THESIS

PATTERNS OF BEHAVIOR IN ALZHEIMER UNITS:

EXAMINING THE ROLE OF THE PHYSICAL ENVIRONMENT INTERFACE

Submitted by

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ABSTRACT

PATTERNS OF BEHAVIOR IN ALZHEIMER UNITS: EXAMINING THE ROLE OF THE PHYSICAL ENVIRONMENT INTERFACE

The purpose of this study was to examine the relationship among the physical environment and behaviors within individuals with Alzheimer's in a Special Care Unit (SCU). The SCU was located in a skilled nursing facility in Fort Collins, CO providing care for individuals with mid to late stage dementia, including individuals with Alzheimer's.

Of interest in this research study was the impact of this relationship to influence positive, and negative, behaviors contributing to *positive quality of life*, or positive behaviors supported by one's physical surroundings creating a living environment directed at acknowledging the person's life experiences, opportunities for choice and decision, and activities replicating prior home/work activities for residents with Alzheimer's or dementia. This study sought to enhance the existing body of knowledge about environmental impacts on behavior in care for individuals with Alzheimer's. Day, Carreon, and Stump (2000) suggested design of the physical environment should be therapeutic, promoting well-being and functionality for individuals with Alzheimer's or dementia.

The research design was an instrumental case study investigating issues surrounding a specific phenomenon (i.e., the relationship of environment and behavior in the SCU) and collected both qualitative and quantitative data. Data collection began with a physical inventory documenting the environment through photographs noting furniture locations, lighting, colors, contrast, materials and finishes, and wear within the space. Observational data were collected

over a 10 week consecutive period, during non-randomized times to accommodate the facility (three times a week) for 30 minutes each. Finally, the e-Survey with qualitative and quantifiable data obtained from staff ($n^s = 6$) perceptions of the physical environment and residents' ($n^r = 9$) behaviors.

Findings suggested staff behavior reinforcing a medical model of care in contrast to contemporary approaches providing *person-centered care;* staff perceptions of communications differed from observed instances of communication; resident wandering and communication were the two most frequently occurring behaviors recorded during observations. Instances where the physical environment impacted resident behaviors considered: a flooring transition strip instigated frustration by a resident in a wheelchair unable to move over the height difference; areas with greater levels of lighting, whether natural or artificial, appeared to promote greater socialization; and furniture placement and corridor planning in the unit shaped the pathways for movement through the unit.

Two specific behaviors, not identified in the empirical literature, were found in the study to potentially contribute to a positive quality of life for residents with Alzheimer's: physical touch and cleaning. Observed body language and facial expressions, of residents, during these behaviors suggest possible connection supporting in individual's positive quality of life. The study revealed positive quality of life and person-centered care to be interlaced and not separate entities due to their concentration on personalization of care and establishing a connection to the individual's past experiences.

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Last but not least, David, you have always been there for me, encouraged me and supported me in more ways that you can imagine, and from 1,200 miles away. Your words of love and encouragement gave me drive and inspiration in times of writers block and frustration to keep pushing and do my best. For this I am truly thankful.

DEDICATION

This thesis is dedicated in memory of my grandmother, Ruth, who inspired me to learn how, as a designer, I might impact and improve spaces in which people with Alzheimer's live to seek a rich and positive end of life.

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CHAPTER I

INTRODUCTION

"We shape our buildings, then they shape us." –Winston Churchill

Alzheimer's disease effected nearly 5.2 million American in 2014 (Alzheimer's Association, 2014) with those in late stage dementia requiring round the clock care. According to the American Health Care Association (2013), Special Care Units (SCU) within nursing homes required 79,937 beds in 2012, many devoted to the care of individuals with dementia who can no longer be cared for by a loved one, partner, or family member. Figure 1 shows the percentage of individuals in the United States from the 2010 census (Hebert, Weuve, Scherr, & Evans, 2013) diagnosed with Alzheimer's, with the majority of individuals with Alzheimer's in the 75-84 range of years.

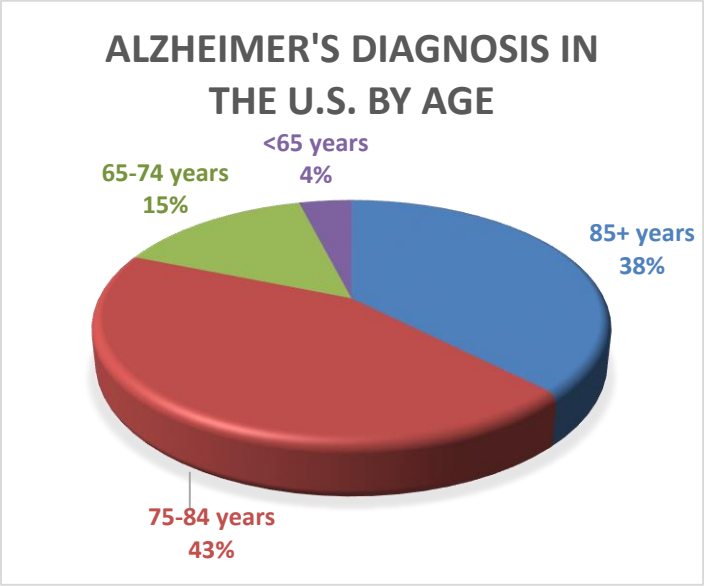

Figure 1. Percentage of individuals by age range in the U. S. (Alzheimer's Association, 2014; data from Hebert, Weuve, Scherr, & Evans, 2013).

The high demand for beds within SCUs for individuals with Alzheimer's emphasized a need to meticulously evaluate the environments in which these individuals will reside to achieve the highest possible quality of life. Care and facility evaluations need to extend beyond meeting the requirements of building codes and health guidelines; working to a mandated minimum does not necessarily satisfy human need (Brawley, 1992). Environmental needs, in terms of the physical and social surroundings of individuals with Alzheimer's, differ from cognitively intact individuals with researchers revealing new ways the physical environment impacts those with Alzheimer's and supporting movement away from a medical model of care in which custodial care was the goal, to one of *person-centered care* in which the environment seeks to maintain personhood, in spite of the individual's cognitive decline (Normann, Asplund, & Norberg, 1999), potentially requiring an adjustment in caregivers' perceptions of acceptable behaviors. According to Dilani (2001, p. 17) "[t]he quality and character of the built environment has a profound influence on…health."

Statement of the Problem

Research findings have previously suggested links to the physical environment. For example, in the physical design of an Alzheimer's SCU facilitating wayfinding (Grierson, Zelek, Lam, Black, & Carnahan, 2011; Marquardt, 2011; Marquardt & Schmieg, 2009; Passini, Pigot, Rainville, & Tetreault, 2000) and deterring undesired exiting among residents (Dickinson, McLain-Kark, & Marshall-Baker, 1995; Morgan & Stewart, 1999; Passini, Rainville, Marchand, & Joanette, 1998). The goal of this research project was to examine the potential relationships between physical space and behavior enhancing residents' quality of life and supportive of positive behavior. Subsequently, this relationship would invite caregivers to offer changes in the physical environment supportive of positive behavior thus impacting care management plans.

A content review of The Center for Health Design Knowledge Repository (Figure 2), revealed a concentration of 36 empirical studies encompassing environments for individuals with dementia under *care, acoustics and lighting,* and *behavioral* foci. Few studies surfaced focused on the physical aspects or characteristics of relationships among the physical environment and behavior suggesting further investigation is needed to document this relationship and the impact of behavior and physical space directed toward constructing a positive quality of life. In addition to positive behaviors supported by one's physical surroundings creating a living environment directed at acknowledging the person's life experiences, opportunities for choice and decision, and activities replicating prior home/work activities for residents with Alzheimer's or dementia.

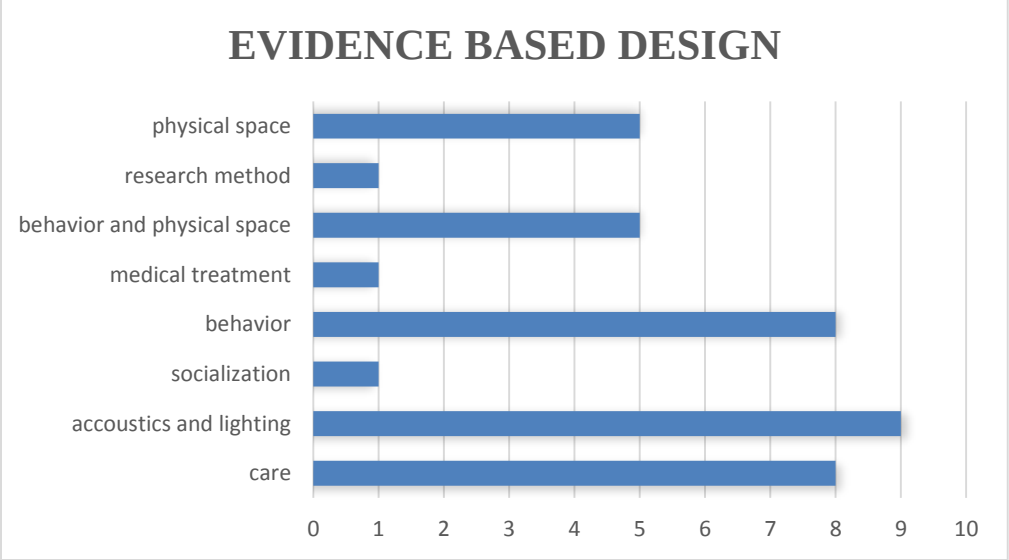

Figure 2. Empirical research reports focusing on issues related to dementia. (The Center for Health Design Knowledge Repository, n.d.)

