EFFECTS OF A DESIGN INTERVENTION FOR FACILITATING PET VISITS TO LONG-TERM RESIDENTS IN AN AGED CARE FACILITY

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ABSTRACT

Animal-assisted therapy is growing in recognition in long-term aged care facilities because of the benefit it offers for alleviating negative behaviors and increasing socialization among residents. However, animal-assisted therapy programs are often discouraged by environmental constraints. The purpose of this study is to create a design intervention to 1) facilitate human-animal interactions in a long-term aged care facility that endeavor to promote pet therapy, and 2) to determine the effects of environmental factors that may influence the beneficial outcome from human-animal interactions.

A design intervention was created to support the spontaneous and pleasant nature of the pet visit therapy sessions. Sixteen residents participated in the study and were offered to interact, supported by the design intervention, six times with a chinchilla, three-day intervals. A total of 63 human-pet interactions were observed and analyzed. Participants' negative behaviors decreased significantly (NHBPS, $p=.01$). A consequence of the use of the design intervention was the identification of consequential environmental factors including time of the day and the level of privacy, both of which affected aged persons' interaction with the chinchilla.

In the end, this study demonstrated that supportive environment design is of critical benefit in conducting successful animal-assisted therapies in long-term aged care facilities.

Keywords: Animal-assisted Therapy, Pet-therapy, Design Intervention, Design for Aging, Healthcare Design

BIOGRAPHICAL SKETCH

Fang (Luna) Zhang attended Tianjin University in China and Politecnico di Torino in Italy for her undergraduate education. She studied Engineering as a freshman before finding out about her passion in design. After she graduated with a Bachelor of Engineering in Industrial Design, Luna pursued her graduate study at Cornell University with a concentration on Design for Special Populations and a minor of Human Factors and Ergonomics within the Department of Design and Environmental Analysis.

Luna loves to explore unmet needs and improve people's lives through design. Post-Cornell, Luna has been practicing design as a creative means to make things beautiful, solve problems, improve learning, and optimize processes. Ultimately, she would like to work in an educational setting, rippling the power of design among student designers.

When she is not working, Luna enjoys traveling, cooking, reading, conversing, learning new languages, and the company of her cats. Her travels have taken her to a number of places where she has always been fortunate to mingle with local people and learn about different cultures.

To all the companion animals that have made our world a more lovable place

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1. Literature Review:

This study explores how design can empower animal therapy intervention in a long-term aged care facility to promote better health outcomes on elderly residents. The literature review chapter will examine:

1.1 natural elements in healthcare environments and health outcomes

1.2 the importance of natural elements in long-term aged care facilities

1.3 the natural elements that are present in long-term aged care facilities, and the challenges that inhibit employing their full potential

1.4 design as a means to address the challenges in conducting AAT in long-term aged care facilities

1.1 Natural Elements in Healthcare Environments and Health Outcomes

When examining the relationship between the built environment and people, much research and education has focused on the threats caused by various environmental hazards: toxic chemicals, radiation, biological and physical agents, etc.. However, the built environments may also provide healthful exposures to people and yield positive health outcomes. These healthful exposures including natural elements may be profoundly meaningful for healthcare environments.

In 1984, Wilson proposed his renowned "biophilia hypothesis": "the innately emotional affiliation of human beings to other living organisms". He suggested that there is an instinctive bond between human beings and other living systems, and that our association with them is a fundamental component of nourishing good health for all living systems involved. Specifically, the American Veterinary Medical Association (AVMA.org, 2015) has officially recognized human-animal bond as "a mutually beneficial and dynamic relationship between people and animals that is influenced by behaviors that are essential to the health and well-being of both". This bond, which has existed for thousands of years, integrates the emotional, psychological, and physical interactions of people, animals, and the environment.

Indeed, humans have benefited from the salubrious effects of natural elements in the built environment for a long time. In the 400's BC, the Ancient Greeks built Asclepeia, healing temples sacred to the Greek God Aesculapius, to provide the sick and injured with restorative spaces. The designers of Asclepeia carefully controlled the temple environment to provide nature, art, and music (Farnell, 1921) to maximize the healing effects of the institution.

2,200 years after the creation of the ancient Greek healing institutions, Florence Nightingale, "the Lady with the Lamp", paved the foundation of professional nursing. She provoked social reforms including improving healthcare systems in Britain and India. She conducted extensive statistical studies in healthcare settings, and presented her data using visual infographic diagrams called "coxcombs". Based on her findings, she suggested medical practices to optimize environmental factors that improve patient comfort and facilitate health and healing (Nightingale, 1858). In 1860, Nightingale published her classic text: *Notes on Nursing: What It Is, and What It Is Not*, in which she addressed what she believed to be the fundamental essentials of the patient experience, asserting the therapeutic benefits of direct sunlight, bright-colored flowers, and an overall peaceful and restful environment (Nightingale, 1860).

Since the twentieth century, humans have started to create buildings and spaces that seemed to be the antithesis of the natural world. As a result of modern medicine advancement, healthcare facilities have become places that response to sicknesses and injuries, with less and less attention on patient experience and holistically curing. The natural elements in healthcare environments have been disregarded for not being able to give immediate solution for sickness. In contrast to the Ancient Greek Asclepeia, healthcare facilities today are often cut off from nature, encased in concrete structures with institutional-looking indoor environments. Many healthcare settings are neither nurturing nor healing, notwithstanding their purpose of promoting health. Hospital stays have become stressful, or even dangerous for patients, families, and healthcare staff (Ulrich, 2008). In long-term caring facilities such as nursing homes and rehab centers, more attention might have also been directed at procedures to fix illnesses than promoting the overall health benefits and patient experience in healthcare, or rather "sickcare" facilities.

The health benefits of natural elements in healthcare facilities had not been proven in empirical research until 1984, when Roger Ulrich published his well-controlled, landmark study on patients' aesthetic and affective responses to visual environments outside of patient rooms. Over the course of 10 years, among 23 pairs of patients recovering after cholecystectomy, the ones who stayed in rooms with windows facing natural scenes recovered faster, spent less time in hospital, required fewer painkillers, and experienced fewer post-operative complications than the ones in similar rooms with the view of a brick building wall (Ulrich, 1984). This study has first scientifically documented the health outcomes of a hospital window view. Thereafter, designers, architects, researchers, and healthcare leaders started to rethink the relationship between healthcare design and patient outcomes, as well as the relationship between the natural elements and healing.

Healthcare design has been increasingly informed by rigorous research connecting healthcare facilities' physical environments and health outcomes. In 1993, a team of pioneering healthcare and design professionals founded The Center for Health Design (CHD) to empower design with research to improve patient outcomes in healthcare environments. CHD has identified more than 1,200 environmentally-relevant studies to guide hospital designers and administrators in creating healing spaces that reduce stress, promote health and healing, and improve patient and staff safety. Respectively in 2004 and 2008, Ulrich et al. have conducted two exhaustive searches for empirical studies that linked the healthcare environment design with health outcomes, and found a rapidly growing body of rigorous studies to guide healthcare design. The findings also identified design characteristics or interventions that are effective for creating positive patient safety outcomes, other patient outcomes, and staff outcomes. These characteristics include single-bed rooms rather than multi-bed rooms, effective ventilation systems, a good acoustic environment, nature distractions and daylight, appropriate lighting, better ergonomic design, acuity-adaptable rooms, and improved floor layouts and work settings. Directions for future research are also identified. Specifically, "nature distractions" including "a view of nature" were found to contribute to reduced pain, reduced patient stress, reduced depression, reduced length of stay, increased patient satisfaction, decreased staff stress, increased staff effectiveness, and increased staff satisfaction.

1.2 The Importance of Natural Elements in Long-term Aged Care Facilities

In his 1984 study, Ulrich noted: "Views to the outside may be especially important to individuals who have unvarying schedules and spend a great deal of time in the same room, such as surgical patients." The average length of hospitalization among all patients in Ulrich's study was 8.33 days. The benefits of having healthful exposure to nature may be more important to people with "unvarying schedules" who have limited mobility in long-term care facilities, especially in assisted living and skilled nursing aged care facilities. The National Nursing Home Survey estimated that 1.5 million residents received nursing home care, spending an average length of time of about 28 months (NNHS, 2009). The 2010 National Survey of Residential Care Facilities revealed that more than 735,000 people nationwide lived in assisted living setting with a median length of stay is about 22 months (NCHS Data Brief No. 91, 2012). Nursing Home Compare, a US government website's most recent updated database shows that there are 1.67 million certified beds in skilled nursing facilities nationwide(medicare.gov|Nursing Home Compare, 2015). Almost 4 in every 10 residents receive assistance with three or more activities of daily living (ADLs), including bathing, dressing, toileting, transferring, and eating. An additional 36% of the residents receive assistance with one or two of ADLs, and only 26% do not receive assistance with any daily living activity. (NCHS Data Brief No. 91, 2012).

The population who live in aged care facilities is only likely to increase. The United States 2010 Census has recorded the greatest number and proportion of people aged 65 and older in all of its decennial census history: 40.3 million, or 13% of the total population. This "Baby Boomer Generation" effect is forecasted to continue and people aged 65 and older are expected to comprise 20% of the total U.S. population by the year 2050. The fastest growing segment of the population is of those who are 85 and older, from 5.8 million in 2010 to 19 million by 2050 (United States Census 2008, 2010). A lot of them will live a significant length of time in aged cared facilities.

Adding natural elements in aged care environments may help designers improve residents' lives in meaningful ways. Eden Alternative, a non-profit organization that promotes creating quality of life for Elders, identifies loneliness, helplessness, and boredom to be the three plagues that account for the bulk of suffering among the elderly. Kongable et al. (1990) commented that nursing home residents, especially residents with dementia, are "at particular risk for social isolation and withdrawal because of their physiological and cognitive deterioration." The 2010 National Survey of Residential Care Facilities supported this statement by identifying the 10 most common chronic conditions among residents. Most of them were either, if not both, physically painful or mentally distraught: High blood pressure (57%), Alzheimer's disease or other dementias (42%), heart disease (34%), depression (28%), arthritis (27%), osteoporosis (21%), diabetes (17%), chronic obstructive pulmonary disease and allied conditions (15%), cancer (11%), and stroke (11%). Almost three quarters of residents had ever been diagnosed with at least 2 of these chronic conditions, and more than one-quarter of residents had ever been diagnosed with 4–10 of these chronic conditions.

Similar to most of the healthcare facilities, many long term aged care facilities operate on the medical model, although the majority of residents do not enter nursing homes for medical care. In the 90 days prior to the interview conducted by The 2010 National Survey of Residential Care Facilities, only 10.8% of the residents had ED visit(s) and/or hospitalization(s). The problem with following the medical model is the focus on treatment of physiological problems using medical interventions, neglecting the psychological factors such as loneliness, helplessness, or boredom that are prevailing among the majority of elderly residents. In most aged care facilities, senior residents spend a good amount of time in isolation, unable to care for themselves or their environments. Family members of all ages rarely enjoy visiting or participating in activities. They are recognized with the stereotype of having a non-fulfilling life, being depressed, and being in depressing, sterile environments.

1.3 The Natural Elements that are Present in Long-term Aged Care Facilities, and the Challenges that Inhibit Employing their Full Potential

Thomas (1996) pointed out that nursing homes are essentially homes, not hospitals, and suggested creating a "human habitat" with a diverse, spontaneous, and natural ambience where unexpected and unpredictable interactions and events may take place (Principle 5, figure 1.1).

Figure 1.1: The Ten Principles of The Eden Alternative (edenalt.co.za, 2015)

To alleviate the suffering from loneliness, helplessness, and boredom of elderly life, Eden Alternative promotes "an Elder-centered community commits to creating a Human Habitat where life revolves around close and continuing contact with plants, animals, and children. It is these relationships that provide the young and old alike with a pathway to a life worth living" (Principle 2, Figure 1.1). From a naturalist perspective, the Eden Alternative advocates the inclusion of diverse species and companionships in the environment. Thomas (1994) regarded "biological diversity as good for human habitats as it is for natural habitats". The presence of plants and animal companions transforms lonely nursing home environments into diverse, vibrant places to live. The more species a habitat affords, the more healthful the environment.

1.3.1. Resident/Visiting Animals

More senior assisted living communities are allowing residents to move in with their companion animals. And more skilled nursing facilities have begun to integrate resident animals into their care through pet therapy programs. McCabe et al. (2002) documented the impact of introducing a resident dog into an Alzheimer's care unit and found a significant decrease in residents' daytime occurrence of behavioral complications that were categorized as "aggressive", "irrational", "sleep", "inappropriate", and "annoying". Their findings supported the long-term therapeutic effects of resident dogs for residents in Alzheimer's special care units. Kanamori et al. (2001) also reported the impact of pet visits using a dog or a cat in a dementia day-program in Japan. Participants with the pet visits made significant behavior improvements after 3 months compared to those in a day program without pet visits.

Weisberg and Pack (1991) observed the changes after a resident cat moved into a nursing home. Residents were observed to have regular distractions from tearful delusions when the cat was present. Stroking the cat was associated with less agitated or withdrawal behaviors. Interestingly, they have also noted that the non-verbal interaction with the cat offered special promise for residents that were socially isolated by language barriers.

Crowley et al. (1996) conducted a multi-year study to compare the effects of a resident dog versus a visiting dog, and a visiting researcher in three aged nursing care units in Australia. Vigor was found to increase in all three units, and fatigue decrease significantly in both visiting and resident dog units. However, only in the nursing home with a resident dog, tension and confusion were reduced, and depression was significantly decreased. Their findings indicated that there might be more benefits of keeping a resident dog than having a visiting dog in a nursing home.

Barba, Tesh & Courtset (2002) suggested selecting healthy residential animals that have appropriate temperaments, and conform to the facility culture. Resident dogs, cats, rabbits, birds, hamsters, fish, and other species were recommended (Table 1.1).

Animals In Nursing Homes

Dogs	• One dog for every 20 to 40 residents	• Dogs should be obedient, good mannered, and reliable
Cats	• One cat for every 10 to 20 residents	• Cats should be healthy, well-tempered, and mature
Birds	• One or two birds for every resident • Caged birds may be offered to individual residents in their rooms	• Birds are safe, cost-effective, long lived • Birds are inexpensive to purchase and keep, and require little space
Fish	• Fish tanks placed where residents gather	

Table 1.1: Suggested Animals in Nursing Homes (Barba, Tesh & Courtset, 2002)

Having resident animals in the facilities not only makes residents less bored, but also empowers them. Residents enjoy taking the responsibility of ownership for of the resident animals. Barba et al. (2002) recorded stories in which residents returned to the nursing homes "in record time after being hospitalized because they were worried about their birds". They quoted the expression of a 99-year-old blind resident on how "delighted she was with the bird's movements and vocalizations" and that "she is never alone because she has the birds". A 94-year-old woman was elated that the resident cat decided to sleep on her bed, she said: "Do you know how long it has been since I've had a warm body in bed with me?"

