing the use of psychotropic medications and improving the QOL in residents with dementia (Briones et al., 2021). In this study, resources to mitigate the cost of companion pets were provided by the study site and vendor for the companion pets. Funding may be available from the National Institute on Aging (NIA) for research using nonpharmacological intervention development in the areas of dementia care, caregiver research, and prevention (NIA, 2021).

### Methodological Considerations

Limitations for this study included the use of a small convenience sample at one residential care facility. This study was conducted during the COVID-19 pandemic, significantly restricting participant interactions with their family, which may have negatively impacted changes in loneliness. Repeating the study when family visitation restrictions are lifted, may produce different results. The results are not generalizable but may be transferable to similar residential care environments (Gustafsson et al., 2015).

### Implications for Advancing Knowledge, Practice and Research

There is a growing need for alternative and complementary nonpharmacological interventions to manage health outcomes for the increasing number of residents with dementia (Gustafsson et al., 2015). AAT programs, using robotic companion pets, is an innovative, holistic, nonpharmacological technological intervention that can be applied in multiple healthcare and community settings. AAT can be part of the treatment process with the goal to enhance social, physical, and cognitive functions thus improving a person's well-being (Klimova et al., 2019) and all care providers can participate. Physical activity is improved by petting the animal, and communication skills are enhanced when bonding with the animal (Gustafsson et al., 2015; Klimova et al., 2019). The body releases endorphins and other hormones when interacting with the animal through hugging or petting (Klimova et al., 2019). Facilitating interprofessional collaboration and team building, implementation of an AAT program engages the



interprofessional team in promoting positive outcomes between staff and residents at the facility (Mills et al., 2019).

The findings from the study have the potential to impact practice and patient care to improve care and health outcomes for older adults with dementia. This study was conducted during a pandemic where visitor restrictions and shelter-in-place orders were in effect. Additionally, the live pet therapy dog at the facility was restricted from entering the facility at the onset of the pandemic. Implementing this type of holistic program coincides with improving the health of older adults with dementia and advancing nurse practice. The American of Colleges of Nursing (AACN) describes the call for action to focus on health promotion and disease prevention among vulnerable populations and to refine assessment skills in specialized populations (AACN, 2006). Additionally, on a national level, this type of holistic, nonpharmacological program supports the *Healthy People 2030* goal to improve the health and quality of life for individuals living with dementia (CDC, 2020).

This study adds to the limited body of research in the US currently available on the use of robotic companion pets in cognitively impaired older adults. In this study, AAT was explored in the cognitively impaired older adult with dementia looking at the potential to decrease depression and loneliness using the companion pets. Taking into consideration clinical scholarship and evidence-based practice, more research is needed, and the scope of AAT needs to be expanded in order to explore AAT and psychotropic medication use. In the study conducted by Briones et al. (2021), the researchers explored enhancing the QOL for dementia patients with the use of AAT, specifically, using a dog, to reduce dementia related symptoms such as agitation, depression, insomnia, and the use of psychotropic medications. The researchers concluded more research needed to be done to evaluate AAT and the use of psychotropic medications (Briones et al., 2021).

In the study by Lu et al. (2021), the researchers reviewed literature on the effectiveness of using robot care for people with dementia measuring agitation, depression, and QOL. When the people with dementia were exposed and engaged with pet-type robotics, the researchers found these type of pets stimulate interaction and had a positive effect on depression in people with dementia (Lu et al., 2021). The researchers suggested additional studies

be conducted in the field of pet-type robotics for use in therapy programs.

There are resources available to fund an AAT program. The vendor of the robotic animals is a potential source of funding as well as the facility or hospital planning to conduct the research. Additionally, the NIA has funding opportunities available for research using nonpharmacological intervention development in the areas of dementia care, caregiver research, and prevention (NIA, 2021). Providing a nonpharmacological intervention, such as an AAT program, in the facility, hospital, or community has the potential to improve health care outcomes in the older adult population.

There are many opportunities to improve the health outcomes of older adults with dementia and improve their QOL. This research identified a nonpharmacological intervention that can be implemented to decrease depression and loneliness in older adults. As holistic nursing professionals, facilitating interprofessional collaboration through the implementation of this alternative AAT program has the potential to engage professional caregivers in promoting positive outcomes between the caregivers and the residents at the facility. As clinical leaders, working with professional caregivers to allocate the time for caregiver implementation of this program is essential in fostering leadership and team building. Systems leadership for quality improvement has the potential to create a system-wide change in holistic nursing practice delivery as well as improving health outcomes (AACN, 2006).