As cognition levels of individuals with Alzheimer's degenerate, diverse behavioral characteristics arise with potential to cause harm or danger to themselves and other residents, family members, and staff. This is the point at which caregivers are forced to seek institutional or

more formal care systems such as nursing homes or SCUs. One specific behavior, *wandering*-characteristic of many individuals with Alzheimer's, may worsen as the disease progresses and reinforce the need to seek more formal care systems. This behavior can lead to exiting to the outdoors without appropriate supervision, or even inadvertently leaving the residence or unit. In one facility, benches were purchased to invite residents to enjoy an outdoor garden area; residents moved the benches against the enclosure fence, climbed over the fence, and were found wandering through the adjacent neighborhood (K. Leigh, personal communication, September 3, 2014). Considerately planned environments can increase the individual's well-being and safety as well as reduce agitation, aggression, and depression in individuals with Alzheimer's; in contrast, poor design has been known to foster disorientation, confusion, and frustration (Brawley, 2001), creating unexpected and unwanted situations as noted in the above scenario.

Purpose of the Study

The purpose of this research was to discover elements of the physical-behavioral interface in SCUs capable of influencing positive, and negative behaviors in individuals with Alzheimer's. The study sought to deepen the existing body of knowledge by examining how an individual's environment impacts their behavior. Data collected were examined for relationships between the physical characteristics of the SCU and desired behavioral characteristics of residents.

Past studies (Ancoli-Israel, 2003; Cohen-Mansfield, Thein, Marx, Dakheel-Ali, Murad, & Freedman, 2012; Dickinson et al., 1995; Elmstahl, Annerstedt, & Ahlund, 1997; Garce, 2002; Passini et al., 1998; Passini et al., 2000) examined connections between behaviors of individuals with Alzheimer's and the physical environment primarily focused on lighting and wayfinding (see Appendix A: Studies Examining Behavior and Physical Space).

Research Questions

Two research questions frame this inquiry:

Q1: What is a *positive quality of life* for people with dementia?

Q2: Does the physical environment in a Special Care Unit for individuals with dementia-like conditions promote positive behaviors in the residents?

Terms and Definitions

The following terms were used in this study to create contextual understanding:

- *Alzheimer's disease:* Alzheimer's disease is a neurodegenerative disease in which the nerve cells within the brain slowly die off and lead to loss of memory and learning (Turkington & Harris, 2001).
- *Appropriate behavior:* behavior that fits into a cultural norm (Kitwood, 1997).
- *Behavioral map:* carefully watching individuals use their environments and recording activities and behaviors (Zeisel, 2006).
- *Dementia:* a significant decline in cognition and interfering with independence in daily activities (Alzheimer's Association, 2014).
- *Environment:* the surroundings or conditions created by physical components placed in the environment in which a person lives.
- *Negative behaviors:* behaviors encompassing; cursing, grabbing, kicking, pushing, pacing, wandering, general restlessness, constant request for attention, verbal bossiness, and [excessive] complaining (Gruber-Baldini, Boustani, Sloane, & Zimmerman, 2004).
- *Person-centered care*: seeking to *maintain personhood*, in spite of the individual's cognitive decline (Normann, Asplund, & Norberg, 1999), potentially requiring an adjustment in caregivers' perceptions of acceptable behaviors.

- *Physical environment:* for the purposes of this study limited to the "designed" environment including architectural features, spatial configurations, daylighting, furniture, fixtures, and artifacts/accessories; items people can touch or with which they may interact.
- *Positive behaviors:* behaviors enhancing quality of life for those with Alzheimer's or dementia (e.g., socialization, communication).
- *Positive quality of life:* positive behaviors supported by one's physical surroundings creating a living environment directed at acknowledging the person's life experiences, opportunities for choice and decision, and activities replicating prior home/work activities for residents with Alzheimer's or dementia.
- *Quality of life:* general well-being of individual's daily life
- *Salutogenic* (Antonovsky, 1996): factors supporting human health and well-being; rather than factors causing a disease.
- *Spatial configuration:* the floor plan of the SCU.
- *Special Care Units (SCU):* facilities separated from other care facilities, potentially secured, serving those individuals with specialized needs (e.g., cognitive impairment such as dementia, Day et al., 2000).
- *Wayfinding:* "orientation and the ability to reach destinations" (Passini et al., 2000, p. 135); how cognitively intact individuals use cues and signs to locate an object or location within a space (Zeisel, Hyde, & Levkoff, 1994).

The terms Alzheimer's and dementia were used interchangeably.

Researcher's Perspective

Entering into this research project, I had experienced interactions with an individual with Alzheimer's, my grandmother, Ruth Myers. During the last year and a half of her life, she was under my mother's care and lived with my parents. Over the span of that year and a half, my mother shared stories about her hallucinations and confusion, witnessing those behaviors myself when I visited my home. I am aware of some of the extreme behaviors an individual with Alzheimer's can have, and this knowledge and exposure helped me to not feel shocked or nervous when making the SCU observations required for data collection. This exposure to someone close to me created the impetus for my interest in engaging in a gerontological exploration focused on dementia environments.

After receiving my undergraduate design degree, I worked with the world's largest home improvement specialty retailer. The interface with diverse customers provided a sense of how different people regard their physical environments and require different solutions to their homes and work challenges.

Entering graduate studies and serving as a graduate teaching and research assistant invited growth of knowledge deepening my understanding of interior design and its potential to impact many facets of daily living activities. Helping undergraduates develop their capstone solutions provided a mini tutorial with exposure to diverse market segments, including health care environments. These experiences helped realize my passion for projects dealing with the elderly and their quality of life.

Delimitations

This study focused on one nursing home with a secure unit for individuals with Alzheimer's or late stage dementia in Fort Collins, Colorado. There were other facilities in

Northern Colorado area, but access was a key determinant, as well as detriment. An administrator of one other facility in Fort Collins invited the researchers to tour the facility requesting design assistance and indicating inclusion in the study but the facility's management declined to participate in the end. Several facilities mixed their resident populations so that those with dementia-like conditions are located in non-specific units with other nursing home residents. For this study, only facilities with dedicated units were considered.

Formal and informal interviews were not permitted by the facility management and they restricted interviews between the researcher and staff due to staff shortages and time constraints. The specified stage of cognitive deterioration of each resident was not disclosed to the researcher due to resident privacy requirements[1]. During the study, levels of light, sound and acoustic levels were not recorded during unit observations.

[1] The Health Insurance Portability and Accountability Act of 1996 (HIPAA) protects the privacy of individually identifiable health information.

CHAPTER II

LITERATURE REVIEW

The physical design of spaces devoted to caring for individuals with later stages of dementia and Alzheimer's can impact behaviors of facility residents residing in SCUs. Yet, few studies can be identified in reviewing the empirical literature. While a permanent cure for the disease has yet to be identified, selected sources suggest improvement in deterring an individual's cognitive and physical deterioration can be valid by creating an environment that is familiar and predictable. Deepening an empirical understanding of the interface between the physical environment and behavior has potential to improve planning of special unit spaces, family and staff social interactions, and support an individual's well-being. As Brawley (2001) noted, the need for carefully planned environments can impact behavior, with poor design fostering disorientation, confusion and frustration. Efficient design or planning that meets the functional as well as stimulative needs of residents has the opportunity to increase morale of residents and staff, build stronger relationships between residents and staff, and increase work efficiency among staff potentially leading to better quality of life for residents (Lee, Chaudhury, & Hung, 2014).

The literature review examined studies dealing with the behavioral characteristics of individuals with Alzheimer's and how space planning and interior finishes of those facilities – the physical environment - assist or deter residents' orientation, actions, and exit seeking. The review synthesized design elements and features positively or negatively impacting individuals with Alzheimer's. SCUs typically offer separation from other care facilities and house those with cognitive impairments including dementia (Day et al., 2000), and encompass additional security

measures. This review focused on four key areas potentially informing behaviors within physical spaces:

- examination of care surrounding the disease;
- development of theoretical frameworks and models informing the structural parameters for dementia care;
- understanding the spatial environment in plans influencing dementia behaviors; and
- identification of interior materials impacting dementia behavior.