Having resident animals may be a good solution for shelter animals. Aged care facilities have the potential of becoming places where residents and shelter pets live their golden years together. Many residents struggle with the transition to assisted living, as they have to give up their homes and do not feel as independent as they once were. One staff member of an aged care facility in Washington D.C. commented that welcoming a rescue animal into their community allows the residents to feel that they are giving a pet what a "human habitat" facility is giving them -- an independent and joyful life, just in a new place (Huffpost, 2014).

While the number of resident animals is increasing, there are also more animal visitation program nationwide to make animal-assisted therapy more easily accessible. Organizations and pet owners can become registered (www.petpartners.org, 2015) and bring their pets to visit children with disabilities, nursing home residents, and hospital patients. This visitation therapy can also involve domesticated pets (e.g., dogs, cats, guinea pigs, chinchillas), farm animals (eg, horses, potbellied pigs, the camelids), and marine animals (e.g., dolphins), with dogs being the most commonly used.

Animal-assisted therapy has grown in recognition especially in residential aged care facilities (Filan & Llewellyn-Jones, 2006). Elderly residents who regularly interact with companion animals were found to have a decreased blood pressure as well as increased levels in neurochemicals related to relaxation and bonding (Odendaal & Meintjes, 2003). These beneficial interactions may be constructive in increasing socialization, stimulating verbalization of memories (Churchill et al., 1999), and ameliorating negative behavioral and psychological symptoms among nursing home residents.

Specifically, a considerable number of studies were conducted using companion animals with elderly provided evidence that regular interactions with a companion animal can increase socialization (Kongable et al., 1989; Churchill et al., 1999; Greer et al., 2001) and decrease agitation behaviors (Churchill et al., 1999; Kanamori et al., 2001; McCabe et al., 2002).

Kongable et al. (1989) observed that when a dog was present, nursing home residents showed significantly more social behaviors including looks, smiles, laughs, touches, leans, and verbalization. Similarly, Churchill et al. (1999) identified significantly increases in both duration and frequency of social behaviors in the presence of a visiting therapy dog. Residents in the study of Churchill et al. (1999) exhibited significantly less agitated or aggressive behavior when interacting with an investigator and a dog compared to interacting with the investigator when a dog was not present, demonstrating that the beneficial effects are brought by human-animal interaction.

1.3.2. Plants, Gardens, and Personal Responsibility

Ulrich (1984) noted that "…natural views apparently elicit positive feelings, reduce fear in stressed subjects, hold interest, and may block or reduce stressful thoughts, they might also foster restoration from anxiety or stress." Plants may provide both natural views and pleasant fragrances that evoke positive feelings, hold interest, make the environment more inviting, decrease unpleasant odors, and may therefore reduce stressful thoughts. Outdoor plants may supply garden vegetables and material for crafts for facility activities (Barba et al, 2002). Indoor and outdoor gardens may also be designed to provide serene and safe environments for wandering residents.

Plants also increase the residents' feelings of choice and sense of responsibility over daily events, which were found to be far more important than being a view of nature. With the intent of making nursing home residents more mindful, and helping them engage with the world and live their lives fully, Langer and Rodin (1976) gave the 47 nursing home residents the option to choose a houseplant to care for, and to decide where to place the plant in their room, as well as when and how much to water it. However, the second group of 44 residents were simply given houseplants and told that the caregivers would care for them. A year and a half later, they found that residents of the responsibility induced group were found to be happier, more active, and more alert than the second group, based on a variety of tests administered both before and after the experiment. Moreover, the more engaged residents were also healthier, less than half as many of this group passed away than did those in the control group.

The remarkable findings of this important study have brought the attention that the greatest benefit from having natural elements in aged care facilities is so much more than just from having the elements as a static existence, but is from the possibility of empowered interaction and the increased sense of responsibility. In order to bring the most beneficial health outcomes and give more meanings to elderly residents' life, the relationship between humans and the natural elements has to be varied, dynamic, and spontaneous.

1.4 Design as a Means to Address the Challenges in Conducting AAT in Long-term Aged Care Facilities

Despite all the promising research findings that have shown how much companion pet visits can benefit nursing home residents, the environmental demands for conducting pet visits remain high. Studies (Libin & Cohen-Mansfield, 2004) have noted the challenging nature of designing and conducting regular pet visits because of insufficient resources available to care for a pet, allergies reactions to pets, as well as other difficulties such as coordinating among live animals, residents, and the administrative routine of the facility. They proposed having substitute artificial companion, i.e. a robotic pet and/or a plush toy pet, to serve as an alternative. Although Greer et al. (2001) found that live cats stimulated more communication both during cat visits and immediately afterwards than the toy cat did, when evaluating the effects of a live cat versus a toy cat on elderly women with dementia that were randomly assigned into two groups.

Evans and Cohen (1987) pointed out the stress to meet environmental demands can be balanced by an increasing the level of human resources, and the increased level of human resources can be altered by the design of physical environment (Evans & McCoy, 1998). Hence, it's reasonable to assume that the physical environment may serve as a potential to suffice the insufficient resources identified by Libin and Cohen-Mansfield (2004).

Nevertheless, few studies have mentioned if the visits were carried on after the study or implied how human-animal interaction could be supported by the physical environment. In "Guidelines for animal-assisted interventions in health care facilities" (Lefebvre et al., 2008), a working group of 29 animal-assisted therapy experts and project leaders systematically reviewed, debated, and presented a detailed, specific guideline on conducting animal-assisted interventions in health care facilities. However, the guidelines were focused on minimizing injuries and the transmission of infectious organisms to and from the therapy animals. The physical environment was only mentioned at the very end of the document with a note of "practice routine cleaning of environmental surfaces after visits" addressing hygiene of the physical environment.

However, the affordance of the physical environment can be so much more than simply not transmitting infectious organisms. Elderly residents spend almost all their time within the boundaries of aged care facilities, the physical environment may assume critical roles that may strongly mediate the effect of animal assistant therapy. The Design in Caring Environments Study (Parker et al., 2004) examined the building design and quality of life in 38 care homes in the UK, and found significant positive associations between several aspects of the built environment and the residents' quality of life. They also found that, when the environment is designed with a focus on safety and health requirements, the evidence show that the risk-averse environments created act against quality of life. Evans, Kantrowitz, and Eshelman (2002) found that not only is the quality of the physical environment associated with the psychological well-being among the elderly population, but it also help build nursing home residents' attachment to the facility.

This study will explore design, a manipulation of the physical environment, and its effectiveness on addressing the challenges that hinder the full potential benefits animal-assistant therapy has to offer.

2. Description of the study

"*A small pet is often an excellent companion for the sick, for long chronic cases especially. A pet bird in a cage is sometimes the only pleasure of an invalid confined for years to the same room. If he can feed and clean the animal himself, he ought always be encouraged to do so.*"

- Florence Nightingale, Notes on Nursing: What It Is, and What It Is Not , 1860, p. 147

This chapter will introduce

2.1 description of the care center

2.2 intention and concepts of the design intervention

2.3 components of the design prototype and compliance with ADA

2.4 description of the research design

2.1 Description of the Care Center

This study took place in May, 2013 in an average sized care facility for rehabilitation and nursing with 120 beds based in a county seat in central New York State. At the time of the study, the facility had 110 residents indicating that it was 92% occupied. The facility had three floors with three different levels of care, with rehabilitation residence being on the first floor, assisted living on the second, and skilled nursing on the third.

The facility first opened its doors in 1920 as a rehabilitation residence for children afflicted with polio. It had served as a home for people with disability and frail elderly since the early 1950s, and it opened its Alzheimer's Dementia Unit, the first in the county, in 1994. The care provider accept both Medicare and Medicaid programs, and provides resident counseling services.

According to the official U.S. government website for Medicare, the facility was evaluated to have an about average Registered Nurse (RN) hours per resident per day, an about average Certified Nursing Assistant

(CNA) hours per resident per day, and slightly lower-than-average licensed practical (LPN) or vocational nurse hours per resident per day within the state of New York. Compared to the state of New York average, the facility had a significantly higher percentage of long-stay residents who self-report moderate to severe pain (10.1% as compared to 5.2%), a significantly higher percentage of long-stay residents whose need for help with daily activities has increased (34.6% as compared to 14.1%). Compared to the state of New York, the facility had a significantly lower percentage of residents who have depressive symptoms (1.5% as compared to 11.4%), a significantly lower percentage of long-stay residents who were physically restrained (0.7% as compared to 1.6%), and a similar percentage of long-stay residents who received an antipsychotic medication (19.7% as compared to 17.8%) (medicare.gov, 2015).

The care facility adopted a Person-Centered Care model and valued the "quality of life" to make skilled nursing and rehabilitation a comfortable home-like option for its residents. Residents were encouraged to make personal choices about their daily routines and to live life every day through a variety of recreational activities and experiences that involved family, friends and community. Residents were allowed to bring plants, photographs, and personal items that would help provide a "home-like" atmosphere. Residents also had the freedom to get up early, or sleep in. Showers or baths were given when residents liked to take them, not when it "worked" for staff.

At the time of the study, the facility had already been the home of a variety of resident animals, including fishes in a fresh-water fish tank in the entrance lobby, two cats, one chinchilla "Persie", one parakeet, and a couple of doves. The two cats had their food and litter box in the staff office and had the freedom to roam in and around the facility. Both cats were very independent and tended to avoid direct contact with the residents during the day. Sometimes, they chose at random a resident's bed to sleep on during the night.

The chinchilla "Persie" stayed in his caged habitat on the first floor, and the birds in their cages on the second and the third floor. The cages employed made it impossible for residents to touch the animals. At times but rarely, staff took out "Persie" the chinchilla from the habitat and brought him around to interact with the

residents. However, staff preferred not to do so because "Persie" always would resist being removed from his habitat. Consequently, a number of residents who lived on different floors were not aware of the existence of certain resident animals.

A few residents whose rooms were in the vicinity of the chinchilla and the bird habitats showed strong attachment to resident animals. Two residents seemed to take personal ownership of the chinchilla and the birds, respectively. One resident not only conducted chores to care for "Persie" the chinchilla, but also expressed unwillingness to let other people remove "Persie" from his habitat. Contrastively, a study in 2008 concluded that although AAT (Animal-Assisted Therapy) had statistically significant improvements in residents' levels of loneliness and levels of attachment to the animal, attachment was not a mediator variable between AAT and loneliness, as the Lexington Attachment to Pets Scale (MLAPS) measures did not correlate with changes in loneliness (Banks, Willoughby & Banks, 2008).

In addition to having resident animals, the facility was one of the destinations of a pet visitation program dedicated to the development of the Human-Animal Bond sponsored by the College of Veterinary Medicine at a local university. Volunteers, including students, faculty, staff, and individuals from the local community, brought their pets to visit residents in aged care centers, children with disabilities, and hospital patients.

Pet visitation volunteers made visits to the care facility of this study once a week for two hours. The visits usually consisted of two parts. Care staff would first bring multiple residents to the activity room on the first floor for a group visitation session. After the group visitation session, volunteers then would bring their pets to individual rooms to visit residents who could not attend the group visitation session. The majority of visiting animals were dogs.

The lack and the difficulty of having direct contact between residents and resident animals in this particular facility and/or similar facilities raised the question of whether environmental design could enhance human-animal interaction and/or contribute to a stronger human-animal bond.

2.2 Intention and Concepts of the Design Intervention

Adequate or abundant necessities do not directly add to individuals' subjective well-being (Desmet & Pohlmeyer, 2013). This finding implies that something else beyond a clean aged care facility with decent furnishing, utility services, products, and good food factored in to individual's sense of well-being. The present study, at its core, was an exploration of that "something else." The initial goal in this study was to contribute to the residents' subjective well-being by staging for her or him a delightful, engaging experience, in this case with human-animal interaction. Design was employed as a tool for creating the stage such that the experience would enable the human-animal interactions to stimulate and inspire.

What, then, was the design process for creating this meaningfully inspiring, stimulating stage?

The design process began with guidance from the 10 Principles of The Eden Alternative, especially Principle 2, Principle 3, andPrinciple 5, were adopted:

Principles of The Eden Alternative:

2. An Elder-centered community commits to creating a Human Habitat where life revolves around close and continuing contact with plants, animals, and children. It is these relationships that provide the young and old alike with a pathway to a life worth living.

3. Loving companionship is the antidote to loneliness. Elders deserve easy access to human and animal companionship.

5. An Elder-centered community imbues daily life with variety and spontaneity by creating an environment in which unexpected and unpredictable interactions and happenings can take place. This is the antidote to boredom.

(edenalt.org, 2015, Home » About » Mission, Vision, Values, Principles)

The first two of these principles underscored the purpose of the design in this study—to facilitate human-animal contact and companionship. Although residents in the elder care facility that participated in this study lived in proximity to companion animals, immediate personal contact between residents and pets was not guaranteed. Animals were caged or, in the instance of the cats, wandered freely but typically avoided contact

Figure 2.1: Mobile bookshelf for the sick (Unknown Author, 1928)

with residents. Bringing the residents into direct contact with residents required deliberation. The design response was to create a cart similar to that in a picture of unknown origin (Figure 2.1). Shown is a design of a mobile bookshelf that was employed by The Los Angeles Public Library's (Unknown Author, 1928). The mobile library, as depicted in the picture, was used to provide easy access to a selection of books for bedridden hospital patients in 1928. The design consisted of bookshelves contained in a tilted box that was fitted with wheels. There were handles behind the shelf box to allow it to be pushed by a care provider or volunteer. The design allowed people with limited mobility to have a palpable library experience: the patient could scan the shelves, select and pick up a book, and leaf though the book before she or he would decide whether or not to read the book. Above all, the design demonstrated a level of care provided by the hospital and the library, thus, exemplifying their purpose of serving everyone in the community, engaging even individuals who were otherwise neglected with easy access to books, information, and the universe of ideas.

The process of designing a cart that would serve as a stage for human-animal contact and companionship was informed by the third principle with its emphasis on variety and spontaneity. As Charles Eames, noted

architect and furniture designer, once asserted "We don't take our pleasures seriously enough." (unknown date), the design opportunity was to invest the cart design with the unexpected qualities. The design was enriched with features such as an inlaid cat image and legs that reference animal forms. The design also celebrated the experience by creating anticipation. The noise created by the wooden wheels rolling along the corridor and the visual intrigue of the free-wheeling spokes made the approach of the animal a delightful part of the experience.

Therefore, the designer's intention was to employ design to restore the spontaneous nature of human-animal interactions, and to bring pleasure by adding enjoyable, pleasing, and unexpected features to the design.

Figure 2.2: Design intervention for Animal-assisted Therapy

In order to make animal-assisted therapy more accessible as a surprise to all the residents in the care center, a mobile cart (Figure 2.2) was constructed to transport the chinchilla, "Persie", throughout all three floors of the facility to visit residents. The design presented a "mini-stage" (the Interaction Surface) upon which the

animal, in this case, "Persie" the chinchilla, could rest in his small bed while being petted by the resident. The stage was fitted with wheels and a pair of handles behind to afford control by a caregiver.