Using an interprofessional team building approach to engage unit champions with implementing the program has the potential to create opportunities for other health care professionals to engage and participate with the residents in this type of program (Mills et al., 2019). Additionally, having unit champions model program implications can encourage and motivate staff members to become involved in executing the program within their unit or neighborhood to improve patient outcomes. Facilitating team building and collaboration contributes to improved patient outcomes by providing individualized, holistic, person-centered care for the older adult population (AACN, 2006).

From a business practice, securing the funds needed to purchase the robotic companion pets for the AAT program is essential to the success of the program. With current COVID-19 infection control practices in place, the ability for each resident or

patient to have their own robotic companion pet helps to mitigate the risk of cross-contamination between residents or patients is essential. When using a cost-benefit analysis to secure the needed funds, consideration of the intangible results of improved patient satisfaction and QOL should be considered as essential benefits. Additionally, AAT has the potential to be a cost-effective intervention by decreasing the use of psychotropic medications and improve the QOL in dementia patients (Briones et al., 2021). Using the holistic, nonpharmacological technology of robotic companion pets as an AAT intervention to improve health outcomes, supports nursing practice to improve and transform healthcare in this vulnerable population (AACN, 2006).

Robotic companion pets in AAT programs have implications for policy and the potential to change the landscape of pet therapy especially for those with allergies to pet dander, potential disease transmission, fear of animal bites, and where live animals are not permitted into facilities. With proper health and infection control policies in place at facilities, the use of robotic companion pets in AAT programs has the potential to decrease the risk of zoonotic pathogens transmitted from animals to humans (CDC, 2015).

The use of robotic companion pets in AAT programs is a technology that can be applied in multiple healthcare and community settings to improve health care outcomes in older adults with dementia supporting holistic nursing practice as well as patient care technology for the improvement and transformation of health care (AACN, 2006). In a study by Moyle et al. (2012), family members of loved ones with dementia felt the robotic animal improved their loved one's well-being. Anecdotal comments provided by participants, families, and professional caregivers supported this notion.

Kelly et al. (2021) conducted a study using the robotic PARO® seal in an acute care setting for hospitalized patients with dementia. The study was conducted with patients in three units of the hospital which included orthopedics, progressive cardiac care, and medical-surgical with study results showing potential for positive social and affective interactions (Kelly et al., 2021). Neal et al. (2020) reported the use of robotic animals in adults with dementia increased positive behaviors and an improved QOL. Robotic animal technology has the potential to decrease depression and loneliness in older adults with varying cognitive impairments. In

this research, participants were engaged and stimulated by the interaction with their companion pet, providing a meaningful activity and generating positive engagement.

## Conclusions

Robotic companion pet technology is holistic and innovative, and this technology changed the AAT landscape at the study facility, especially when live animals were restricted. Companion pets improved depression and loneliness without risks associated with pharmacological interventions (Hu et al., 2018). Participants were engaged with their companion pet, providing meaningful activity and positive experiences, especially when COVID-19 restrictions were at its worse, with participants sequestered, and family visitation restricted. More importantly, conversations between participants, family, and professional caregivers enhanced the therapeutic milieu.

## Acknowledgments

Funding for the companion pets for this research was provided by Duncaster Foundation and Ageless Innovation LLC.

## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the Duncaster Foundation and Ageless Innovation LLC.

## ORCID iDs

Donna M. Fogelson  <https://orcid.org/0000-0002-4779-849X>  
Kathie S. Zimbardo  <https://orcid.org/0000-0001-8841-2664>

## References

- Ageless Innovation (2021). *Joy for All™ companion pets guide for family caregivers*. [https://agelessinnovation.com/wp-content/uploads/2020/05/CareGuide\\_ENGLISH\\_Master-1.pdf](https://agelessinnovation.com/wp-content/uploads/2020/05/CareGuide_ENGLISH_Master-1.pdf).