Alzheimer's and Dementia: Culture of Care

Alzheimer's disease is a neurodegenerative disease in which the nerve cells within the brain slowly die off and lead to loss of memory, learning difficulties (Turkington & Harris, 2001) and behavioral changes (Gwyther, 1992). "The number of people who die from Alzheimer's disease may be far higher than previously thought…[t]he study's numbers would make Alzheimer's the third leading cause in the U.S., right behind heart disease and cancer" (McMillen, 2014). The majority of Americans with Alzheimer's are over 65 years of age (Hebert et al., 2013) and primarily women perhaps attributable to women typically living longer than their male counterparts (Turkington & Harris, 2001). According to the 2014 Alzheimer's Association report, there is no treatment to slow or stop the deterioration of brain cells within individuals with Alzheimer's. However, five drugs recently approved by the U.S. Food and Drug Administration, slow the progression of symptoms for six to twelve months with the effectiveness of these drugs varying across participants (Alzheimer's Association Report, 2014).

Dementia is not a disease in itself but a group of symptoms associated with other specific diseases including Alzheimer's, Huntington's, Pick's, Creutzfeldt-Jakob and Parkinson's (Gwyther, 1992). The final stage of the disease can lead to greater difficulty swallowing and

eating and potentially leading to poor nutrition, dehydration and infection. The cause of death is not typically labeled as Alzheimer's but heart disease or pneumonia (McMillen, 2014).

Behavioral characteristics range in severity with no common set of characteristics typical in a dementia diagnosis. Memory loss for individuals with Alzheimer's can be characterized by frequent forgetfulness and confusion that is unexplainable (Turkington & Harris, 2001). Such memory loss impacts everyday life and the individual's ability to perform everyday tasks (Alzheimer's Association Report, 2014; Turkington & Harris, 2001). As the disease progresses, family members as care givers may be forced to choose specialized facilities when behaviors and care go beyond their capabilities.

Lawton, Van Haitsma, and Klapper (1996) developed a method to assess affect states of residents in nursing home residents (n = 253 residents with dementia; n = 43 residents without dementia) with Alzheimer's using the 6-item Philadelphia Affect Rating Scale. The researchers used direct observation of facial expression, body movement, and other cues independent from self-report to study residents for both positive affect (pleasure, interest, contentment) and negative affect (sadness, worry/anxiety, and anger). Their work provided insight into quality of life for the residents who themselves could not communicate their perceptions in other ways. Of interest was the idea that positive affect was a manifestation of outward socialization while negative affect appeared to present internalized thought. Kappas for the two-observer ratings were very high (.76 to .89) indicating strong reliability among six different states. Discriminant and convergent validities also indicated strengths, using the 6 state mean affect scores correlated with a variety of indicators of residents' current status resulting in large numbers of bivariate correlations. Although limited support for the two-factor dimensionality of the affect ratings was evident, their approach to gaining insights from residents with dementia offers insight to seeking

voice for these individuals. Study limitations also suggested low incidences of anger in residents with challenges to assessing sadness of residents. "It is possible that the widespread pathology of dementing illness does cause a leveling or simplification of the structure of affect in the direction of a simple good vs bad dimension…[and] just as likely that observers impose such simplicity of structure on what they see in AD patients" (p. 11).

Medical Model versus Person-centered Care

Care for individuals with Alzheimer's has transitioned from a medical model of care characterized as institutional and impersonal to one of person-centered care (Kitwood, 1997). The old culture of care model disregarded human integrity, isolated those feeble and/or confused and hid these individuals who acted in ways unacceptable to the norms of behavior. The Alzheimer's population received care meeting basic human need, and were provided with a safe environment disregarding treatment of the whole person.

Person-centered care is directed at enhancing the *personhood* of the individual, providing care for the whole individual (Kitwood, 1997). Person-centered care revealed the need to consider the *pathological process* and the *social psychology* of the individual (Kitwood, 1993; Murray & Boyd, 2009). Although, a finite definition for person-centered care may not exist, common features of this care model include: seeking to *maintain personhood* in spite of the individual's cognitive decline (Normann et al., 1999); individualizing the person's care and surroundings by displaying familiarities and references to personal experiences (Ettema, Dröes, de Lange, Mellenbergh, & Ribbe, 2007; Normann et al., 1999; Post, 2000); encouraging an equal balance of relationship with care task (Sjögren, Lindkvist, Sandman, Zingmark, & Edvardsson, 2011); and incorporating family into means of care and decision making processes (Hughes, Lapane, & Kerse, 2011; Sabat, 2005; Sjögren et al., 2011; Van der Steen, Soest-Poortvliet,

Mirjam, Achterberg, Ribbe, & De Vet, 2011). This culture of care delivers *compassion* related to what the individual has and is *enduring* and acknowledges the *accomplishments* he or she has achieved over the course of their life (Kitwood, 1997). A shift in awareness of behaviors occurred in this care model contrasting suppression of behavior meeting cultural norms to supports for the individual's quality of life. Acceptable behaviors under the medical model adhered to expectations of controlled behavior, rather than behaviors contributing to an individual's personal needs to construct a positive quality of life. This culture of care encourages interaction, viewed as a *healing component* (Kitwood, 1997) and a contributing factor to creating a positive quality of life for each individual.

Behavioral Characteristics of Residents with Dementia or Alzheimer's in SCUs

Zeisel, Silverstein, Hyde, Levkoff, Lawton, and Holmes (2003) studied seven SCUs for individuals with dementia or Alzheimer's and found specific behavioral characteristics associated with the design of the physical space. These characteristics were identified using three scales, the Cohen-Mansfield Agitation Inventory (CMAI; Cohen-Mansfield, Marx, & Rosenthal, 1989), the Multidimensional Observation Scale for Elderly Subjects (MOSES; Helmes, Csapo, & Short, 1987), and the BEHAVE-AD Psychotic Symptom List (Reisberg, Borenstein, Salob, Ferris, Franssen, & Georgotas, 1987), measuring different behaviors. Behaviors identified included:

> …verbal aggression…, physical aggression…, destroying property, self-abusive behavior, wandering, restlessness, inappropriate dress, handling items inappropriately, attention seeking, verbal repetitivism, complaining or noncompliance, making strange noises…, hiding items, and screaming…depression…, being worried, tense, and anxious…, being pessimistic…, being in good spirits…, and being socially withdrawn…paranoid delusions… and misidentification syndromes… (p. 703).

A void remained, however, in the significant lack of empirical research pertaining to the positive behavioral characteristics of individuals with Alzheimer's and their relationship to the physical environment. Through promoting positive behaviors, the environment might impact the reduction of negative behaviors.

Creating the Foundation for a Conceptual Model

Theories and models often suggest how physical environments and behaviors might be shaped. The empirical work of Zeisel et al. (1994) and Dilani (2001) presented insights into the physical environment and behaviors desirable in SCUs dedicated to care for individual's with Alzheimer's or dementia.

Environment-Behavior Model (Zeisel et al., 1994)

The Environment-Behavior model demonstrates the "relationship between environmental influences and behavioral effects, including behavior, perception and attitudes" (p. 4). Eight major concepts were found for: "exit control, wandering paths, individual private places, common space structure, outdoor freedom, residential scale, autonomy support, and sensory comprehension" (pp. 4-5).

- Exit control includes using devices to limit residents from exiting a facility (e.g. alarms, or locks) and including low-profile hardware to limit distraction of residents to exit doors.
- Wandering paths are considered to be therapeutic to individuals with Alzheimer's and the model reinforces the need to include walking paths within a SCU.
- Individual private places include personalizing a resident's bedroom to aid in a more home-like feel and a more secluded room to retreat from other residents.
- Common space structure encompasses areas where social interaction through formal or informal activities is encouraged by the way in which furniture is placed to encourage interaction.

- Outdoor freedom may include wandering gardens within a SCU and are designed with individuals with Alzheimer's or dementia as the end recipient.
- Residential scale refers to the facility housing a small number of residents and incorporating design features with home-like quality (i.e., "non-institutional doors, windows and hardware;" p. 16).
- The concept of support of autonomy is influential for individuals with Alzheimer's and the SCU staff because the individuals gain freedom and self-identity with staff feeling the residents are less likely to hurt themselves or others if left alone.
- When sensory comprehension is included in the design of SCUs, the residents' 5 senses are stimulated but not overwhelmed with the surroundings of their environment.