Instead of organizing group therapy sessions, the design intended to empower caregivers to freely transport a small animal to individual residents giving then the opportunities to have "unexpected and unpredictable interactions" with the animal, as addressed by Principle 5 of The Eden Alternative (edenalt.org, 2015, Home » About » Mission, Vision, Values, Principles). The design also intended to empower each resident so she or he could interact with the animal in a natural manner, unencumbered by constraints such as having to bend down to reach the animal, or needing to have someone hold the animal.

2.3 Components of the Design Prototype and Compliance with ADA

For the reasons mentioned in 2.2, components of the design prototype were proposed, drafted, and built to serve the function of providing enjoyable and fun experiences for its users.

2.3.1 Components of the Design Prototype (Figure 2.3)

The cart prototype was built using 1/4 inch birch plywood, walnut wood scraps, oak, and steel bolts and nuts. The prototype consisted of an Interaction Surface to support and present the animal, two wheels that allowed the cart to be moved and turned around, two handles with comfortable grip for both pushing and lifting, and two side panels that offered stability when the cart was the a resting position.

a. Interaction Surface:

The Interaction Surface (component a, Figure 2.3) provided the surface for residents to interact with the animal. A titled, recessed surface located in the center provided a relatively safe slot for placing a small animal bed. The tilted angle was calculated so that when the cart was in the resting position, the recessed surface would be horizontal to the floor, with the leading surface slightly tilted down toward the resident (Figure 2.6).

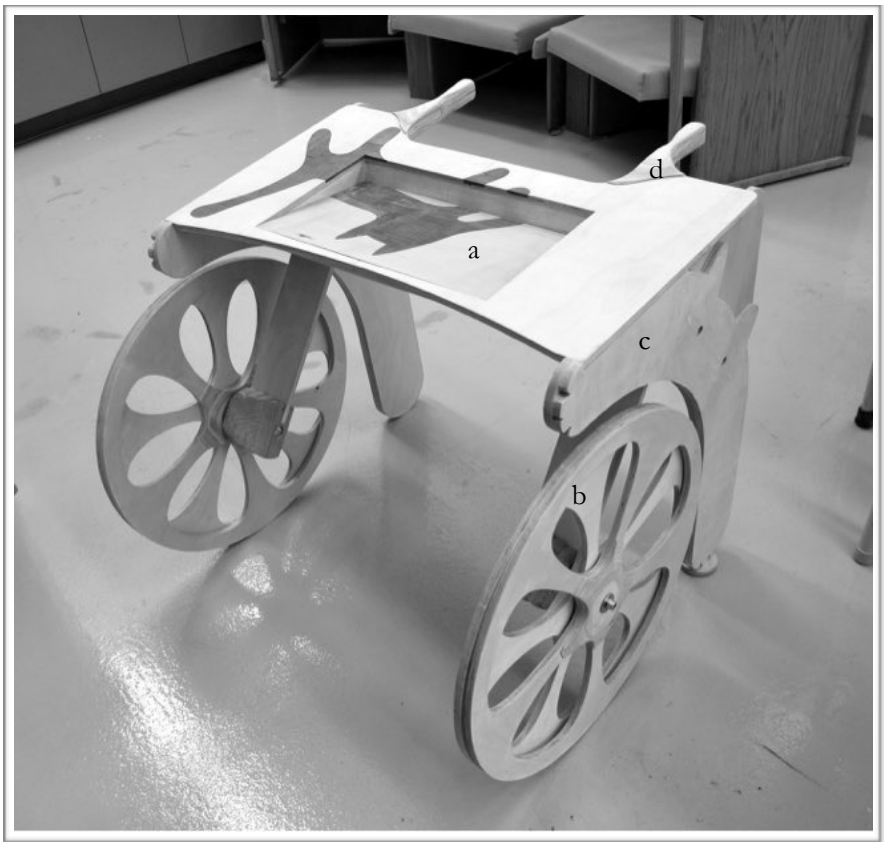


Figure 2.3: Components of the prototype design

Walnut wood fragments with a strong color contrast were hand cut and inlaid into a cat pattern across the Interaction Surface to help define the overall purpose of the surface (Figure 2.5). The inlay also added to the coherence of the surface as well as the aesthetic appeal if the cart.

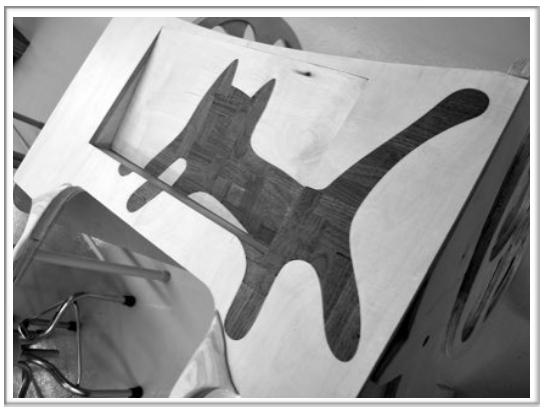


Figure 2.4: The Interaction Surface

Figure 2.5: Details, the Interaction Surface

b. Wheels and c. Side Panels:

The wheels (component b, Figure 2.3) revolved around two axels attached to opposing sides of the frame on the same axis of rotation. The idea was initially inspired by a folding walker (Figure 2.7) with high weight capacity. This configuration would ensure that the weight on the Interaction Surface would be in the center of gravity of the cart thus maximizing stability, while allowing each side to operate relatively independently for ease of movement through narrow spaces. Lateral stability was provided by an extra wooden panel underneath and perpendicular to the Side Panels (component c, Figure 2.3). Such a design would provide maximum foot/leg room and facilitate wheel movement without compromising stability.

Figure 2.6: Recessed Surface

Figure 2.7: A folding walker (Drive Medical, 2015)

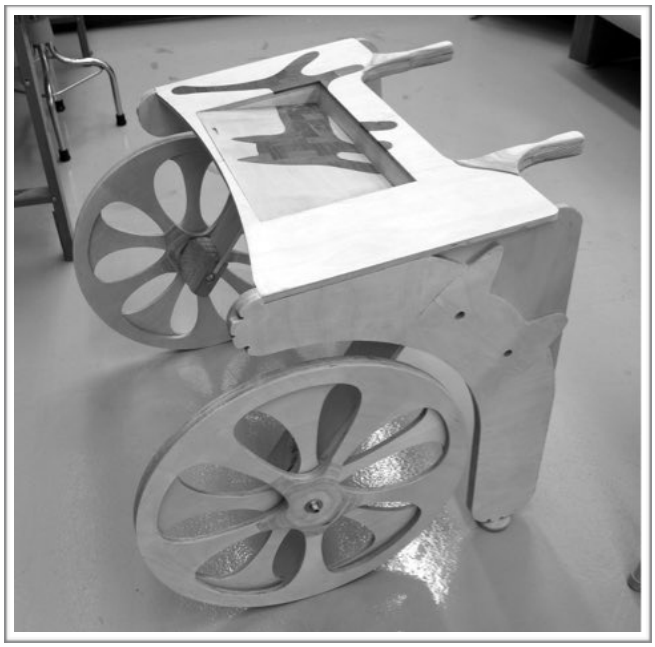


Figure 2.8: Wheels of the design prototype

The wheels were fabricated by a CNC (Computer Numerical Control) wood router with organically shaped spokes. Each wheel had two identically shaped panel pieces that were not bound to each other. The independent wheel panels also provided more flexibility for easy maneuver. When being rolled, the two wheel panels would rotate at different speeds, with the ever-changing overlapped spaces among spokes creating visual fascination for residents as they view the cart being rolled along.

One organically shaped hub piece (four hub pieces in total) was attached to each wheel panel to give extra support for stability, while softening the straight lines on side surfaces of the wheel panels (Figure 2.8).

Figure 2.9: Details of wheel panels and hub

The Side Panels (component d, Figure 2.3) were shaped in quadrants as animal-like figures (Figure 2.8). The Side Panels provided support when the cart was in the resting position, and were lifted when walking. A glide ski (Figure 2.8) was attached to one of the panels to allow for leveling of the cart when in a resting position.

d. Handles:

Figure 2.10: Details of a handle

Three layers of plywood were glued into one whole piece that was then sanded into the final wing-shaped handle design (component d, Figure 2.3). This handle design allowed the forces applied to the hand to be more evenly distributed over a larger portion of the palm (Figure 2.10). Prototypes were tested by different people and handles were refined and retested until the optimal shape was found.

2.3.2 Compliance with ADA

The design prototype was built to be compliant with The Americans with Disabilities Act ("ADA") (United States Department of Justice, 2010) with sufficient space underneath for knee clearance that would encompass a majority of wheelchairs (Table 2.1). Once the cart surrounded the wheelchair, a small animal would be at a comfortable height for a work surface, with the cart height measured 30" (Figure 2.12 (b)) and the height ranged required by ADA being 28"-24", and the half-height of a small animal (a chinchilla or a small rabbit) measured 4"-6". The resident could then easily look at, touch, pet, or even feed the animal, without extra help from the caregiver.

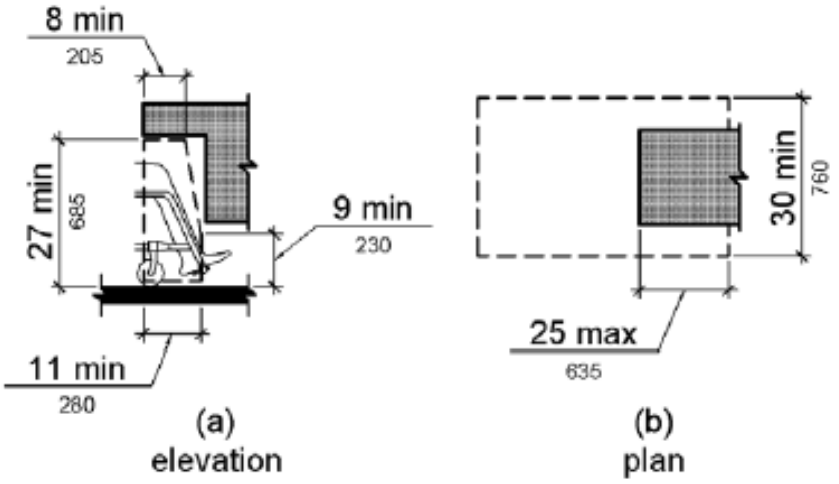
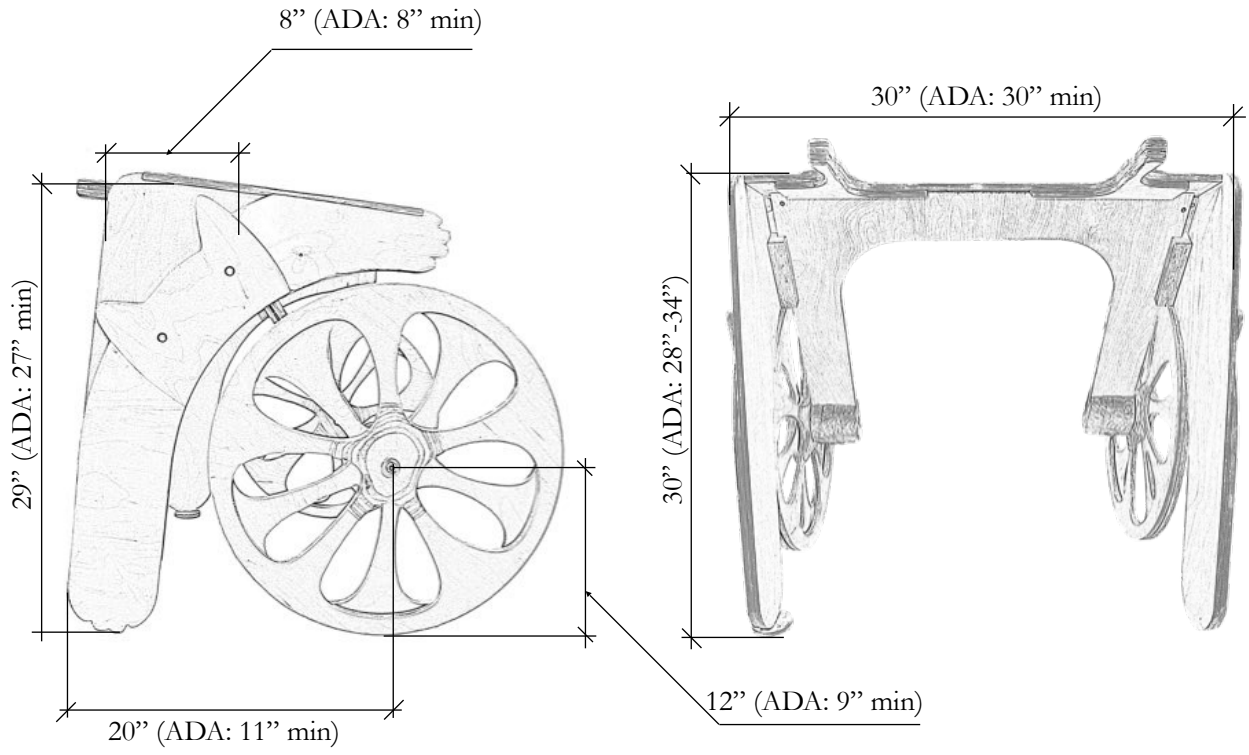


Figure 2.11: ADA Standards for Knee Clearance



(a) Elevation: Side (b) Elevation: Rear

Figure 2.12: Measures of the Prototype Design

The space under the interaction surface was measured 29", outside of the height range required by ADA standards for knee clearance (9"-27") (Table 2.1, 306.3.1). The space under the surface, nevertheless, still complied with the ADA standards for knee clearance. (Figure 2.11, 2.12)

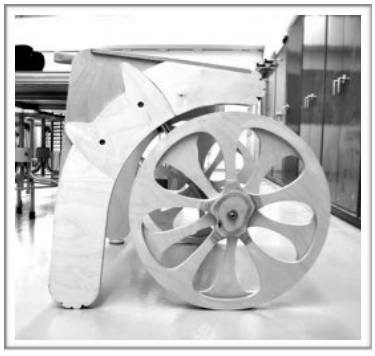




Figure 2.13 - 2.15 Top, Side, and Rear Views of the Design Prototype

ADA Standards for Accessible Design (2010) on Surface Height and Knee Clearance
Dining Surfaces and Work Surfaces Height (902.3) *The tops of dining surfaces and work surfaces shall be 28 inches (710 mm) minimum and 34 inches (865 mm) maximum above the finish floor or ground.*
Knee Clearance ***General (306.3.1)*** *Space under an element between 9 inches (230 mm) and 27 inches (685 mm) above the finish floor or ground shall be considered knee clearance and shall comply with 306.3.* ***Maximum Depth (306.3.2)*** *Knee clearance shall extend 25 inches (635 mm) maximum under an element at 9 inches (230 mm) above the finish floor or ground.* ***Minimum Required Depth (306.3.3)*** *Where knee clearance is required under an element as part of a clear floor space, the knee clearance shall be 11 inches (280 mm) deep minimum at 9 inches (230 mm) above the finish floor or ground, and 8 inches (205 mm) deep minimum at 27 inches (685 mm) above the finish floor or ground.* ***Clearance Reduction (306.3.4)*** *Between 9 inches (230 mm) and 27 inches (685 mm) above the finish floor or ground, the knee clearance shall be permitted to reduce at a rate of 1 inch (25 mm) in depth for each 6 inches (150 mm) in height.* ***Knee Clearance Width (306.3.5)*** *Knee clearance shall be 30 inches (760 mm) wide minimum.*

Table 2.1: ADA Standards for Accessible Design (2010) on Surface Height and Knee Clearance

Evans and McCoy (1998) proposed five design elements that might affect human health by shifting human resource levels: stimulation, coherence, affordances, control and restorative. The design prototype was developed incorporating these five elements for the purpose of enhancing the experience of residents during pet visits. Table 2.2 detailed a list of design qualities that intended to comply with the design elements.