- Alzheimer's Association (2021). *Facts and figures*. <https://www.alz.org/media/documents/alzheimers-facts-and-figures-infographic.pdf>.
- American Association of Colleges of Nursing (2006). *The essentials of doctoral education for advanced nursing practice*. Retrieved from <https://www.aacnursing.org/DNP/DNP-Essentials>.
- Balsamo, M., Cataldi, F., Carlucci, Padulo, C., & Fairfield, B. (2018). Assessment of late life depression via self-report measures: A review. *Clinical Interventions in Aging*, 13, 2021-2044. <https://doi.org/10.2147/CIA.S178943>
- Banks, M. R., & Banks, W. A. (2002). The effects of animal-assisted therapy on loneliness in an elderly population in long-term care facilities. *Journal of Gerontology: Series A, Biological Sciences and Medical Sciences*, 57(7), M428-M432. <https://doi.org/10.1093/gerona/57.7.M428>
- Banks, M. R., Willoughby, L. M., & Banks, W. A. (2008). Animal-assisted therapy and loneliness in nursing homes: Use of robotic versus living dogs. *Journal of the American Medical Directors Association*, 9(3), 173-177. <https://doi.org/10.1016/j.jamda.2007.11.007>
- Brones, M.Á., Pardo-García, I., & Escribano-Sotos, F. (2021). Effectiveness of a dog-assisted therapy program to enhance quality of life in institutionalized dementia patients. *Clinical Nursing Research*, 30(1), 89-97. <https://doi.org/10.1177/1054773819867250>
- Brown, E. L., Raue, P., Halpert, K. D., & Titler, M. G. (2015). Evidence-based guideline detection of depression in older adults with dementia. *Journal of Gerontological Nursing*, 41(11), 15-21. <https://doi.org/10.3928/00989134-20151015-03>
- Cavazzoni, P. (2021). FDA's decision to approve a new treatment for Alzheimer's disease. *U.S Food & Drug Administration*. <https://www.fda.gov/drugs/news-events-human-drugs/fdas-decision-approve-new-treatment-alzheimers-disease>.
- Centers for Disease Control and Prevention (2015). Background H. animals in health-care-facilities. *Environmental infection control guidelines*. <https://www.cdc.gov/infectioncontrol/guidelines/environmental/background/animals.html>.
- Centers for Disease Control and Prevention (2020). COVID-19 and animals. *Coronavirus Disease 2019 (COVID-19)*. <https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/animals.html>.
- Centers for Disease Control and Prevention (2020). *Healthy People 2030, dementias including Alzheimer's*. <https://cdc.gov/aging/publications/healthy-people-2030/index.html>.
- Centers for Disease Control and Prevention (2021). *Percent of long-term care services users diagnosed with Alzheimer's disease or other dementias*. <https://cdc.gov/nchs/fastats/alzheimers.htm>.
- Gaugler, J., James, B., Johnson, T., Marin, A., & Weuve, J. (2019). 2019 Alzheimer's disease facts and figures. *Alzheimer's & Dementia*, 15(3), 321-387. <https://doi.org/10.1016/j.jalz.2019.01.010>
- Gustafsson, C., Svanberg, C., & Müllersdorf, M. (2015). Using a robotic cat in dementia care: A pilot study. *Journal of Gerontological Nursing*, 41(10), 46-56. <https://doi.org/10.3928/00989134-20150806-44>
- Hu, M., Zhang, P., Leng, M., Li, C., & Li, C. (2018). Animal-assisted intervention for individuals with cognitive impairment: A meta-analysis of randomized controlled trials and quasi-randomized controlled trials. *Psychiatry Research*, 260, 418-427. <https://doi.org/10.1016/j.psychres.2017.12.016>
- Hung, L., Liu, C., Woldum, E., Au-Yeung, A., Berndt, A., Wallsworth, C., Home, N., Gregorio, M., Mann, J., & Chaudhury, H. (2019). The benefits of and barriers to using a social robot PARO in care settings: A scoping review. *BMC Geriatrics*, 19(232), 1-10. <https://doi.org/10.1186/s12877-019-1244-6>
- Jennings, L. B. (1997). Potential benefits of pet ownership in health promotion. *Journal of Holistic Nursing*, 15(4), 358-372. <https://doi.org/10.1177/089801019701500404>
- Kelly, P. A., Cox, L. A., Petersen, S. F., Gilder, R. E., & MacDonell, K. (2021). The effect of PARO robotic seals for hospitalized patients with dementia: A feasibility study. *Geriatric Nursing*, 42(1), 37-45. <https://doi.org/10.1016/j.gerinurse.2020.11.003>
- Khoshnood, Z., Rayyani, M., & Tigari, B. (2018). Theory analysis for Pender's Health promotion model (HPM) by Barnum's Criteria: A critical perspective. *International Journal of Adolescent Medicine and Health*, 32(4), 1-9. <https://doi.org/10.1515/ijamh-2017-0160>
- Klimova, B., Torman, J., & Kuca, K. (2019). Effectiveness of the dog therapy for patients with dementia: A systematic review. *BMC Psychiatry*, 19(276), 1-7. <https://doi.org/10.1186/s12888-019-2245-x>
- Koh, W. Q., Ang, F. X. H., & Casey, D. (2021). Impacts of low-cost robotic pets for older adults and people with dementia: A scoping review. *JMIR Rehabilitation and Assistive Technologies*, 8(1), e-25340-e-23353. <https://doi.org/10.2196/25340>
- LeVasseur, A. L. (2021). Effects of social isolation on a long-term care resident with dementia and depression during the COVID-19 pandemic. *Geriatric Nursing*, 42(3), 780-781. <https://doi.org/10.1016/j.gerinurse.2021.04.007>
- Lu, L. C., Lan, S. H., Hsieh, Y. P., Lin, L. Y., Lan, S. J., & Chen, J. C. (2021). Effectiveness of companion robot care for dementia: A systematic review and meta-analysis. *Innovation in Aging*, 5(2), 1-13. <https://doi.org/10.1093/geroni/igab013>
- Majić, T., Gutzmann, H., Heinz, A., Lang, U. E., & Rapp, M. A. (2013). Animal-assisted therapy and agitation and depression in nursing home residents with dementia: A matched case-control trial. *American Journal of Geriatric Psychiatry*, 21(11), 1052-1059. <https://doi.org/10.1016/j.jagp.2013.03.004>
- Mills, W. L., Pimentel, C. B., Snow, A. L., Allen, R. S., Wewioski, N. J., Palmer, J. A., Clark, V., Roland, T. M., McDannold, S. E., & Hartmann, C. W. (2019). Nursing home staff perceptions of barriers and facilitators to