Environmental-behavior concepts can enhance quality of life in positive ways when designing a SCU by evaluating plans, or critiquing the degree to which a SCU functions to meet patient care goals and objectives (Zeisel et al., 1994). Designers require an understanding of how residents will relate to the physical environment in which they will spend their time. The environment-behavior model offers guidance to designers in identifying and considering key concepts within a SCU to include behavioral awareness, social interaction, individualized care, relationship building, and support of personhood.

Psychosocially Supportive Design (Dilani, 2001)

Dilani (2001) introduced his theory of Psychosocially Supportive Design based on the impact the physical environment can have on an individual's healing and wellness, specifically directed at "promot[ing] health" (p. 13). His main focus was to create and improve spaces to encourage healing. Psychosocially Supportive Design encompassed health promotion, salutogenic orientation, and sense of coherence. According to the World Health Organization (1948), health is not the absence of a disease but the highest physical, mental and social well-

being state an individual can have. Salutogenic, a term coined by Antonovsky (1996) relates to factors supporting human health and well-being, not a focus on the factors causing a disease. Salutogenic orientation is a foundation for health promotion requiring both research and action to develop a psychosocially supportive design related to "healthy lifestyle and positive distractions" (Dilani, 2001, p. 15). Coherence is characterized by the stimuli impacting an individual's behavior coming from inner and outer environments. Although further empirical study is needed to reveal empirical evidence to support *health promotion* or disease prevention, this theory provides researchers with future directions for study (p. 15). As a model (Zeisel et al., 1994) and theory (Dilani, 2001) emphasizing the relationships of behavior and space, each introduces the need to understand the interrelationship of the physical environment and resident and staff behaviors.

Physical Environment and Facility Design

Empirical research evaluating the impact of the physical environment, particularly in SCUs has negatively impacted the current body of knowledge by missing critical elements with the potential to impact residents' quality of life. This may be due to this lack of funding for dementia compounded by the level of difficulty in executing this type of research with a special population (Devlin & Arneill, 2003). Empirical research has revealed a need for standards in designing physical environments for individuals with Alzheimer's with both moderate and severe levels of cognitive deterioration, to better assist in the stimulation of senses (Brawley, 1992). In Wong, Skitmore, Buys, and Wang's (2014) study, focus group participants, comprised of caregivers and nurses caring for individuals with dementia and architects designing these facilities, were asked to assess impacts of varying indoor environmental factors. The findings concluded acoustics, lighting, and the thermal environment appeared to be "most important

influencing factors" (p. 32). These findings reinforce the need for empirical research pertaining to the physical environment for individuals with Alzheimer's. Areas of research examined with potential to impact the findings of this study encompassed spatial orientation and relationships of functional activity areas, egress, wayfinding, behavioral mapping, color, lighting, sound, and door and window coverings. Limited research has also focused on the orientation of elements in these spaces, and the relationship of these elements, which will also be examined in the following sections.

Spatial Orientation and Relationships

Different spatial configurations impact residents' abilities to orient and wayfind within a care facility. Marquardt (2011) identified five empirical studies focusing on design of the floor plans of nursing homes (Elmstahl et al., 1997; Marquardt & Schmieg, 2009; Netten, 1989; Passini et al., 1998; Passini et al., 2000). Elmstahl et al., (1997) revealed that L-shaped facilities decreased *disorientation* of residents and straight corridors increased uncoordinated movements, lack of connection to reality, and disconnection with identity. Marquardt and Schmieg (2009) discovered the size of living space and capacity of residents impacted residents' orientation with greater orientation occurring within units housing eight to ten residents. The study conducted by Netten (1989) concluded that routes with few *decision points* and spaces with various functions and meanings resulted in the promotion of greater wayfinding of residents. Passini et al., (1998) revealed facilities can create a supportive environment through: simplistic circulation paths, visual access to a common space and an architectural environment with distinct reference points for wayfinding. Passini et al., (2000) discovered that all spaces pertinent to residents' daily activities need to be located on the same floor to avoid the use of an elevator. This dearth of

empirical findings invites further empirical study of SCUs beyond the impact of floor plans and locations of elements affecting behavior.

Alzheimer care facilities using L, H, or square-shaped corridors have been found to offer improved spatial orientation for residents than facilities with long, linear bowling alley-type corridors (Elmstahl et al., 1997). Morgan and Stewart (1999) found a facility with a T-shape layout yielded better monitoring by nursing staff.

Existing facilities frequently have limited capabilities, when an existing care unit, generally with a single double loaded corridor design, is converted to an SCU. Researchers collected data from staff and caregiver interviews in one care facility for individuals with dementia pertaining to residents' physical and social environments. Results discovered areas of need for residents included: "safety, homelike setting, optimal stimulation, cues, and options for privacy and social interaction" (Morgan & Stewart, 1999, p. 105). In the course of the renovation, the facility increased spatial density causing nursing staff to spend more time locating residents to ensure safety. Staff had increased difficulty monitoring residents in the long corridor spatial configuration (Morgan & Stewart, 1999). Units with smaller numbers of residents appeared to facilitate better orientation and wayfinding for residents (Marquardt & Schmieg, 2009); research efforts have not yielded a consistent number of residents to define a unit as "large" or "small" (Day et al., 2000) or to be an optimal size for person centered care which may be more a function of staffing ratios. According to Marquardt and Schmieg (2009), residents require a circulation layout allowing direct visual access to locations within the space relevant to them, with residents having diminished mental mapping capabilities able to visually obtain information informing wayfinding decisions (Passini et al., 2000). Corridors with a defined and visible end created greater orientation for residents (Marquardt & Schmieg, 2009).

Layouts with cul-de-sacs appeared to increase confusion, pacing, and disorientation of residents (Marquardt & Schmieg, 2009).

Brawley (1992) suggested an overall goal in the design of spaces for individuals with cognitive impairments should be functionality, offering less stress for residents and staff. The spatial cognitive impairment of individuals with Alzheimer's and dementia has been found to contribute to the decline of spatial orientation and wayfinding performance (Liu, Gauthier, & Gauthier, 1990). Individuals with Alzheimer's require environments that are "architecturally rich" to enhance diminished wayfinding abilities (Passini et al., 2000, p. 699). With cognitive deterioration causing individuals with dementia to rely on the environment to guide and direct them throughout a space, Marquardt and Schmieg (2009) found *size* and *shape* of interior corridors supported resident's spatial orientation when evaluating residents' ability to find specific locations (i.e., live-in kitchen, resident's room, toilet, outside, and common room) within a nursing home. Ability was rated on a scale of 0-2; 0 represented the resident could not find their way, 1 represented the resident needed some reminder, and 3 represented the resident was able to find their way independently. Ratings were made by the head nurse or a *gerontopsychiatric* trained nurse in the nursing home. Their findings, conflicted with those of Passini et al. (2000), suggesting straight corridors with line of sight to the entire corridor from living spaces yielded optimal resident orientation (Marquardt & Schmieg, 2009) questioning the provision of architecturally rich environments for those with cognitive impairments.

Egress

A major safety concern of staff and caregivers for individuals with Alzheimer's is residents' attempting to exit the facility (Day et al., 2000). Architectural and aesthetic features appear to attract or deter residents from exiting SCUs when the staff do not desire the individuals

to exit. Residents' attraction to exiting a secure facility is reduced when the design of exits are not treated as a prominent feature (Passini et al., 1998) but rather a minimized, opposite to the intent of an exit threshold. A study by Morgan and Stewart (1999) supports this idea revealing when exit doors were placed along a corridor, less exit seeking by residents occurred compared to an exit located at the end of a corridor, where the residents turned while pacing. Facilities utilizing multiple-occupancy bedrooms and concentrating their staffing into smaller areas also provided stronger monitoring abilities for staff (Morgan & Stewart, 1999), reducing the possible number of exit attempts by residents. Findings demonstrated distraction from the exit door but placement of the door within a facility may require further investigation.

Wayfinding

Landmarks (Brawley, 1992; Lynch, 1960) and nodes (Lynch, 1960) serve as aids in wayfinding within a space and help to differentiate place within a setting (Brawley, 1992) aiding individuals with varying cognitive levels.

Physical settings facilitating effective orientation and wayfinding behaviors, may allow individuals with dementia to experience greater overall well-being (Passini et al., 1998). Cama (2013) suggested having a "hierarchy of memorable landmarks" (p. 26) to help guide individuals, whether residents or visitors, through a space to help reduce stress and anxiety. Nodes, as described by Lynch, (1960) create foci at an intersection along the path of travel when a change in direction is needed. He suggests these nodes, viewed as directionally significant, be based on junctions within a space (Lynch, 1960) with landmarks as large objects or elements in a space (e.g., a large aquarium or an aviary) visible from a distance and facilitating wayfinding and spatial orientation (Brawley, 1992). Cues, whether a name plate, number, or sign, viewed at close range (Brawley, 1992) also support wayfinding. Individuals of all cognitive levels are often

faced with making wayfinding decisions with or without spatial cues, landmarks, and nodes as information sources, (Passini et al., 1998), but use of nodes, landmarks, and cues may hold relevance to aid individuals with Alzheimer's in positive orientation and wayfinding.