Design elements (Evans & McCoy, 1998)	**Design qualities of the Design Prototype**
Stimulation	• High levels of Stimulation: novelty of form and patterns of the cart, mystery, and intensity to touch a live animal • Low levels of Stimulation: color, noise, smell, interpersonal distances • A combined moderate level of the complexity and diversity of elements created a moderate level of stimulation that would neither cause boredom (when insufficient) nor distraction (when overabundant)
Coherence	• Clarity and comprehensibility of the cart's function: surface for interaction, side panels to support standing, handles and wheels for movement • When in position, resident would only see the interaction surface so to avoid disorientation, appropriate behavior was encouraged • Animal patterns on the cart complied with the function
Affordances	• Ability to encompass a wheel chair • Appropriate height for vision and interaction • Adequate surface area for interaction and safety • Possibility of elevated attraction to the animal • Face-to-face spatial arrangement, talking distance with the caregiver • Possibility of increased interaction with the caregiver that might affect communication, friendship, and status differentiation between the resident and the caregiver (Sommer, 1967)
Control	• Moderate-low physical control: when cart was in position, the resident had relatively high physical constraints and low defensible space, which complied with the spatial syntax of the aged care facility setting for safety concerns • Moderate-high control for the resident in interaction with the animal and the caregiver • High flexibility for caregiver to move the cart into proximity or bring the animal to a bedridden resident
Restorative	• Private 1-on-1 interaction with the animal with a dedicated cart might offset some of the stressful impacts of high levels of stimulation • Fascination and restorative distraction might be created by direct contact with the animal • High potential in therapeutical functions as justified by literature in Chapter 1

Table 2.2:

Design Elements that affect stress and stress-related health outcomes and design qualities of the cart

2.4 Description of the Research Design

2.4.1 Purpose and Objectives

The fundamental purposes of this study were

a. to achieve a joyful, positive experience for both residents and staff in the long-term aged care facility
b. to explore the process of generating design solutions informed by research
c. to identify the environmental factors that contribute to successful animal assisted therapy visits
d. to promote the creation of cheerful, vibrant, and healing care environments that emphasize wellness and restoration in healthcare facilities, especially long-term aged care facilities

The objectives of this study were therefore to develop a design prototype that provides easier access to animal companionship and test the following hypotheses:

1. the design prototype would facilitate human-animal interaction in a nursing home setting by resulting in residents having more interactions with the pet animal, less nurse-reported negative behaviors, increasing residents' expressions of the wish for subsequent visits;
2. during each interaction, environmental factors such as the adoption of the design prototype, time of the day, privacy, and the use of the design prototype would increase positive behaviors of the residents, including speaking more, looking at, touching,, and initiating more meaningful conversations;

This study was also an exploratory application of Evidence-based Design (EBD) implementing the eight key steps of an EBD process (Center for Healthcare Design, EBD Guide 1, 2010), i.e.:

1) Define evidence-based goals and objectives;

2) *Find sources for relevant evidence;*

3) Critically interpret relevant evidence;

4) Create and innovate evidence-based design concepts;

5) Develop a hypothesis;

6) *Collect baseline performance measures;*

7) *Monitor implementation of design and construction;*

8) *Measure post-occupancy performance results."*

2.4.2 Data Collection Methods

Two pre-study observation sessions were conducted in April, 2013 at the care facility to study interaction patterns between residents and the animals. Although there were no pet therapy sessions being run at the time of these observations, researchers did observe one 2-hour session with the pet visitation program and one recreation therapy session with in-house recreation staff.

During the actual study, sixteen(16) elderly residents (11 females and 5 males, median age 83.4, range 73-95 years) from all three floors of the care facility and four (4) recreation staff members participated. The residents were selected based on the following criteria:

1) residents who liked pets and were willing to have a pet visiting their rooms with the facilitation of the design prototype;
2) residents who were cognitively alert and able to communicate verbally.

As the primary goal for the design intervention was to facilitate human-animal interaction, the study strived to implement the least intrusive intervention, and followed the care center's person-centered care model. Therefore the residents' pet visitations were part of the daily choices that were given to each resident to support their life-long habits. Residents were visited both in group settings and in their individual rooms, based on the availability of residents and their willingness to participate at the time of the visit. In other words, not all 16 residents participated in all six pet visit therapy sessions due to being temporarily unavailable or unwilling to be visited by the chinchilla.

During therapy sessions, some residents who had not been originally selected to participate in the study also expressed wishes to interact with the chinchilla. Therefore, the final number of residents who participated in the visits (25) turned out to be bigger than the original number of participants(16).

While petting, holding, or simply looking at the animal, residents were asked questions in a casual manner by the recreation staff. Residents were also free to talk to and ask any questions of the recreation staff. Residents were free to end the pet visit at any time.

The design prototype was present at all times during the visits. However, it was not always used to facilitate the interaction, especially when the resident was bed ridden or sitting in an oversized wheelchair. Table 2.3 presents the details of all six pet visit therapy sessions, including the specific time, date, length of the visit, number of residents visited (i.e. number of interactions), and number of residents visited using the design prototype.

Therapy Session	**Time and Date**	**Total Length of Session**	**Number of Residents Visited (# of Interactions)**	**Number of Residents Visited using the Design Prototype**
1	May 7, 7:24p.m.-8:39p.m.	75 Minutes	12	7
2	May 10, 7:32p.m.-8:29p.m.	57 Minutes	8	8
3	May 13, 6:55p.m.-8:25p.m.	90 Minutes	7	6
4	May 16, 3:29p.m.-5:39p.m.	130 Minutes	13	10
5	May 19, 2:57p.m.-5:20p.m.	143 Minutes	12	7
6	May 22, 3:31p.m.-5:31p.m.	120 Minutes	11	9
		Total: 615 Minutes Average: 102.50 Minutes	Total: 63 Average: 10.50	Total: 47 Average: 7.83

Table 2.3: Summary of pet visit therapy sessions

2.4.3 A Summary of Measures

Table 2.4 presents a listing of data collected in the study.

Survey

Throughout the data collection period, one recreation staff member filled out the The Nursing Home Behavior Problem Scale (NHBPS) survey two times: the day before the first visit and seven days after the last visit. The 16 Participants' demographic data was also collected to determine each participant's age and gender. Room number was used to determine level of care he or she was receiving based on the floor the participant lived on (first floor: Independent living, second floor-Assistant Living; third floor-Skilled Nursing).

The Nursing Home Behavior Problem Scale (NHBPS) (Ray et al., 1992) was an inventory of serious behavior problems among nursing home residents that may be observed by nurses or nursing assistants. It was developed to measure the specific disruptive behavior problems that occur in nursing home settings. The scale was a 29-item 5-level Lickert Scale (0 =never to 4 =always) with 6 subscales: uncooperative or aggressive behaviors, irrational or restless behaviors, sleep problems, annoying behaviors, inappropriate behaviors, and dangerous behaviors. The scale was designed to be completed by nursing assistants to report the frequency of each behavior in the past 3 days. The scale's inter-scorer reliability was measured by the Pearson correlation coefficient, with inter-scorer correlations of approximately .8 (Ray et al., 1992). The scare has high-convergent validity; with its correlation with the widely used Nurse Oriented Scale for Inpatient Evaluation (NOSIE) being –.747 and that with the Cohen Mansfield Agitation Inventory (CMAI) being .911 (Ray et al., 1992).

Observations of Each Participant

All pet visit therapy sessions were documented by a video camera for data analysis. Among the 16 participants who signed up to participate in the study, the number of sessions they participated in, i.e. the occurrences of their interactions with the pet animal, was recorded to decide the effectiveness of the pet visit therapy.

Tool used	Item	Example	Rationale
Survey	NHBPS (Nursing Home Behavior Problems Scale) total score	6, 0	To document probable behavior problems of the resident before and after the pet visit therapy intervention
	Age (years old)	91, 83	To determine the age of the resident
	Sex	Female, Male	To determine the gender of the resident
	Room number	305, 158	To determine the floor that the resident was on when the survey was conducted, indicating the level of care that the participant was receiving (first floor: Independent living, second floor-Assistant Living; third floor-Skilled Nursing) Possible Possible factor of the pet visit therapy
Observations of Each Participant	Occurences of interactions	1, 5	Number of visits may affect the results of the design intervention
Observations of Each Interaction	Time of the day	Early Afternoon, Late Afternoon	Possible factor of the pet visit therapy
	Adoption of the design prototype	Yes, No	Possible factor of the pet visit therapy
	Social setting/Privacy	Individual, Group	Possible factor of the pet visit therapy
	Length of the interaction (Seconds)	146, 615	Possible Outcome measure
	Number of words said by the resident per minute	20.74, 34.06	Possible Outcome measure
	MIUs (Meaningful Information Units) per minute	7.18, 18.23	Possible Outcome measure
	VIs (Verbal Initiations) per minute	0, 2.4	Possible Outcome measure
	Smiles per minute	0.67, 2.05	Possible Outcome measure
	Percentage of touching the pet (%)	17.28, 71.59	Possible Outcome measure
	Percentage of looking at the pet (%)	65.44, 92.00	Possible Outcome measure
	Transcript of the participants	"More often is better", "I am glad you came before supper."	To determine participants' preference on factors that might affect the effectiveness of pet visit therapy

Table 2.4: List of data collected

Observations of Each Interaction

The video camera also recorded all necessary image and voice footages of each interaction. Time of the day, wether or not the design prototype was adopted during the interaction, and whether or not the resident was visited in his/her group setting or in the individual rooms were recorded as possible independent variables of the pet visit therapy.

An interaction was recognized when the chinchilla was presented within arm's reach of a resident upon his or her approval of being visited. All interactions, including the ones with the pre-selected residents and the ones with the non-pre-selected residents, were considered in the data analysis to determine the environmental factors that might affect the pet visit therapy. Some residents, both pre-selected and non pre-selected, were presented in group pet visit sessions but did not directly interact with the chinchilla. Their presences were not recognized as interactions.

During the time of the pet therapy sessions, residents usually had supper between 6:00 p.m. and 7:00 p.m.. Interactions that happened before supper time were considered as "early afternoon" interactions. All the interactions in the first three pet visit therapy sessions took place before supper (between 2:57p.m. and 5:39p.m.), thus were considered as "early afternoon" interactions. Interactions that happened after supper time were considered as "late afternoon" interactions. All the interactions in the last three pet visit therapy sessions took place after supper (between 6:55p.m. and 8:39p.m.), thus were considered as "late afternoon" interactions.

An interaction was defined as an interaction in a "group" group when there was at least one more resident in the same setting, to whom the primary resident could easily talk to within earshot. Examples of group interactions were when several residents sat in a circle in the same activity room, or when residents sat unorganizedly in the common room, or when two roommates both presented in their shared room. An interaction was defined as an interaction in an "individual" setting when there as no other resident in the

same setting. Examples of individual interactions were when a resident interacted with the chinchilla in his or her single room, or in a hallway without any other resident within earshot.

All residents' verbal performance during the interactions was converted to scripts for data analysis. Length of the interaction, number of words said by the resident, MIUs (Meaningful Information Units), VIs (Verbal Initiations), smiles, time spent touching the animal, and time spent looking at the animal were recorded as possible dependent variables of the pet visit therapy.

MIU were defined as words or phrases produced by the participant that had meaning, were not redundant, and were directly related to the conversation. Verbal Initiations were defined as utterances produced without a verbal model. They were counted if they introduced new information, and were directed towards another person or one of the stimuli. Inter-scorer reliability was .88 for MIU, .97 for total words, and .99 for initiations (Greer et al., 2001).

As the total time each resident spent on interaction varied due to reasons mentioned in 2.4.2, number of words said by the resident, MIU, and smiles were calculated and presented in their frequency of happening per minute. Time spent touching the animal and looking at the animal were calculated and presented in their percentage of happening during the entire time of each interaction.

Residents' expressions of opinion regarding the interaction, comments on the animal and the design prototype, and the wish for subsequent visits were also documented to determine participants' preference on factors that might affect the effectiveness of pet visit therapy.

2.4.4 Data Analysis

To determine the effect of the pet visit therapy intervention brought by the design prototype, a paired T test was used to analyze the total scores on the NHBPS before and after the pet visit therapy sessions.

Descriptive statistics were used to identify possible independent variables and dependent variables that might affect the pet visit therapy. A significance level of $p < .05$ was used for this study. Because of the small sample size, additional analyses by gender, age, and length of stay on the unit were not done.

3. Results

The results chapter will present

3.1 an overview of all the data collected

3.2 findings at the individual level among pre-selected participants

3.3 findings of environmental factors that might affected interactions

3.4 stories worth telling

3.1 Overview

During the 615 minutes of all pet therapy visit sessions, nearly half of the time (304 minutes and 22 seconds) was spent on transferring the animal with the design prototype in between interactions. A total of 310 minutes and 38 seconds was spent in visiting and interacting with residents in a variety of settings including the activity room, common/dining rooms, hallways, outside courtyard, and individual rooms.

All 16 pre-selected residents participated in the study for at least 1 interaction, and at most 5 interactions out of the 6 visit sessions. There were 9 additional residents who were not originally selected in the study that

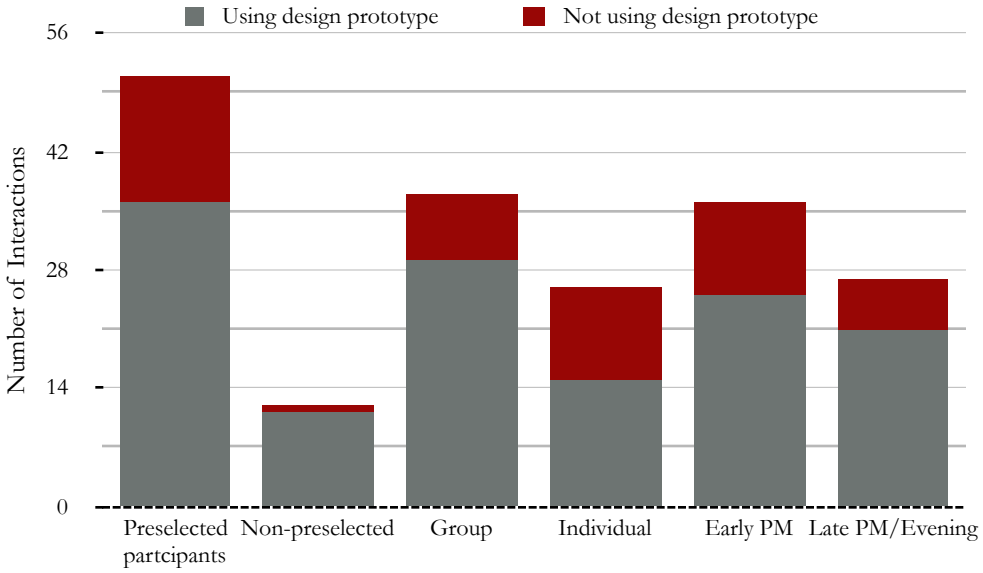


Figure 3.1 Interactions, by number

also took part in the pet visits for at least 1 interaction, because they expressed wishes to interact with the animal. Of these additional residents, 2 residents even participated in two different pet visit sessions. A total of 63 interactions were observed.