- implementing a quality improvement intervention. *Journal of the American Medical Directors Association*, 20(7), 810-815. <https://doi.org/10.1016/j.jamda.2019.01.0139>
- Moyle, W., Murfield, J. E., Griffiths, S. G., & Venturato, L. (2012). Assessing quality of life of older people with dementia: A comparison of quantitative self-report and proxy accounts. *Journal of Advanced Nursing*, 68(10), 2237-2246. <https://doi.org/10.1111/j.1365-2648.2011.05912.x>
- National Institute on Aging (2021). *Behavioral and social research areas in Alzheimer's disease*. <https://www.nia.nih.gov/research/dbsr/behavioral-and-social-research-areas-alzheimers-disease#funding>.
- Neal, I., du Toit, S. H. J., & Lovarini, M. (2020). The use of technology to promote meaningful engagement for adults with dementia in residential aged care: A scoping review. *International Psychogeriatrics*, 32(8), 913-935. <https://doi.org/10.1017/S1041610219001388>
- O'Caomh, R., O'Donovan, M. R., Monahan, M. P., Dalton, O'Connor, C. D., Buckley, C., Kitty, C., Fitzgerald, S., Hartigan, I., & Cornally, N. (2020). Psychosocial impact of COVID-19 nursing home restrictions on visitors of residents with cognitive impairment: A cross-sectional study as part of the engaging remotely in care (ERiC) project. *Frontiers in Psychiatry*, 11(585373), 1-9. <https://doi.org/10.3389/fpsyt.2020.585373>
- Petersen, S., Houston, S., Qin, H., Tague, C., & Studley, J. (2017). The utilization of robotic pets in dementia care. *Journal of Alzheimer's Disease*, 55(2), 569-574. <https://doi.org/10.3233/JAD-160703>
- Petiprin, A. (2016). Pender's health promotion model. *Theories & models*, <https://nursing-theory.org/theories-and-models/pender-health-promotion-model.php>.
- Pérez-Sáez, E., Pérez-Redondo, E., & González-Ingelmo, E. (2020). Effects of dog-assisted therapy on social behaviors and emotional expressions: A single-case experimental design in 3 people with dementia. *Journal of Geriatric Psychiatry and Neurology*, 33(2), 109-119. <https://doi.org/10.1177/0891988719868306>
- Polit, D. F., & Beck, C. T. (2017). *Nursing research: Generating and assessing evidence for nursing practice* (10th ed). Wolters Kluwer.
- Reisberg, B., Ferris, S. H., de Leon, M. J., & Crook, T. (1982). The global deterioration scale for assessment of primary degenerative dementia. *American Journal of Psychiatry*, 139(9), 1136-1139. <https://doi.org/10.1176/ajp.139.9.1136>
- Russell, D. (1996). UCLA Loneliness scale (version 3): Reliability, validity, and factor structure. *Journal of Personality Assessment*, 66(1), 20-40. [https://doi.org/10.1207/s15327752jpa6601\\_2](https://doi.org/10.1207/s15327752jpa6601_2)
- Scales, K., Zimmerman, S., & Miller, S. J. (2018). Evidence-based nonpharmacological practices to address behavioral and psychological symptoms of dementia. *The Gerontologist*, 58(S1), S88-S102. <https://doi.org/10.1093/geront/gnx167>
- Sheikh, J. I., & Yesavage, J. A. (1986). Geriatric depression scale (GDS) recent evidence and development of a shorter version. *Clinical Gerontologist: The Journal of Aging and Mental Health*, 5(1-2), 165-173. [https://doi-org.proxy.lib.edu/10.1300/J018v05n01\\_09](https://doi-org.proxy.lib.edu/10.1300/J018v05n01_09)
- Simard, J., & Volicer, L. (2020). Loneliness and isolation in long-term care and the COVID-19 pandemic. *Journal of the American Medical Directors Association*, 21(7), 966-967. <https://doi.org/10.1016/j.jamda.2020.05.006>
- Sun, W., Matsuoka, T., Oba, H., & Narumoto. (2021). Importance of loneliness and psychological symptoms of dementia. *International Journal of Geriatric Psychiatry*, 36(4), 540-546. <https://doi.org/10.1002/gps.5450>
- Thodberg, K., Sørensen, V., Poulsen, P. B., Houbak, P. H., Damgaard, B., Keseler, V., Edwards, I., & Christensen, D., & W, J. (2016). Behavioral responses of nursing home residents to visits from a person with a dog, a robot seal, or a toy cat. *Anthrozoös*, 29(1), 107-121. <https://doi.org/10.1080/08927936.2015.1089011>
- Walker, J. (2021, June 7). FDA Approves first new Alzheimer's Drug in nearly two decades. *The Wall Street Journal*, <https://www.wsj.com/articles/first-alzheimers-drug-to-slow-disease-is-approved-by-fda-11623078912>.
- Wang, H., Li, T., Barbarino, G., Gauthier, S., Brodaty, H., Molinuevo, J. L., Xie, H., Sun, Y., Yu, E., Tang, Y., Weidner, W., & Yu, X. (2020). Dementia care during COVID-19. *Lancet (London, England)*, 395(10231), 1190-1191. [https://doi.org/10.1016/S0140-6736\(20\)30755-8](https://doi.org/10.1016/S0140-6736(20)30755-8)
- Yesavage, J. A., Brink, T. L., Rose, T. L., & Lum, O. (1983). Development and validation of a geriatric depression screening scale: A preliminary report. *Journal of Psychiatric Research*, 17(1), 37-49. [https://doi.org/10.1016/0022-3956\(82\)90033-4](https://doi.org/10.1016/0022-3956(82)90033-4)