In a study by Innes, Kelly, and Dincarslan, (2011), individuals with dementia and their family members were asked questions about their perception of the physical space in which they received care. Themes for wayfinding, use of space, and cues were prominent findings in this study. Individuals with dementia responded they were unable to find the restroom due to a lack of signage and cues telling them where to go. These individuals also communicated the most important design features within a care facility related to "wayfinding cues and the outside space" (Innes et al., 2011, p. 554). Some residents and family members were able to color code spaces to aid in wayfinding and establish landmarks. Color was added to the care facilities increasing the residents' wayfinding abilities and helping them relate function or activity to space more easily.

Behavioral Mapping

Zeisel (2006) details behavioral mapping as a multi-faceted method of understanding people in their natural surroundings. While observing those in their natural surroundings researchers have a greater opportunity to discover how the "physical environment supports or interferes with behaviors taking place within it" (Zeisel, 2006, p. 191). This observation may reveal how the physical environment supports or hinders behavior and how the individuals, whether in groups or individually, use the environment. Using this technique researchers, designers, and architects can become better informed in how to design spaces for specific populations. By observing individuals in their natural environment one may be able to

distinguish, in the case of individuals with dementia, what elements could be altered in the physical environment and what elements enhance positive behavior and quality of life.

Individuals experiencing dementia-like conditions may use space differently than those with greater cognitive abilities. Place-centered maps recording the actions and behaviors of individuals or groups using a specific place over a period of time (Behavioral Maps, n. d.). By using place-centered mapping, researchers may gain a better understanding about how individuals with dementia diagnoses use specific spaces and spatial elements.

Color

Wayfinding design must balance the consideration for the cognitive levels of residents with Alzheimer's versus cognitively functioning staff and visitors (Passini et al., 1998). A level of inference is applied when assuming individuals with Alzheimer's can decipher three-dimensional cues better than abstract cues such as color coding or simple application of environmental color (Brawley, 1992). When using color to aid in wayfinding, contrasting color and texture were found to cause anxiety in individuals with Alzheimer's or cognitive deterioration (Passini et al., 2000). Passini et al. (2000) implemented two approaches to examine the utilization of color on flooring to facilitate wayfinding or orientation. One approach applied monochromatic use of color within flooring materials with reference points or "distinctive elements in the environment that are remembered or recognized… act[ing] as anchor points in localizing nearby spaces and are important in remembering wayfinding decisions along a given path" (p. 698). Individuals with Alzheimer's or cognitive deterioration became distressed or disturbed by strong uses of color within flooring materials and those with cognitive deterioration had greater difficulty processing multiple stimuli at once but needed visual relief from the use of one color (Brawley, 1997) based on the physical surroundings available. Individuals focusing on

the floor as they walk became disturbed by a material's variation in color. Lines created by tiles in the floor become *paths* for individuals with Alzheimer's and were also viewed as holes or steps (Passini et al., 2000) causing the individual to 'step over' and impacting balance potentially leading to falls. Contrast specified in flooring materials should be subtle to avoid distraction - "beige to darker beige" (Brawley, 1992. p. 6). On the other hand, using contrast between walls and flooring, suggest wall base should be the same color as the walls, so the boundaries, both vertical and horizontal are well defined (Brawley, 1992). The use of color within a SCU can cause a positive or negative impact interacting with sources and quality of lighting (Rashid & Zimring, 2008) and potentially result in behavioral changes to residents such as agitation or frustration or positive influences such as gathering before a sunny window to a garden area.

Lighting

One's circadian rhythm is impacted by the external environment surrounding the individual and consists mainly of light and dark patterns as they reach the back of the eye (Hanford & Figueiro, 2013). The word *circadian* is used because the pattern is a daily occurrence and derives from the Latin words *circa* meaning "close to", and *dia* meaning "day" (White, 2014). Another benefit to carefully designed lighting within the SCU is the reduction of *sundowning* and its associated behaviors. This disorder is associated with increased aggression in individuals with Alzheimer's during late afternoon and early evening hours of the day (Burgio & Leon, 1997; Cohen-Mansfield & Billig, 1986; Gruber-Baldini et al., 2004; Volicer, Harper, Manning, Goldstein, & Satlin, 2001). As dementia progresses, sleep patterns become more abnormal causing aggression in some individuals and increased stress on caregivers due to disturbed sleep (Hanford & Figueiro, 2013). Empirical findings suggest introducing individuals

with Alzheimer's to consistent light and dark patterns within their daily physical environment helps the individual's sleep and wake cycles to become more natural impacting daytime mood, cognition, alertness, and nighttime sleep cycle (White, 2014).

Ancoli-Israel (2003, p. 26) monitored activity via a wrist band and administered light treatment during 3 different times of day "morning bright light (n = 30), morning dim red light (n = 31), and evening bright light" using light boxes. The study examined how light therapy impacted individuals' with Alzheimer's lengths of nighttime sleep. The findings concluded when exposing the individual to bright light in the morning or the evening there was no significant difference but length of the longest sleep session was impacted (Ancoli-Israel, 2003). Although this study focused on examining the impacts of light therapy, the researcher suggested, "…it is highly probable …light treatment itself may not be sufficient for total sleep improvement and consolidation" and other environmental factors should be examined (p. 31) in order to improve the physical environments for individuals with Alzheimer's. Garce's (2002) study examined the impacts sun setting and artificial light had on individuals with Alzheimer's (Garce, 2002). Findings revealed a reduction of negative sun setting behaviors of individuals with Alzheimer's due to the manipulation of artificial lighting in an experimental room.

Alessi, Yoon, Schnelle, Al-Samarrai, and Cruise (1999) found individuals who had higher levels of physical activity during the day, surroundings with decreased levels of noise, and a care practice reducing sleep disruption, yielded improved nighttime sleep for the *incontinent* individual. Low levels of lighting in a resident's bedroom were also found to have a positive correlation with mood with the low light levels contributing to a negative emotional mood. However, residents who spent many hours in low lit bedrooms showed more signs of negative behaviors (Garre-Olmo, López-Pousa, Turon-Estrada, Juvinyà, Ballester, & Vilalta-Franch,

2012). In another study of the impact of different lighting exposures in dining and activity areas to light intensities on sleeping patterns and circadian rhythms of persons with dementia (n = 66), bright light appeared to have a modest but measurable effect on sleep with ambient light preferable to stationary devices such as light boxes (Sloan, Williams, Mitchell, Preisser, Wood, Barrack, Hickman, Gill, Connell, Edinger, & Zimmerman, 2007). Four intervention conditions employed were morning bright light, evening bright light, all-day bright light, and minimum standard light. Participant exposure averaged 2.5 to 3.0 hours for the morning and evening interventions and 8.4 hours for the all-day intervention with nighttime sleep measured using wrist actigraphy and daytime activity using unobtrusive daytime observations. Night-time sleep increased significantly in participants exposed to morning and all-day light, with the increase most prominent in participants with severe or very severe dementia (mean increase 16 minutes (P5.008) for morning, and 14 minutes (P5.01) for all-day). Morning light produced a mean phase advance of 29 minutes (P5.02) and evening light a mean phase delay of 15 minutes (P5.06). Effects on daytime sleepiness were inconsistent, and the number of sleep bouts, mesor, amplitude, intradaily variability, and interdaily stability were not significantly different, indicating overall strength of day and night activity rhythms did not change significantly under any treatment condition.

Sound

Research revealed impairments in cognition when an individual's surroundings include *acute and chronic noise* (Cheng, Wang, Chen, & Liao, 2011; Cui, Wu, & She, 2009; Manikandan, Padma, Srikumar, Jeya, Parthasarathy, Muthuvel, & Devi, 2006) and Alzheimer-like changes in correlating regions of the brain during these exposures (Cheng et al., 2011; Cui, Wu, She, & Liu, 2012; Cui, Zhu, She, Wu, Ma, Wang, Zhang, Xu, Chen, An, & Liu, 2012).

Flooring materials, specified within a SCU, potentially impact the quality of life for residents (Rashid & Zimring, 2008) by reducing or adding to environmental noise. Cui and Li (2013) discovered individuals exposed to high levels of environmental noise potentially had a higher risk of actually developing Alzheimer's. Residents within a SCU were evaluated during exposure to high levels of environmental noise and showed signs of lessened social interaction (Garre-Olmo et al., 2012), suggesting basic changes to the physical environments for those with Alzheimer's (e.g., adjusting the temperature, lighting, and sound levels). In examining the relationship between environmental noise and agitation among individuals with Alzheimer's, individuals with cognitive deterioration were found to have increased levels of agitation when experiencing increased levels of environmental noise (Joosse, 2012).