Figure 3.1 and Figure 3.2 present, by the number of interactions and by the length of interactions respectively, the breakdown of use of the design prototype in all interactions, categorized by the environmental factors.

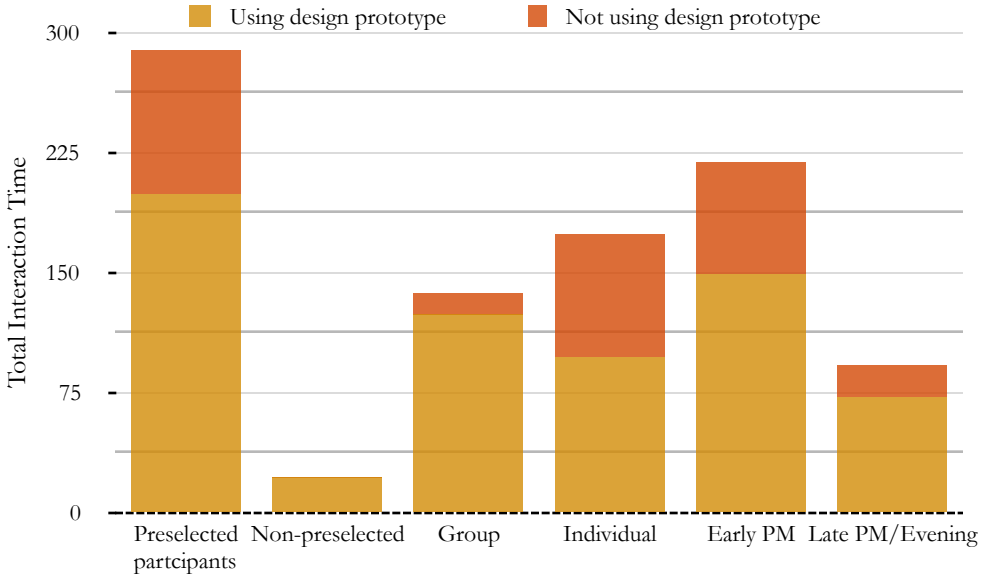


Figure 3.2 Interactions, by length

As shown in Figure 3.1 and Figure 3.2, the design prototype was adopted 47 times of all 63 interactions, and was adopted 70.80% of the total interaction time. Interactions with residents that were not pre-selected were more likely to always adopt the design prototype (11 out of 12 times), whereas interactions with pre-selected residents did not use the design prototype as much (36 out of 51 times).

More (37) interactions were successfully conducted in group settings compared to the number of interactions (26) conducted in individual settings. However, more time (55.74% of total interaction time) was spent on interactions in individual settings instead of group settings. The design prototype was significantly more likely to be adopted in group settings than individual settings (Pearson's chi-squared test, $p<.005$).

More (36) interactions occurred during pet visit therapy sessions conducted in the early afternoons compared to the number of interactions (27) occurred in late afternoons. Accordingly, more time (70.4% of the total interaction time) was spent during early afternoon pet therapy visits.

The average interaction length was 4 minutes and 56 seconds (range: 15 seconds to 14 minutes and 40 seconds, SD: 198 seconds). On average, a resident spoke 26.20 words per minute, of which 11.52 were Meaningful Information Units (MIUs). Residents initiated .74 new topics per minute, spent 59.25% of the interaction time touching the animal and 71.15% of the interaction time looking at the animal.

3.2 Findings at the Individual Level among Pre-selected Participants

3.2.1 NHBPS Scores

Among the 16 pre-selected residents, a decrease (M= -1.875, SD=2.58) of their NHBPS scores was observed. There was a significant difference between their NHBPS scores before the first pet visit therapy sessions and their NHBPS scores after the last pet visit therapy session (paired t test, p=.01).

3.2.2 Correlations: Factors that Might Affect the Score Changes

The change of score was found to be strongly correlated with the pre-test NHBPS score. A negative correlation of -.95 was found between these two sets of data (Figure 3.3). This meant that the more behavior problems a resident had before the first pet visit therapy session, the more likely the resident would have a bigger score drop on NHBPS.

However, the decrease in their NHBPS scores was neither significantly affected by the room number (i.e. level of care) (ANOVA, $F(2, 13)=2.86$, $p>.05$), nor the number of visits residents received, nor the total length of the interactions that residents had.

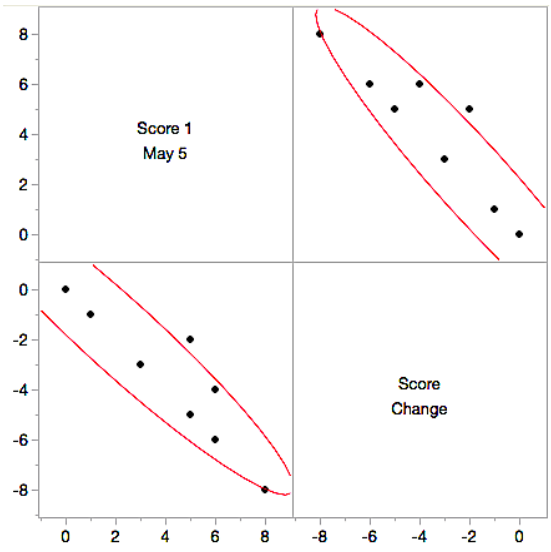


Figure 3.3: Correlations between Initial Score and Score Change

3.3 Environmental Factors that Might Affected the Interactions

A one-way ANOVA was conducted to compare the effect of time of the day, usage of the design prototype, and privacy setting on interaction quality as measured by interaction length, number of words, Meaningful Information Units (MIUs), and verbal initiations (VIs) per minute, as well as time residents spent on touching and looking at the animal.

3.3.1 Time of the Day

As noted in 3.1, more (36) interactions occurred in the early afternoons than in late afternoons(27). In sum, during early afternoon interactions, residents spent significantly longer time interacting with the animal but initiated significantly less new verbal topics as compared to interactions in late afternoons.

Residents also talked faster with more MIUs, spent more time touching and looking at the animal, but smiled less often in early afternoon interactions as compared to late afternoon interactions. However, these differences were not found to be statistically significant.

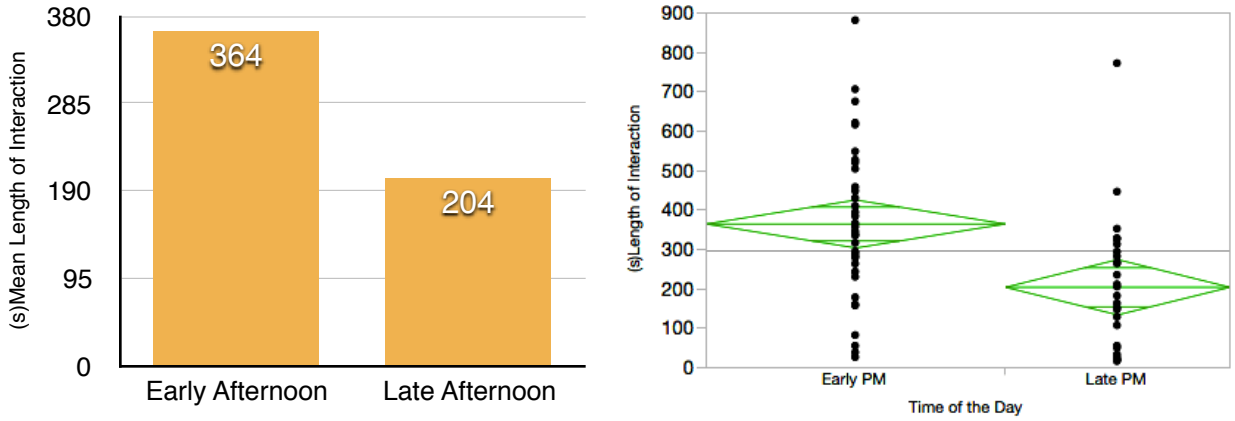


Figure 3.4 Length of Interaction by Time of the Day

Interactions that occurred in early afternoons lasted longer (M=364 seconds) than interactions that occurred in late afternoons (M=204 seconds). There was a significant difference between the Early Afternoon and Late Afternoon group means of interaction length as determined by one-way ANOVA ($F(1, 61) = 11.94$, $p = .001$) (Figure 3.4).

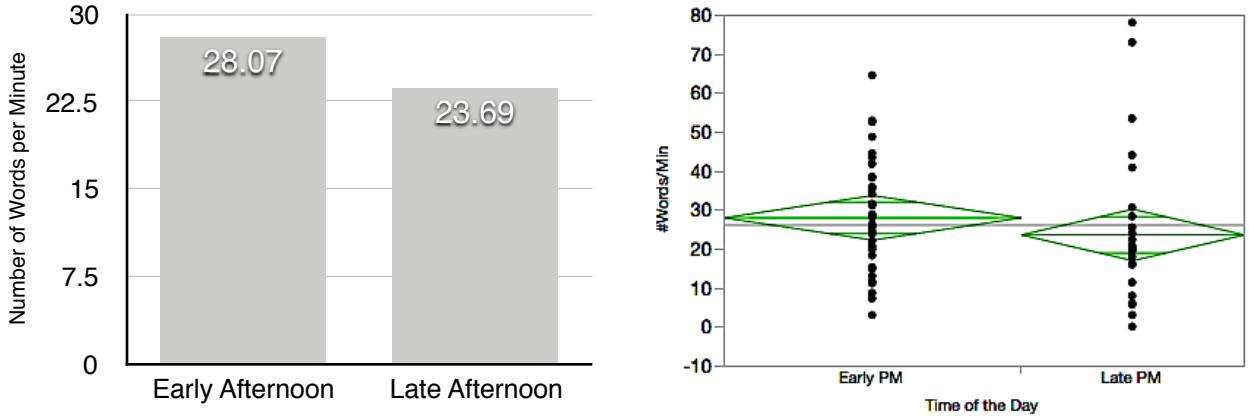
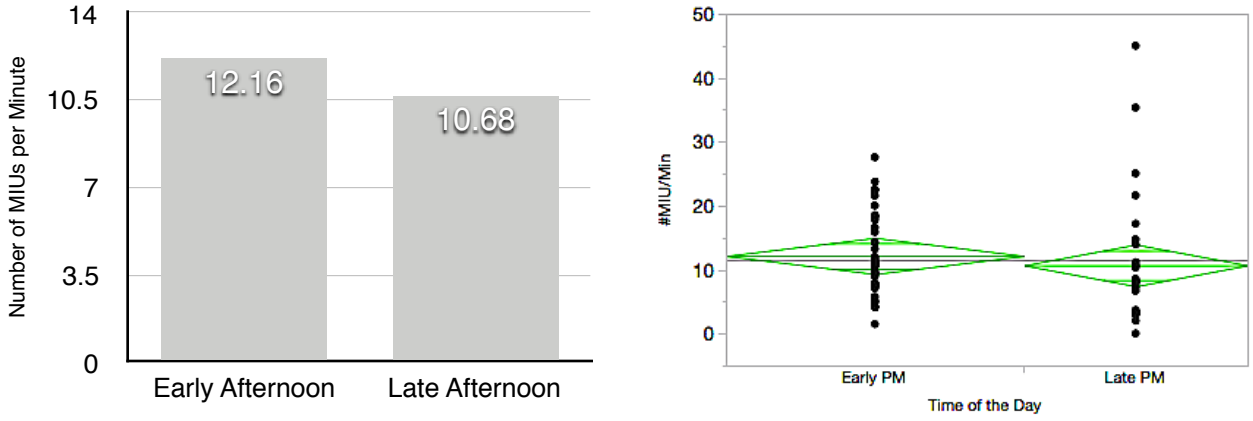


Figure 3.5 Number of Words per Minute by Time of the Day

On average, residents involved in interactions that occurred in early afternoons spoke slightly faster (28.07 words per minute) than residents involved in interactions that occurred in late afternoons (23.69 words per minute). However, the difference between the Early Afternoon and Late Afternoon group means of Number

of Words per Minute was not significant (F(1, 61) = 1.01, p > .05), as determined by one-way ANOVA



(Figure 3.5).

Figure 3.6 Number of MIUs per Minute by Time of the Day

Similarly, residents involved in interactions that occurred in early afternoons spoke with slightly more MIUs (M=12.16 words per minute) than residents involved in interactions that occurred in late afternoons (M=10.68 words per minute). However, the difference between the Early Afternoon and Late Afternoon group means of Number of MIUs per Minute was not found to be significant (F(1, 61) = 0.47, p <.05), as determined by one-way ANOVA (Figure 3.6).

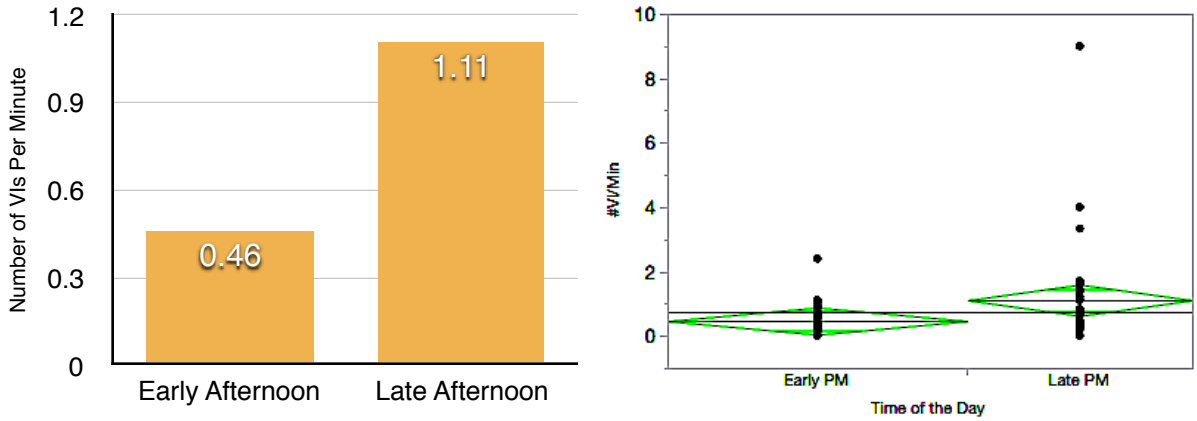


Figure 3.7 Number of VIs per Minute by Time of the Day

Notwithstanding, residents initiated significantly more new verbal topics in interactions that occurred in late afternoons (M=1.11 Verbal Initiations "VIs" per minute) than residents in interactions that occurred in early afternoons (M=.46 VIs per minute). This difference between the Early Afternoon and Late Afternoon group means of Number of VIs per Minute was found to be significant ($F(1, 61) = 4.06$, $p < .05$), as determined by one-way ANOVA (Figure 3.7).