## Author Biographies

**Dr. Donna M. Fogelson**, is a board-certified Adult-Gerontology Clinical Nurse Specialist and Educator. She is a Nursing Adjunct Clinical Faculty member at the University of Connecticut and University of Saint Joseph. Dr. Fogelson was honored as the 2021 recipient of the DNP Scholarship Award by the Old Dominion University School of Nursing. Research interests include community and population health, complementary, alternative, and integrative health.

**Dr. Carolyn Rutledge**, is a Professor and Associate Chair of the Graduate program in Nursing, and the current Director of the DNP program at Old Dominion University. Dr. Rutledge practices in the clinical setting as a Family Nurse Practitioner at Eastern Virginia Medical School.

**Dr. Kathie S. Zimbardo**, is the Nurse Executive for Research and Lead Nurse Scientist for Sentara Healthcare. She conducts research and disseminates findings that shape the future of health care. Research interests include population health, palliative care, and predictive modeling. She has 33 manuscripts published in referred journals and over \$1.6 million in extramural

funding. Dr. Zimbro is a member of the Editorial Board of the Journal of Nursing Care Quality. Dr. Zimbro was honored as the 2017 recipient of the Clinical Researcher Award by the

Southern Nursing Research Society Governing Board. In 2021, Dr. Zimbro was awarded the Daisy Lifetime Achievement Award by the Daisy Foundation™.