Wong et al. (2014) found specific environmental factors producing noise agitated residents with Alzheimer's. Factors included but were not limited to: dripping water, air conditioner, electric fans, television, and intercom speakers. Mechanical devices can be manipulated to reduce vibration or the production of noise so the residents are disturbed less and the quality of life increases or improves.

Means of egress from SCUs are frequently alarmed to notify staff; however, when residents do attempt to exit, causing the alarm to sound, it may exacerbate behavior by the tone of the alarm creating a disturbance or adding to environmental confusion. Schwarz and Brent (1999) recommended alarms not interfere with facility ambiance, for example, by using a chime sound versus alarm.

Door and Window Coverings

Studies have found coverings on windows and doors assist staff caregivers in keeping the residents from exiting the facility (Dickinson et al., 1995; Mayer & Darby, 1991; Namazi,

Rosner, & Calkins, 1989). Dickinson et al. (1995) found elimination or reduction of attempts by residents to exit occurred when a cloth panel was placed over the door hardware or *panic bar* to camouflage the door hardware. This study evaluated exiting behaviors of seven residents with previous histories of exiting attempts, diagnosed with Alzheimer's or dementia. The seven residents triggered an exit alarm 115 times when there was no visual barrier. The first scenario, closure of the blinds on the door, resulted in 64 attempts reducing attempts by 44%. The second scenario consisted of cloth barrier over the door resulting in five attempts, a reduction of 96% in exiting attempts. The third scenario included both closure of the blinds and a cloth barrier and resulted in 14 exiting attempts, a reduction of 88% suggesting optimization when only the cloth barrier was present. Residents may be distracted and attempt to exit potentially attributable to the reflectivity or projection of the hardware; the use of both cloth barrier and blinds perhaps still attracted individuals with reflectivity of the blinds. Residents, spending a majority of their time indoors can become agitated by mixed signals exiting doors can deliver: they see appealing and inviting handles on solid and transparent surfaces, but then face obstacles such as locks and key-pads preventing exiting (Schwarz & Brent, 1999). When residents can see the outdoors near an exit, for example, they may become distracted and purposely seek an exit (Day et al., 2000). Schwarz and Brent (1999) found residents' agitation reduced by utilizing unobtrusive exit doors and hardware that do not attract the residents' attention as well as care in selection of materials.

Conceptual Framework

The relationship between the physical envelope and behaviors occurring in SCUs for individuals with Alzheimer's or dementia invite further investigation to potentially identify synergistic relationships contributing to residents' positive quality of life, as well as those

interfaces contributing to deterrence. Figure 3, is a conceptual model, suggesting attributes as sources for this examination based on findings from the literature review and research questions.

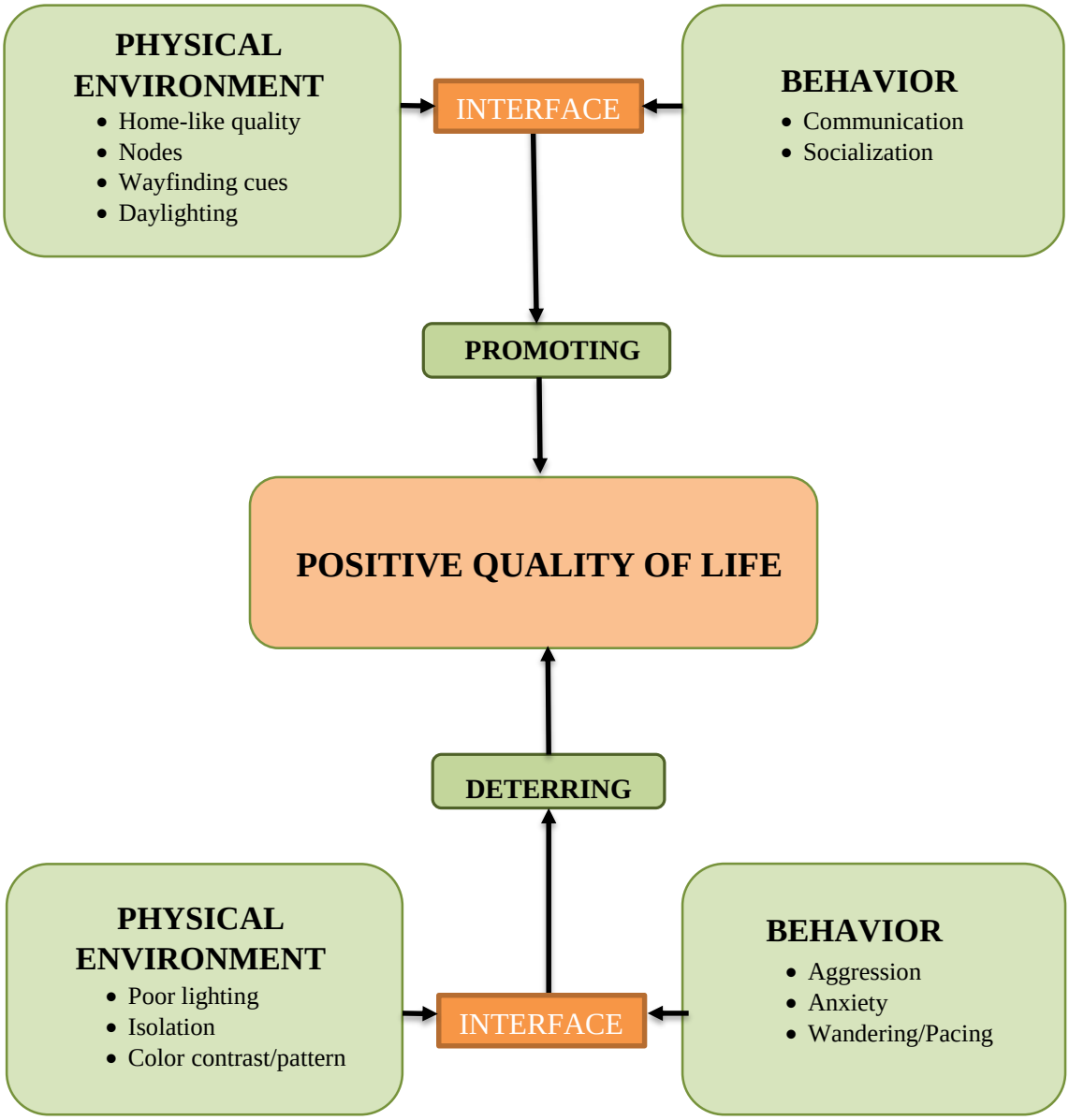

Figure 3. Positive quality of life for individuals with dementia or Alzheimer's living in SCUs positively or negatively affected (deterred or promoted) by the interface occurring between the physical environment and behaviors.

CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

The purpose of this study was to examine the relationship among the physical environment and behaviors demonstrated by individuals with Alzheimer's in a Special Care Unit (SCU). Using an instrumental case study design, physical and behavioral data were examined for potential interfaces between the physical environment and behaviors impacting residents of a SCU in a Fort Collins, CO nursing facility; the SCU provided care for individuals diagnosed with mid to late stage dementia (Stages 2 and 3), including individuals with Alzheimer's. The research design collected qualitative and quantitative data using a) a Spatial Inventory (Appendix B: Spatial Inventory Form) to identify elements in the spaces used by residents, b) researcher observations (Appendix C: Observation Form) of residents and staff engaged in daily activities in the public spaces of the SCU, and c) an electronic survey (Appendix D: Staff e-Survey) to collect responses from staff members engaged in caring for these residents.

Instrumental Case Study Methodology

Case studies investigate the detail of current *phenomenon* tied to an actual setting (Yin, 2009) with *instrumental* case studies seeking a better understanding of specific issues (Stake, 1994), in this study, to understand what it is like to be in this specific environment. In a study by Gordin (2006), use of an instrumental case study methodology invited unique interpretation as well as rich detail offering insights into the process of improving reading and writing instruction. Wasburn (2007) used instrumental case study methods to examine the effectiveness of mentors among female faculty in a university setting and the impact being mentored had on women seeking future career development. The methodology created a foundational understanding of

potential patterns linking physical elements and resident behaviors similar to the objectives of this study.