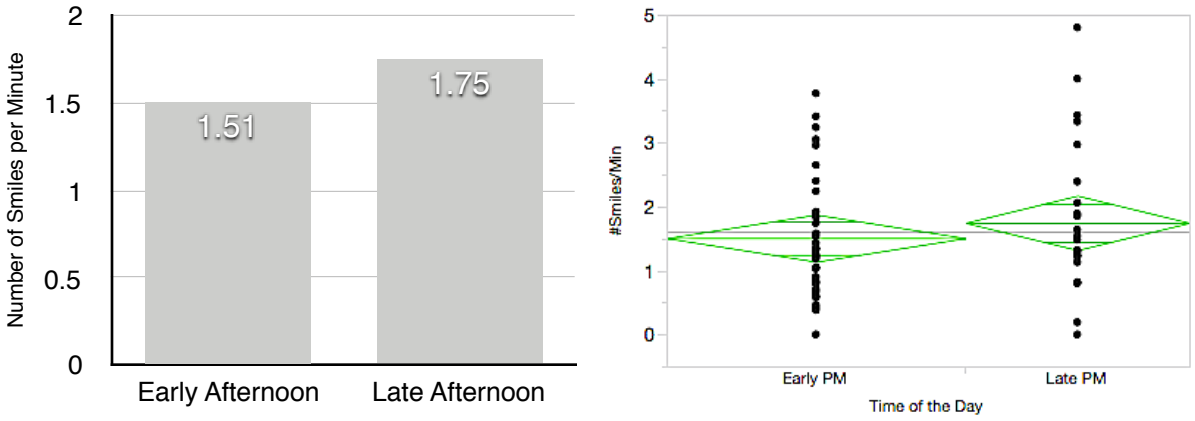


Figure 3.8 Number of Smiles per Minute by Time of the Day

Residents involved in interactions that occurred in early afternoons smiled slightly less often (M=1.51 per minute) than residents involved in interactions that occurred in late afternoons (M=1.75 per minute). This difference between the Early Afternoon and Late Afternoon group means of Number of Smiles per Minute was not found to be significant ($F(1, 61) = 0.72$, $p > .05$), as determined by one-way ANOVA (Figure 3.8).

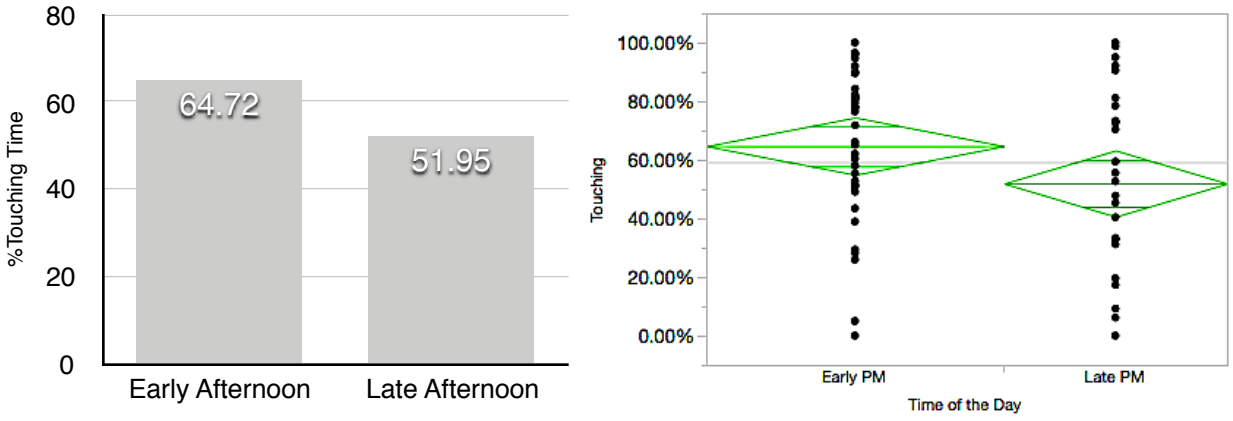


Figure 3.9 Percentage of Touching Time by Time of the Day

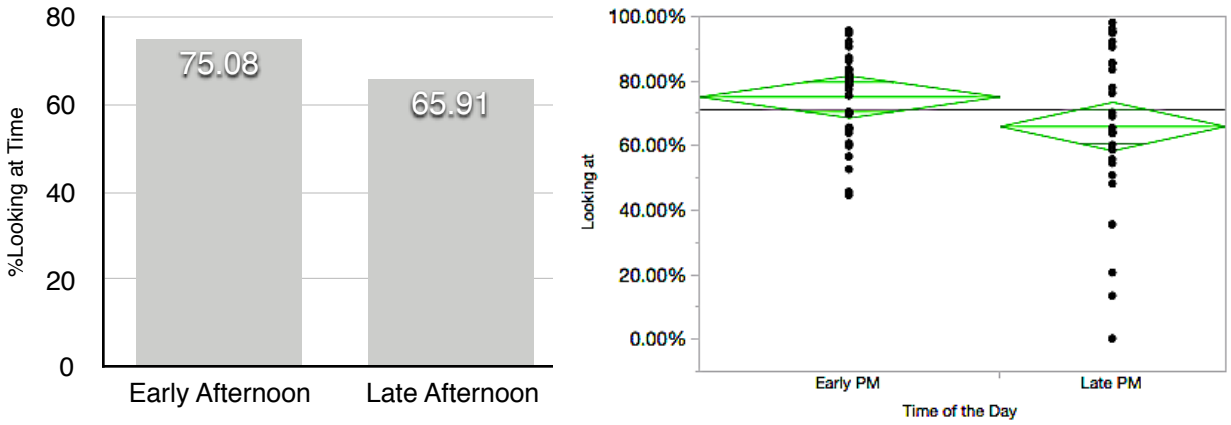


Figure 3.10 Percentage of Looking at Time by Time of the Day

During the interactions with the animal, residents spent slightly more time touching(64.72%) and looking at(75.08%) the animal in interactions that occurred in early afternoons than the time spent touching(51.95%) and looking at(65.91%) the animals in interactions that occurred in late afternoons. These difference between the Early Afternoon and Late Afternoon group means of percentages of time spent on Touching and Looking at the animal were not found to be significant (%Touching $F(1, 61) = 2.92$, $p = .09$; %Looking $F(1, 61) = 3.42$, $p = .07$), as determined by one-way ANOVA (Figure 3.9 and Figure 3.10).

3.3.2 Adoption of the Design Prototype

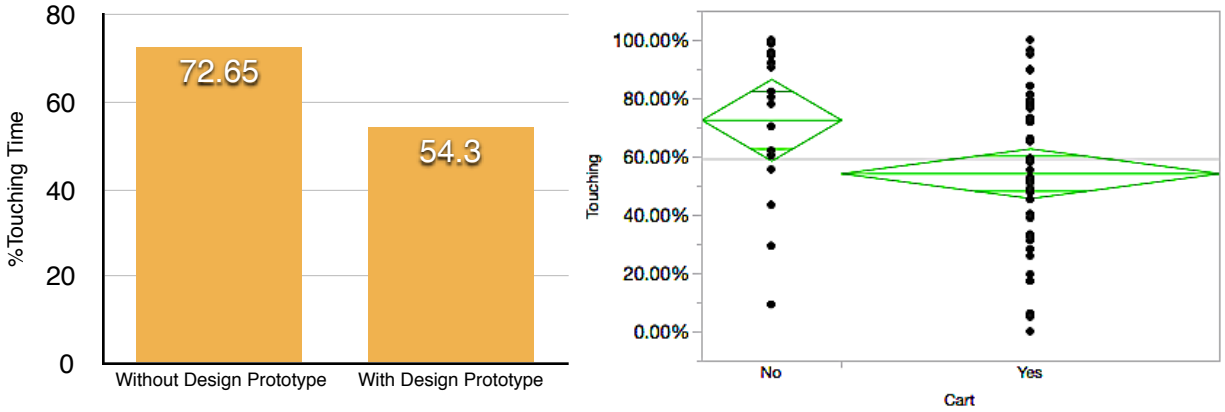


Figure 3.11 Percentage of Touching Time by Adoption of Design Prototype

More interactions (47 out of 63) adopted the design prototype as a tool to facilitate the interaction. When the design prototype was not used to facilitate the interaction, the resident was significantly more likely to spend more time touching or holding the animal ($F(1, 61) = 5.01$, $p < .05$) (Figure 3.11).

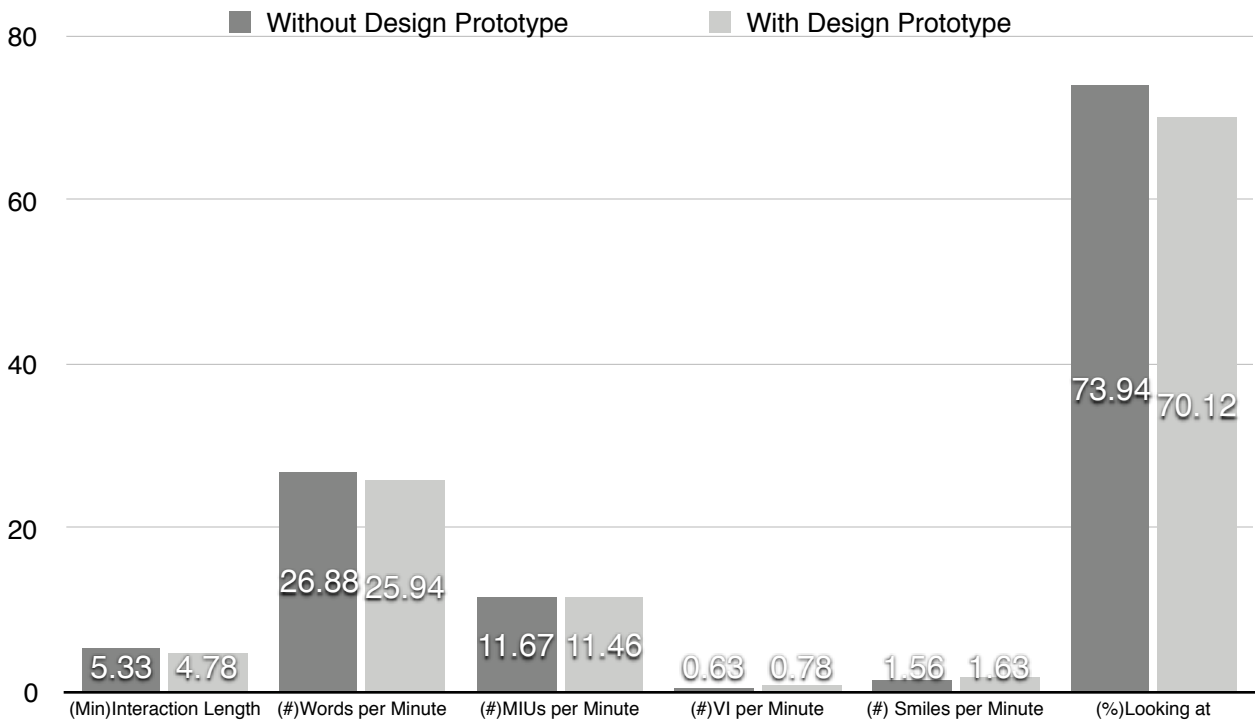


Figure 3.12 Results by Adoption of Design Prototype

However, the usage of the design prototype was not found to have any significant effects on interaction length, number of words, MIUs, and VIs per minute, or time residents spent on looking at the animal (Figure 3.12).

3.3.3 Social Setting/Privacy

When interactions occurred in individual settings, residents spent significantly more time interacting with the animal, compared to interactions that occurred in group settings. ($F(1, 61) = 14.90$, $p < .0005$) (Figure 3.13).

In general, when interacting with the animal in individual settings, residents talked slightly faster, with slightly more MIUs, and spent more time touching the animal. Whereas during interactions in group settings,

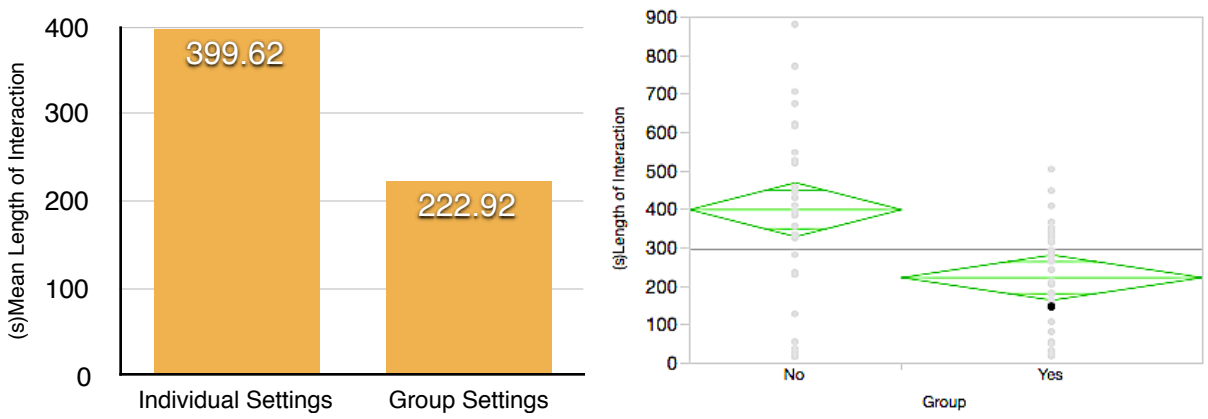


Figure 3.13 Length of Interaction by Social Setting

residents initiated slightly more new verbal topics, smiled more often, and spent more time looking at the animal. However, the social setting was not found to have any significant effects on Number of Words, MIUs, or VIs per minute, or time residents spent on touching or looking at the animal (Figure 3.14).