Empirical research employing case study methodology has explored the relationship of physical space and individuals experiencing dementia in terms of physical features, lighting, environmental attributes, and spatial orientation (Cohen-Mansfield et al., 2012; Dickinson et al., 1995; Figueiro, 2008; Logsdon, Teri, McCurry, Gibbons, Kukull, & Larson, 1998; Marquardt & Schmieg, 2009). Through thick, rich description and analysis of observed situations, happenings, and the physical space (Stake, 1995), reflections by the researcher sought to exemplify the relationships of space and behavior.

Study Participants

The study participants were residents (n^r = 9) of a SCU with late stage dementia diagnoses observed in their residential living environment; and staff caring for these residents (n^s = 6). The facility, at the beginning of the study, had 5 residents (n^r = 5) 4 in double rooms and 1 without a 'roommate" due to resident size (50% occupancy) and was staffed by 6 staff members (n^s = 6), one per shift, rotating between the secure unit and other non-secure units. As the study progressed more residents moved into the unit and increased the study population to a total of nine residents (n^r = 9; 90% occupancy). Activities and programs were carried out primarily in the unit but occasionally took place out of the unit.

Staff provided aggregated demographic information to assist in describing the resident population in the study (e.g., number of current residents and average length of stay). At the beginning of data collection, the secure unit housed 3 men and 2 women ranging in ages 70-100 ($\overline{x}$ = 85.2). Their length of stays ranged from one month up to 6 years ($\overline{x}$ = 26.8 months).

The protocol for the study was reviewed by the Research Integrity and Compliance Review Office's Institutional Review Board (IRB) at Colorado State University and determined to be in compliance with NIH CFR 46 and federal regulations governing review of research involving human subjects (Appendix E: IRB Letter).

Study Setting

Residents lived in a special care unit (SCU) in a skilled nursing facility in Northern Colorado; the SCU was dedicated to those with dementia or mid to late Alzheimer's. This unit was located in one wing of a four-wing building (Appendix F: Facility Floor Plan) accessed from a corridor off the main reception/lounge at the front of the facility. The SCU provided resident rooms located off a main double-loaded corridor, with an activity/kitchen/dining area to the left off the main corridor, and a living room area with television, accessible seating, and access to an outdoor garden and walking area (Figure 4). The double doors leading into the secure unit from the main unit, were constructed of wood contrasting with the wall color and remained locked with the use of magnetized closers which unlocked when the correct code was entered on a pin pad. These doors, along with doors to residents' rooms did not have windows. Resident room doors had a half panel, painted the same color as the walls, attached to the lower portion. A janitorial person repainted these panels and trim from a light beige to a light blue-green color during the final observation session. The door to the outside garden was a full-glass door with a different magnetic alarm, sounding when the device was released as the door was opened. The fire exit door, located at the end of the main corridor, was metal, painted the wall color, and had a glass panel allowing residents to view the outside, and equipped with standard metallic gray panic bar hardware.

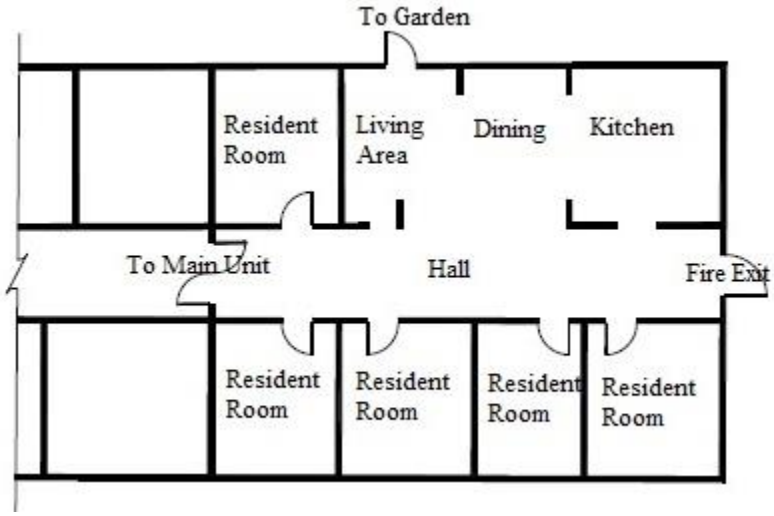

Figure 4. Annotated locational plan of secure unit showing the relationship of functional areas

The unit is oriented on a north south axis, placing the majority of rooms on the west side of the wing, with activity areas on the east along with one resident room.

Approach and Instrumentation

A letter of invitation was provided to the facility detailing the study parameters, their requested involvement, and contact information for the researchers (Appendix G: Letter of Invitation; Appendix H: Letter of Support). The researcher, in initial phone discussion, introduced the study intent and parameters to ascertain interest.

Following the initial phone contact, an invitation packet was emailed with a phone call follow-up. The packet included an invitation to participate in the study, the observation form, copy of the electronic survey, and the spatial inventory form. Follow-up phone and email reminders were exchanged during the process of obtaining the facility's support letter.

Three data collection approaches – direct observation, electronic survey, and a physical space inventory – were utilized to collect data allowing the researcher to examine interactions between the physical environment and behavioral characteristics of individuals with

Alzheimer's. Use of three approaches created triangulation of information to increase study reliability and validity of findings.

Direct observation placed the researcher in an unobtrusive area of the corridor overlooking the activity areas, the prime circulation path (see Appendix F) of residents, and resident access to the controlled outdoor garden. Observations were recorded by noting who was engaged, what they were doing, and their movement patterns in the physical environment. The e-Survey collected self-report data on perceptions of staff working with these residents using questions developed by the researcher and patterned after diverse studies of user perceptions used with components of the CMAI (Cohen-Mansfield et al., 1989) to gain an understanding of residents' levels of agitation. In a study conducted by Zeisel et al., (2003) resulted in a Cronbach alpha using the CMAI ranging from .62 - .76[2]. The spatial inventory, developed by the researcher, was used to record spatial configuration, types of furniture, materials and finishes, lighting, color within the public spaces of the unit along with wear patterns.

Spatial Inventory

A detailed description of each setting (Creswell, 2007) allowed the researcher to pinpoint specific physical elements with which a resident may make a connection. Although Yin (2009) suggested researchers include a variety of documents, for example, archival records, interviews, direct observation, participant observations, and physical artifacts to examine the case, imposed limitations by the facility administration limited this examination to only direct observation and artifacts. The spatial inventory, designed by the researcher, (Appendix B: Spatial Inventory Form) described and assessed physical elements within the spaces (e.g., flooring, ceiling,

[2] Zeisel et al., 2003 examined the validity of the CMAI based on three subscales: physical agitation (α = .68), verbal agitation (α = .62) and aggressive behavior (α = .72).

casework, and lighting) and their physical condition (wear). Each element was digitally photographed and annotated with descriptions and assessment.

Direct Observation

Direct observation (DO) has been used in studies by ancient and modern philosophers and scientists to understand how things occur in the world including how people use space; in this study, direct observation was employed to understand how residents used the common areas of the unit, and what promoted interactions with spatial elements. These observations were direct, structured, and with an attempt to be as unobtrusive as possible in a small unit.

The need to incorporate direct observational approaches was reinforced by Wimo and Nordberg (2007) in their study establishing a strong negative correlation between estimated and observed time for personal activities and supervision (i.e., "personal activities of daily living, instrumental activities of daily living, and supervision," p.71) reported by caretakers of individuals with dementia using observational methods. Due to varying factors within institutional care (e.g., laundry, food preparation, and person finance), estimating time for key activities was more difficult and produced a low correlation between estimated and observed time (Wimo & Nordberg, 2007). Observational methods allow the observer to embed themselves into the environment and activities of individuals with Alzheimer's with less impact on their norms of routine. Direct observation methods have been used in the area of behavioral examination and recently gained approval in research on the behavior of elderly with dementia or Alzheimer's (Curyto, Van Haitsma, & Vriesman, 2008). In the study by Lawton et al. (1996)

> …research assistants positioned themselves to be as unobtrusive as possible while still maintaining a full view of the resident's face. As is usual with naturalistic observation, despite the researchers' frequently being in full view of the resident,

> reactivity to the observer was minimal by the time pilot work was completed and actual data collection had begun (p. 7).

As a naturalistic method, DO has reflected little impact on study participants with dementia.

The goal of observation in the study was to reveal resident behaviors - interactions with people (staff, visitors and family) and activities, (wandering and rummaging behaviors, and exiting attempt behaviors) and the physical artifacts with respect to the character (features/characteristics) of the space that they contacted during these interfaces. Therefore, data collected through direct observation was compared to the detailed spatial description of the unit to further examine interface. Although direct observation has been used in previous studies (Dickinson et al., 1995; Garce, 2002; Marquardt & Schmieg, 2009; Mayer & Darby, 1991; Passini et al., 2000) to gain better understanding of behavioral characteristics of individuals with Alzheimer's, it has not been used to gather data on their use of physical space.