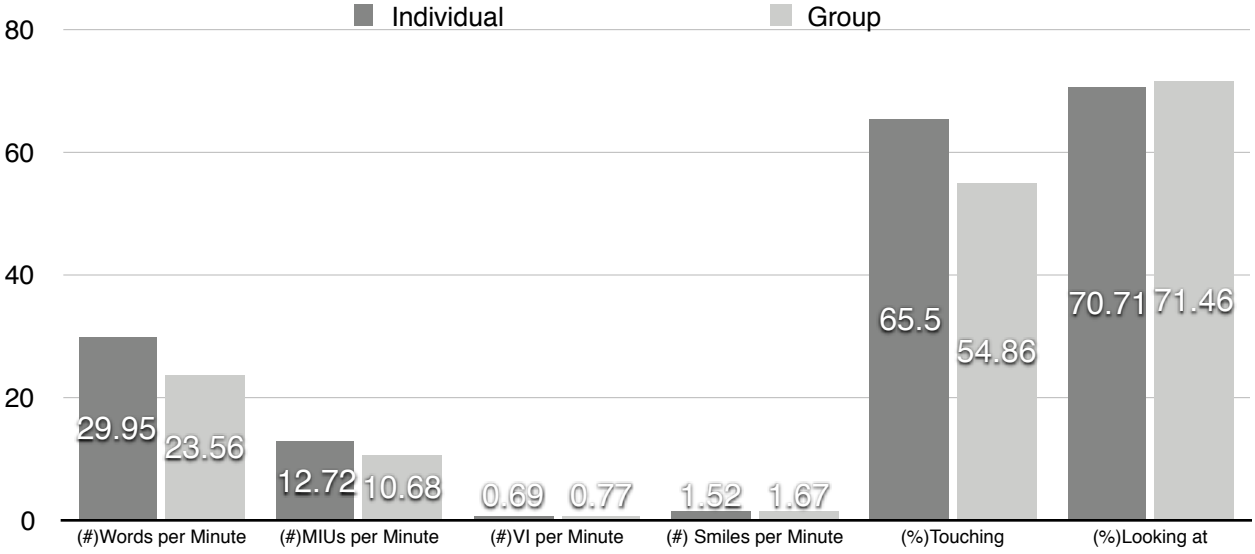


Figure 3.14 Other results by Social Setting

3.3.4 Correlations

There was a positive correlation of +.93 between number of words per minute and number of MIUs per minute (Figure 3.15). There was no other significant correlation among any other outcome measures.

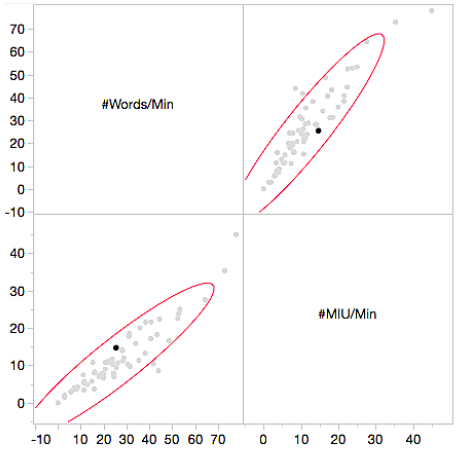


Figure 3.15: Positive Correlation between Number of Words per Minute and Number of MIUs per Minute

3.4 Stories Worth Telling

Figure 3.16: Residents Smiling and Winking during Interactions

Each of the 63 interactions was unique. Residents shared their time, as well as their stories, jokes, and feelings with the researchers while interacting with the animal. This subchapter will highlight visual and verbal transcripts from the 6 pet visit therapy sessions conducted in May, 2013.

3.4.1 Facial Expressions of the Residents

Figure 3.17: Residents being Surprised upon Seeing the Animal

Frequently, residents were surprised upon seeing the animal, especially in individual settings (Figure 3.17). The adoption of the design prototype was seen as an effective means to present the animal to the residents in variable ways. These "unplanned" interactions in individual settings provided the residents with unexpected and unpredictable interactions in their daily lives, thus added variety and spontaneity as suggested by The Eden Alternative (edenalt.org, 2015, Home » About » Mission, Vision, Values, Principles).

Figure 3.18: A Resident Expecting a Surprise

In group settings, residents usually expected to be visited by the animal in turns. However, sometimes when residents spent their time in the common room watching TV, researchers used the design prototype to roll the

animal around the facility and visited the residents in a casual manner. It seemed that some residents wished to interact with the animal while seeing the animal being rolling around. Figure 3.18 shows a resident covering her eyes and expecting a surprise, while the researchers quickly presented the animal in front of her.

Figure 3.19 (left): A Resident and a Creational Staff Member Touching and Looking Closely at the Animal

Figure 3.20 (right): A Resident Smiling at the Animal

Residents exhibited their affection toward the animal by touching, looking closely at (Figure 3.19), and smiling at (Figure 3.20) the animal. Sometimes, they also requested closer contact with the animal by holding and hugging (Figure 3.21) the animal, as well as kissing (Figure 3.22) the animal and touching the animal with their faces.

Figure 3.21 (left): A Resident Hugging the Animal

Figure 3.22 (right): A Resident Kissing the Animal

However, this was not always the case. In some cases, when the animal was presented, a few residents did not show any change in their facial expression at all. These residents also did not actively engage, if at all, in the interaction with the animal. Figure 3.23 is an example of such, a resident remained motionless and unaffecting throughout the period when the animal was presented to him, although he did seem to notice the animal's presence.

Figure 3.23: A Resident Remaining Motionless in the Animal's Presence

In very rare cases, residents withdrew themselves upon seeing the animal. Although most of the time, these residents were able to continue and complete the interaction with more positive verbal and nonverbal behaviors later on. Figure 3.24 shows two examples of resident withdraw upon seeing the animal.

Figure 3.24: Residents Withdrawing from the Animal's Presence

3.4.2 Ways the Design Prototype was Used

Figure 3.25: Residents being visited in their Individual Rooms

In individual rooms, residents usually preferred to sit on the edge of their beds to interact with the animal. The animal was usually presented to the resident from either the design prototype or a table of a similar height. Because individual rooms offered more available space for the researcher/recreational staff to sit down and engage in interactions. Figure 3.25 shows two examples of researchers engaging in the interaction in individual rooms by sitting across from or alongside the resident.

In other individual settings such as an empty hall way, researchers usually did not have a place to sit down. The design prototype was often used to provide physical support to the researcher, so she or he could lean closer to the animal and the resident (Figure 3.26).

Figure 3.26: A Researcher Leaning on the Design Prototype while Interacting with the Resident

Figure 3.27: Residents Holding and Hugging the Animal in Their Beds

A few of the residents were always visited in their individual rooms because they were bed-ridden. In these cases, the design prototype was only used to transport the animal to the individual room, and the animal was usually brought to the resident's bed to stay closely to the resident (Figure 3.27). This may explain why in individual settings, interactions lasted significantly longer with a significant longer time spent on touching/ holding the animal (as noted in 3.3.3) than in group settings. Compared to other settings, residents in their own rooms recalled and narrated more positive memories from their past, topics of the conversations were usually around Persie the chinchilla, the residents' family members, and their previous pets.

In group settings, researchers were observed to often lower themselves to the level of the animal, in order to facilitate the interaction and talk with the resident. Figure 3.28 shows such postures of the researchers.

Figure 3.28: Researchers Kneeling Down to Engage in the Interaction in Group Settings

In order to become closer to the animal, residents sometimes remove the animal and its bed from the design prototype and held the chinchilla in their arms (Figure 3.29).

Figure 3.29: Residents Holding and Hugging the Animal in Group Settings

While the animal visited a particular resident in group settings, other residents usually looked at the animal in a friendly way, as depicted in the middle picture in Figure 3.29. However, there were many incidences when other residents either requested to be visited or came directly to pet the animal, even in the middle of the visit of another resident (Figure 3.30).

Figure 3.30: Other Residents "Interrupting" an Interaction

When these scenarios happened, the resident who was visited the first did not usually like the idea of having another resident involved in their interaction with the animal, and they demonstrated behaviors to defend their position in the interaction. The picture on the left in Figure 31 shows a resident looking at the "intruder", as another resident came close to the animal and petted the animal. The resident in the picture on

the right even "protected" the animal at the presence of another resident in a close range. On the other hand, residents did not show such guarding behaviors when the animal was brought to them and taken away from them in turns.

Figure 3.31: Residents "Guarding" the Animal from Other Resident

All the residents were observed to enjoy their alone time with the animal and the researcher, agreeing with the correlation between privacy and interaction length as noted in 3.3.3. This might mean that privacy might not only be a positive factor for longer interaction durations, but also was the residents' preference.

3.4.3 Noise

Residents were often distracted from their interactions with the animal by loud TV programs playing in the background. In multiple occasions, while the animal was visiting the residents in common rooms, there was a lot of noise made by staff talking and handling kitchenware in the background. Residents never were able to be engaged in meaningful interactions with the animal or the researchers when the background noise was loud. Yet, residents also seemed to be used to loud back ground noises, which obviously took place often. For example: when siren-like noises went off in the hallway, residents did not usually show any reaction.

3.4.4 Contents of Conversations

Although a small number of residents did not talk much during their interactions with the animal, most of the residents visited engaged in conversations about Persie the chinchilla, about their previous pets, about their family members, and sometimes, about the pet visits and the design prototype.

Residents always expressed positive feelings toward having the animal visit them ("I love that, for him to be up there"). Specifically, they loved the fact that they could touch and pet the chinchilla easily, and that the chinchilla and the researchers provided company ("The touch of him makes me feel more real" ;"I am having a lonely day, I have been here, no one has visited until I met him"). They sometimes even cracked jokes with the researchers. Besides petting the animal, residents enjoyed feeding the chinchilla with dried fruit and other chinchilla food.

Residents and researchers interacted in very friendly manners throughout all pet visit therapy sessions. Residents also expressed their appreciation of the researchers, especially when they brought the animal to visit individual rooms ("I never had such a beautiful team before"). One resident kept candy for the researchers as a gift for visiting her. Moreover, some residents asked if researchers would visit again with the animal ("Will you come again this Thursday?"). Once, when the animal visited a double-occupancy room, the resident being visited the first offered the animal to visit her roommate.

Residents often could not remember the species of the animal. They often mistook the chinchilla as a cat ("You little kitty"). However, this did not affect residents' affection toward the animal, and they were always happy to learn that he was actually a chinchilla. Although residents were not likely to remember, they often asked to learn the gender and age of the chinchilla.

A few times, residents got lost while reminiscing about past or non-existing experiences of theirs, before or during the interaction with the animal. Sometimes, they seemed to be able to refocus their attention on the interaction with the animal upon hearing questions asked about the animal. But in other times, the interaction had to be ended due to the resident's inability to engage.

Figure 3.32: A Female Resident Attempting to Walk with the Design Prototype

The researchers never verbally mentioned using the design prototype as a tool to facilitate the pet visit therapy. However, many staff members and residents in the facility noticed the design and made comments about it. A few times, residents started talking about the design during their interaction with the animal as a new topic/verbal initiation ("That's a nice thing you have for that"; "This is nice!"; "I remember this"). Apart from the general comments, residents also analyzed the function and usability of the design prototype ("It's heavy, isn't it?"; "It's beautiful, did you make many things like this?" "At least, you got something there, so you are not carrying it bending over all the time. You got to worry about your back getting hurt."). One female resident even attempted to roll the cart herself ("Let's see if I can drive it"). Figure 3.32 shows the image of the female resident trying to walk while pushing the cart forward.

4. Discussion and Recommendations

The discussion and recommendations chapter will present

4.1 explanation and interpretation of the results

4.2 limitation of the study

4.3 recommendations for future design

4.4 recommendations for future studies

4.1 Explanation and Interpretation of the Results

Over the course of 16 days, residents were visited six times in pet therapy sessions with an animal and the design prototype brought by the researchers. The decrease in the pre-selected participants' NHBPS scores as well as residents' verbal feedback indicated that these pet visit therapy sessions had a positive effect on reducing common behavior problems in nursing homes, lessening boredom, and providing "unplanned" and unexpected interactions in the lives of these long-term, aged care facility residents. Although, the decrease of the NHBPS score was found to be correlated with the residents' initial scores, this decrease was not found to be affected by any single factor such as the time of day or duration of the human-animal interactions.

A closer look at the results showed that environmental factors such as the time of the day and the level of privacy during the interactions did play important roles relative to the quality of the interactions. Although interactions with the animal lasted longer in early afternoon sessions, visit sessions that occurred in the late afternoon evidenced higher levels of verbal engagement in which residents initiated more new conversation topics. A high privacy level of the environment, i.e. "individual settings", was found to correlate positively with length of interactions.

The design prototype adopted in most of the interactions was an effective means for facilitating pet visitation sessions. Moreover, the adoption of design prototype itself did not result in enhanced quality of the interaction, as reflected in the length of interaction, and verbal/non verbal communication indicators.

Residents who chose not to use or could not use the design prototype spent more time touching or hugging the animal than did residents who could use the design prototype. This might be due to the fact that the prototype was designed to encompass a wheelchair and did not fit to residents who were bed-ridden. Study participants who were bed ridden never were able to use the design prototype and almost always had the animal in their arms during their interactions.

It was noted that the residents often communicated with animal as well as the researchers. Although the researchers remained in a role of facilitating rather than initiating communications, residents would often initiate communication with the researchers rather than with the other residents. Study participants also spoke directly to the animal more often than they spoke directly to another resident. Residents even attempted to guard and protect the animal when another resident approached. These observations implied that in addition to the unexpectedness and unpredictability of the interactions, one-on-one interaction may be preferable to the residents relative to group sessions with an animal.

4.2 Limitation of the study

Because the purpose of the study was to create the a cheerful and vibrant healing environment with the emphasis on providing an antidote to loneliness and boredom, and due the explorative nature of the study, the study did not select resident participants based on strict criteria. Additionally, there was no control group. Moreover, because of the person-centered care protocol implemented in the facility, human-animal interactions happened in a variety of settings for different residents. All these factors mentioned above made it difficult to control all environmental, social, and personal variables.

The residents who were pre-selected all started with moderate-low NHBPS scores before the first visit. Although decreases of the score were found to be significant, the range of decrease was small. Therefore, change in NHBPS might not be the ideal pre-post measure as an indicator of aged-care facility residents' response to the intervention.

The study only observed and measured the outcomes of regular and frequent pet visit therapy sessions within a 16 day time period. Consideration was not given to providing resources or support for the staff in the facility to continue on with these pet visitations.

Lastly, the encouraging results in this study could be attributed to the presence and the visitation of the researchers in conjunction with the animal. Residents might perform better when they are visited regularly, and when topics are initiated by a communicative partner.

4.3 Recommendations for Future Design:

The usage of the design prototype was considered successful for making the animal accessible to the residents. Furthermore, the design prototype was seen as having supported the spontaneous and pleasant nature of the pet visit therapy sessions.

For designers interested in creating a future device to facilitate pet therapy interactions, they should primarily aim at creating a natural, spontaneous, and pleasant experience for residents to interact with therapy animals. Moreover, designers should be empathetic not only to the physical needs, but also the emotional needs of elderly residents, and aspire to bring thoughtful intentions to product realizations that entail inspiration and empowerment.

For designers interested in creating a version of an animal transport device, they should also aim for a design that could be manufactured, transported, and assembled with relative ease. This will enable the design to be used in different care centers and other facilities to facilitate human-animal interaction and help build stronger human-animal bond which in turn, may result in elevated feelings of place attachment for the residents (Thorson, 1996).

Providing residents' lives with variety and spontaneity should always be a continuous effort. Loving companionship and human-animal bond may only be built and strengthened over time. The design should

serve the purpose of encouraging the local staff, volunteers, or even residents themselves, to keep up a constant, spontaneous, and long-term pet visitation program that will profoundly benefit the residents by enhancing close and continuing contacts with companion animals.

More specifically, future design for human-animal interactions should consider the following recommendations.

a. When creating and innovating evidence-based design concepts, attention should be focused on pleasure and spontaneity, as well as function and usability of the facilitation tool.
b. The ideal design should be in a form that is light, foldable, and highly mobile.
c. For resident-animal interactions, designers need to consider choosing animals that have the following characteristics: allergen-free, friendly, social, playful, intelligent, lovable, inquisitive, and easy to care for.
d. During the study, one participant in this study tried to "drive" the cart herself. If a cart design were to be adopted, designers might consider the residents as potential users and create a cart that can also function like a walker. This may further empower the residents as they may become the initiators of future pet visits and help other residents interact with the animal.
e. If a cart design were to be adopted, the handles would need to support to the hands of the individual pushing the cart in order to reduce stress on their wrists due to extreme wrist angle.
f. If possible, designers should consider lowering the ambient noise of the facility in order to reduce distractions during the animal visits.

4.4 Recommendations for Future Research

While recognizing the challenge in balancing the rigorous research design and maximizing benefits to the participants, researchers should be aware of the importance and meaningfulness of their studies. As more people choose or otherwise have to live in long-term aged care facilities, more facilities will be built, more use will be made of advanced technology, and more problems associated with loneliness, helplessness, and boredom will appear for residents. Therefore, more loving, supportive, growth-encouraging elder-centered

communities will need to be created in order to provide meaningful and enabling experiences. Research is one of the most powerful instruments in providing guidelines to create these communities and living experiences.

Although one-on-one interactions were found to be preferred by the residents, in order to examine the social aspects of communication, researchers also should consider focusing their measurement on the quality of communicative exchanges between or among participants rather than simply on measures of quantity, such as number of verbal initiations.

Researchers may also consider examining the effects of having human-animal interactions during other times of the day ,the morning hours, for instance, or at different frequencies. Studies may be designed to decide guidelines for the ideal time and frequency of pet visit sessions in terms of maximizing the benefits with limited human and organizational resources.

The effects of the ambient noise caused by alarms, sirens, TV programs, and other people may be a factor that highly affects the quality and benefit of the pet visits, as well as the general life quality in aged-care facilities.

It would be beneficial to utilize advancements of technology in research design and data analysis. For instance, Facial Expression Recognition software may be employed as a powerful tool to provide a potentially accurate measure of the interaction quality.

APPENDICES

APPENDIX A: Informal Interview Questions:

These are the sample questions that were asked to the residents during their interactions with the pet.

- Would you like to hold the pet?
- Do you remember the pet's name?
- Have you had pets before?
- What kind of pets did you have?
- Tell me more about your pet.
- Do you like the cart design?
- Do you feel happy with the pet visit when the pet is with the cart?
- Happier than when the pet is not with the cart?
- Would you like to have another pet visit?
- Would you like to have the pet to visit you more often?
- At what time would you like to have the pet visit you?

APPENDIX B: NHBPS Evaluation Form

NHBPS (The Nursing Home Behavior Problem Scale, Ray et al, 1992)

Name of Resident:_____ Room: _____ Staff: _____ Date: _____

DIRECTIONS

PLEASE RATE THIS RESIDENT'S BEHAVIOR DURING THE LAST 3 DAYS ONLY. INDICATE YOUR CHOICE BY CIRCLING A NUMBER FOR EACH ITEM, USING THIS KEY:

0 = Never 1 = Sometimes 2 = Often 3 = Usually 4 = Always

---

0 1 2 3 4 RESISTS CARE
0 1 2 3 4 BECOMES UPSET OR LOSES TEMPER EASILY
0 1 2 3 4 ENTERS OTHERS ROOMS INAPPROPRIATELY
0 1 2 3 4 AWAKENS DURING THE NIGHT
0 1 2 3 4 TALKS, MUTTERS, OR MUMBLES TO HERSELF
0 1 2 3 4 TRIES TO HURT HERSELF
0 1 2 3 4 REFUSES CARE
0 1 2 3 4 FIGHTS OR IS PHYSICALLY AGGRESSIVE: HITS, SLAPS, KICKS, BITES, SPITS, PUSHES, PULLS
0 1 2 3 4 FIDGETS, IS UNABLE TO SIT STILL, RESTLESS
0 1 2 3 4 HAS DIFFICULTY FALLING ASLEEP
0 1 2 3 4 GOES TO THE BATHROOM IN INAPPROPRIATE PLACES (NOT INCONTINENCE)
0 1 2 3 4 SAYS THINGS THAT DO NOT MAKE SENSE
0 1 2 3 4 DAMAGES OR DESTROYS THINGS ON PURPOSE
0 1 2 3 4 SCREAMS, YELLS, OR MOANS LOUDLY
0 1 2 3 4 ARGUES, THREATENS, OR CURSES
0 1 2 3 4 TRIES TO GET IN OR OUT OF WHEELCHAIR, BED, OR CHAIR UNSAFELY
0 1 2 3 4 ASKS OR COMPLAINS ABOUT HER HEALTH, EVEN THOUGH IT IS UNJUSTIFIED
0 1 2 3 4 HAS INAPPROPRIATE SEXUAL BEHAVIOR
0 1 2 3 4 SEES OR HEARS THINGS THAT ARE NOT THERE
0 1 2 3 4 DISTURBS OTHERS DURING THE NIGHT
0 1 2 3 4 WANDERS, TRIES TO ESCAPE OR GO TO OFF-LIMITS PLACES
0 1 2 3 4 ACCUSES OTHERS OF THINGS THAT ARE NOT TRUE
0 1 2 3 4 ASKS FOR ATTENTION OR HELP, EVEN THOUGH IT IS NOT NEEDED
0 1 2 3 4 IS UNCOOPERATIVE
0 1 2 3 4 PACES: WALKS OR MOVES IN WHEELCHAIR AIMLESSLY BACK AND FORTH
0 1 2 3 4 TRIES TO ESCAPE PHYSICAL RESTRAINTS
0 1 2 3 4 COMPLAINS OR WHINES
0 1 2 3 4 DOES SOMETHING OVER AND OVER, EVEN THOUGH IT DOESN'T MAKE SENSE
0 1 2 3 4 TRIES TO DO THINGS THAT ARE DANGEROUS

APPENDIX C: Observation Form

Resident	Visit		
Verbal			
Words	total #	MIU	VI
Non-verbal			
Looking at	total time		
Touching/Holding			
Notes	Smiles:		

APPENDIX D: Data: All Interactions

#	Time	Participant #	Cart	Group	(s)Length of Visit	#Words/Min	#MIU/Min	#VI/Min	#Smiles/Min	Touching	Looking at
1	Late PM	10	No	Yes	281	11.3167	3.4164	0.0000	1.2811	92.17%	94.66%
2	Late PM	13	Yes	Yes	181	2.9834	1.9890	0.6630	0.0000	0.00%	20.44%
3	Late PM	14	No	Yes	18	20.0000	6.6667	3.3333	3.3333	55.56%	55.56%
4	Late PM	16	Yes	Yes	210	24.0000	10.2857	1.4286	3.4286	73.33%	85.24%
5	Late PM	12	Yes	Yes	145	22.3448	11.1724	0.8276	1.2414	100.00%	97.93%
6	Late PM	4	Yes	Yes	106	25.4717	14.7170	1.6981	1.1321	81.13%	58.49%
7	Late PM	0	Yes	Yes	20	78.0000	45.0000	9.0000	0.0000	95.00%	95.00%
8	Late PM	0	Yes	Yes	49	15.9184	3.6735	1.2245	1.2245	0.00%	77.55%
9	Late PM	0	Yes	Yes	32	0.0000	0.0000	0.0000	0.0000	0.00%	0.00%
10	Late PM	0	No	Yes	54	0.0000	0.0000	0.0000	3.3333	70.37%	77.78%
11	Late PM	2	No	No	445	72.9438	35.3258	1.6180	1.4831	9.21%	13.26%
12	Late PM	5	No	No	127	53.3858	25.0394	0.4724	1.8898	90.55%	54.33%
13	Late PM	16	Yes	Yes	263	28.2890	13.9163	1.3688	2.9658	31.18%	35.36%
14	Late PM	0	Yes	Yes	146	0.0000	0.0000	0.0000	1.6438	72.60%	90.41%
15	Late PM	11	Yes	Yes	25	40.8000	21.6000	0.0000	4.8000	100.00%	92.00%
16	Late PM	0	Yes	No	15	16.0000	8.0000	4.0000	4.0000	33.33%	60.00%
17	Late PM	5	Yes	Yes	162	20.7407	10.7407	0.3704	1.8519	17.28%	50.62%
18	Late PM	0	Yes	Yes	265	7.9245	3.6226	0.0000	1.1321	40.38%	65.28%
19	Late PM	4	Yes	Yes	204	30.5882	10.2941	0.2941	2.0588	78.43%	83.33%
20	Late PM	6	Yes	No	325	40.6154	17.1692	1.1077	1.2923	6.15%	96.00%
21	Late PM	7	Yes	No	234	17.9487	7.1795	0.2564	2.0513	59.40%	76.07%
22	Late PM	9	Yes	Yes	293	19.2491	7.7816	0.2048	0.8191	47.78%	64.16%
23	Late PM	10	No	Yes	312	19.4231	7.8846	0.1923	0.1923	98.72%	68.91%
24	Late PM	16	Yes	Yes	327	16.1468	8.2569	0.7339	2.3853	32.72%	70.03%
25	Late PM	0	Yes	Yes	150	6.0000	3.2000	0.4000	0.8000	52.67%	48.00%
26	Late PM	0	Yes	Yes	351	5.6410	2.9060	0.0000	1.5385	45.30%	85.47%
27	Late PM	1	Yes	No	771	43.9689	8.5603	0.7782	1.3230	19.58%	63.55%
28	Early PM	7	Yes	Yes	81	2.9630	1.4815	0.0000	2.9630	58.02%	80.25%
29	Early PM	9	Yes	Yes	447	20.6711	8.9933	0.5369	0.6711	71.59%	80.54%
30	Early PM	14	Yes	No	383	7.2063	4.0731	0.3133	1.2533	89.56%	78.59%
31	Early PM	16	Yes	No	229	8.6463	4.1921	0.5240	3.4061	96.51%	80.79%
32	Early PM	10	No	No	281	19.8577	7.6868	0.4270	1.9217	80.43%	79.72%
33	Early PM	12	Yes	No	615	52.4878	22.5366	0.8780	2.2439	79.35%	80.81%
34	Early PM	0	Yes	No	37	12.9730	4.8649	0.0000	3.2432	81.08%	70.27%
35	Early PM	4	Yes	Yes	242	25.5372	9.4215	0.2479	1.7355	77.69%	69.83%
36	Early PM	3	Yes	Yes	293	43.4130	18.2253	0.6143	1.4334	38.91%	65.19%
37	Early PM	6	Yes	Yes	344	35.4070	11.3372	0.3488	1.0465	28.20%	81.69%
38	Early PM	5	No	Yes	177	28.4746	11.1864	0.3390	3.0508	29.38%	83.05%
39	Early PM	1	Yes	Yes	365	18.2466	7.0685	0.3288	0.8219	81.37%	94.52%
40	Early PM	2	No	No	25	28.8000	12.0000	2.4000	2.4000	92.00%	92.00%
41	Early PM	10	No	No	393	26.2595	10.6870	0.0000	0.4580	94.66%	95.42%
42	Early PM	14	Yes	No	674	11.4837	5.1632	0.0890	0.7122	89.91%	87.09%
43	Early PM	15	No	No	334	11.4970	5.7485	0.0000	0.8982	43.41%	78.74%
44	Early PM	7	No	No	356	14.8315	5.7303	0.0000	1.3483	60.39%	77.25%
45	Early PM	9	Yes	No	620	34.0645	15.8710	0.3871	0.5806	66.13%	69.52%
46	Early PM	8	No	No	705	24.5106	6.9787	0.1702	0.5957	82.27%	81.56%
47	Early PM	6	Yes	Yes	288	24.3750	7.9167	0.2083	0.4167	0.00%	78.47%
48	Early PM	5	Yes	Yes	408	31.3235	18.5294	0.4412	2.6471	55.39%	65.44%
49	Early PM	1	Yes	No	429	44.4755	22.3776	0.6993	1.5385	65.03%	56.41%
50	Early PM	3	No	No	409	22.0049	10.8557	0.4401	1.0269	78.00%	86.06%
51	Early PM	4	Yes	Yes	315	23.8095	11.6190	0.3810	1.3333	76.51%	90.48%

52	Early PM	2	No	No	457	64.4639	27.5711	1.0503	1.5755	95.84%	59.74%
53	Early PM	10	No	No	547	28.0804	14.2596	0.1097	1.2066	100.00%	83.55%
54	Early PM	14	No	No	519	11.0983	7.3988	0.2312	0.4624	62.04%	75.34%
55	Early PM	0	Yes	No	54	31.1111	17.7778	1.1111	0.0000	25.93%	44.44%
56	Early PM	9	Yes	Yes	262	15.2486	10.7735	0.3315	0.8287	52.76%	60.50%
57	Early PM	8	Yes	No	880	38.1818	13.2273	0.6818	1.8409	50.91%	45.45%
58	Early PM	6	Yes	Yes	503	48.6680	16.5805	0.9543	1.1928	4.97%	86.08%
59	Early PM	5	Yes	Yes	159	35.8491	20.0000	0.7547	3.7736	84.28%	81.13%
60	Early PM	4	Yes	Yes	278	31.5108	9.7122	0.0000	3.2374	65.11%	82.01%
61	Early PM	3	Yes	Yes	336	52.8571	23.7500	0.5357	1.2500	49.11%	63.69%
62	Early PM	0	Yes	Yes	156	38.4615	21.5385	0.7692	0.3846	71.79%	64.74%
63	Early PM	1	Yes	No	526	41.7490	10.4943	0.3422	0.7985	51.52%	52.47%

APPENDIX E: Data: Participants

Gender	#	Age	Room	Score 1 May 5	Score 2 May 29	Score Change	# visits	# visits w/ Cart	Length of Visits	Total Length of Visits v/ Cart
F	1	91	305	1	0	-1	4	4	2091	2091
F	2	87	315	3	0	-3	3	0	927	0
M	3	80	310	6	2	-4	3	2	1038	629
M	4	75	320	0	0	0	5	5	1145	1145
F	5	85	319	8	0	-8	5	3	1033	729
F	6	95	311	5	0	-5	4	4	1460	0
F	7	77	218	6	0	-6	3	2	671	315
M	8	75	217	0	0	0	2	1	1585	880
F	9	90	220	0	0	0	4	4	1622	1622
F	10	73	140	0	0	0	5	0	1814	0
F	11	83	160	1	0	-1	1	1	25	25
F	12	92	158	0	0	0	2	2	760	760
F	13	80	142	0	0	0	1	1	181	181
M	14	80	136	0	0	0	4	2	1594	1057
M	15	75	136	0	0	0	1	1	334	0
F	16	91	140	5	3	-2	4	4	1029	1029

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