The observation plan encompassed a 15 hour period in which observations were conducted three times per week for 30 minute periods between 6am and 9pm period (see Appendix C: Observation Form). The researcher completed observations during morning, afternoon, and evening time frames (inclusive of sun setting time period). Observations took place during the winter season with sunrise and sunset periods (roughly 8:30 am and 4:00pm) occurring every week. Specific observation times were selected based on the units' scheduled off-site activities and researchers' work and class schedule.

In addition to the researcher sitting in an unobtrusive location within the unit's corridor, meticulous notes were recorded during each observation. These notes indicated the number of residents visible in the public spaces of the unit and their initial actions. To maintain anonymity of residents their movements and interactions were tracked and recorded by assigning letters to

each resident and not by recording their names. Written documentations of: location of resident, specific activity, and interactions with other individuals were recorded during each observation.

The study anticipated revealing patterns of behavior that require, are impeded by, or enhanced by the physical environment as used by residents identifying the type of interaction, and frequency of engagement within the secure unit. According to Olinger (2012, p. v), "critical participant observation" is a primary tool design professionals can use to assess the care needs of those with Alzheimer's. Since Alzheimer's is a disease that a cognitively able individual cannot experience through simulation, a trustworthy and reliable way to understand their experiences is through observation of those diagnosed the disease.

Electronic Survey (e-Survey)

An online e-Survey was used "to collect empirical observational data to verify and build theory" (Creswell, 2003, p. 6) from staff delivering dementia care first hand, and was used to cross-validate information gathered from the direct observations. Staff also provided demographic information when participating in the survey. In a study by Leigh (2011), electronic surveys were used to reach a large number of participants within six architectural firms yielding information "establishing a foundation for learning" about the behaviors and preferences of respondents (p. 26). Using the e-Survey allowed the respondents to participate with little interference in their daily work routine due to the electronic nature of the survey, insuring direct delivery of aggregated information, with a maximum number of completed surveys.

An invitation to participate in the survey was sent to each staff member with a link to the survey URL. The administrative contact acted as the gatekeeper to distribute the invitation to only staff assigned to work in the unit.

Although interviews with the staff were preferred, facility administration requested time not be taken from staff working hours due to a staffing shortage; aggregated responses to maintain anonymity also reinforced the decision to employ a survey provider (Survey Monkey). The use of electronic surveys produced better response rates than did paper and pencil surveys. For example, in Chizawsky, Eastabrooks, and Sales (2011) study, they found among busy nursing staffs, a significantly higher response rate (well above their anticipated 50% rate) was achieved using electronic surveys (84%) compared to paper surveys (16%); time in taking their survey was decreased from 33 minutes on the paper survey to 22 minutes on the electronic survey and more web respondents completed the survey on work time versus using break time.

Published instruments used to examine mental states, aggressive behaviors, and daily routines were examined in constructing the study survey instrumentation due to their relevance to the study's population. These instruments were evaluated because they provide a source to caretakers to gain a better understanding of the person in need of care and an increased insight for type and location of care for the individual. Evaluation for inclusion in the survey included examining time and feasibility for staff to utilize the tool. The Mini-Mental State (MMS) assessment (Folstein, Folstein, & McHugh, 1975), the CMAI (Cohen-Mansfield et al., 1989), and the MOSES (Helmes et al., 1987) were evaluated for inclusion in the e-Survey to increase validity of responses and guidance for additional questions for staff members.

Folstein et al. (1975) developed the MMS assessment of cognitive impairment. The MMS examination has commonly been used to estimate the severity of cognitive impairment. The MMS has been used in previous studies (Ancoli-Israel, 2003; Grierson et al., 2011; Littlewood, Seymour, & Owen, 2010; Liu et al., 1990; Mayer & Darby, 1991; Passini et al., 2000) related to individuals with Alzheimer's to gain a better understanding of the severity of dementia. After

careful examination, this instrument was not selected by the researcher because the instrument required staff to physically sit with the individual and therefore was not adaptable to an online survey, and the specific mental state and diagnosed stage of Alzheimer's of each resident was not included in the study.

The second instrument evaluated was the MOSES (Helmes et al., 1987). MOSES is an assessment tool used by staff members to evaluate five areas of daily functions of elderly individuals. This evaluation helped staff to better understand areas of needed assistance and to correctly place individuals in appropriate institutionalized care (Helmes et al., 1987). The measures provide tangential information regarding the interface of the physical environment with the needs of residents, offering a weaker substantiation for inclusion. This instrument was not selected by the researcher because the instrument required detailed observations of one resident by staff to complete the questions and interfered with the staff's restricted schedule.

The third instrument considered for incorporation was the CMAI; the CMAI evaluates the agitated behaviors of elderly individuals with dementia living in nursing homes. This evaluation is typically completed by staff, caregivers, or family members with close interactions with the resident and their awareness of the resident's behaviors (Cohen-Mansfield et al., 1989). The CMAI had been used in previous studies (Gruber-Baldini et al., 2004; Wimo & Nordberg, 2007; Zeisel et al., 2003) to justify sample selection of subjects with significant Cronbach's alphas[3] The original instrument offered 14 questions; five items were selected and adapted from the CMAI for inclusion in the e-survey (see Appendix D) based on relevance and possible impact on this study. By utilizing questions from the CMAI, the survey inquiry encompassed questions pertaining to frequencies of behaviors of the residents.

[3] Zeisel et al. (2003) with Cronbach alpha using the CMAI ranging from .62 - .76

Example Survey Question 19:

Below is a list of behaviors considered as *agitated*. Please indicate how often they are manifested in the unit by residents over the past 2 weeks.

	Never	Less than once a week	Once or several times a week	Once or several times a day	A few times an hour or continuous for half an hour or more
Cursing	○	○	○	○	○
Verbal aggression	○	○	○	○	○

Four open-ended questions about the physical environment and staff member levels of spatial awareness were included in the e-Survey to cross check responses.

Example Survey Question 16:

Are there improvements you would suggest specifically to improve residents' quality of life in the secure unit?

Semantic differential methodology was developed in a pioneering study by Osgood, Suci, and Tannenbaum (1957) in which they developed an objective method to measure meaning through the use of word pairings. This method, utilized in the e-Survey, aided in an increased understanding of how staff members perceived specific aspects of the unit and behaviors of residents. These questions provided structured responses based on a 4-point scale with word pairs the staff members selected.

Example: Semantic Differential Survey Question 5, 17, & 24:

Please use the word pairs below to characterize your perception of the existing unit.

	1	2	3	4	
	○	○	○	○	
satisfying					unsatisfying
calm					active
quiet					noisy

The use of semantic differential methodology in previous studies (Gluth, Ebner, & Schmiedek, 2010; Huang, Chen, & Khoo, 2012; Jenkins, 1966; Marinelli, Fabbrizzi, Alampi Sottini, Sacchelli, Bernetti, & Menghini, 2014) created an improved understanding of the specified meanings of objects or relationships being studied. Huang et al., (2012) in their study of the emotional requirements of consumers referencing product design used semantic differential word pairs. The researchers found a positive correlation between consumer needs and product development ideas. The semantic differential method used by these researchers was similar to standard semantic differential word pairs; however, because they believed consumers would not understand the language, the adjectives were modified to represent basic emotional rankings. This method allowed the researchers to discover the consumers' *genuine opinions* concerning the product design (Huang et al., 2012, p. 569).

Staff were provided with color photos showing images of institutional spaces demonstrating specific attributes. Staff were then asked to rate these spaces according to design attributes relative to perceived comfort level for residents with dementia using open ended questions. By answering these questions, the researcher gained a better understanding of how the staff related space and behaviors.

Example Survey Question 5:


In the photos above, what physical elements would have a positive impact on resident behavior?

Example Survey Question 6:

In Question 11, what elements did you note as important?

Example Survey Question 10:

In the picture above, please rate the quality of overhead and table lighting in the space.

	Adequate			Inadequate
Overhead and table lighting	○	○	○	○

Questions asking for the staff to rate the environment were used along with the space inventory to identify areas or elements of concern.

Example Survey Question 17:

> Please rate the following attributes for your secure unit related to quality of life for the residents:

	Satisfactory			Unsatisfactory
Fixed furniture	○	○	○	○
Color contrast	○	○	○	○
Resident orientation	○	○	○	○
Movable furniture	○	○	○	○

Approach to Data Analysis

Data collected from the three instruments were independently evaluated and analyzed to gain an initial understanding of interface. Once this initial evaluation took place data were cross-examined between the three instruments to examine potential relationship between the physical environment and resident behaviors. The observations were analyzed using qualitative coding to identify elements and physical relationships generating a theoretical understanding of how space may shape or impact behaviors. A priori coding utilized predetermined categories, based on literature or theory, prior to data analysis and that coding was applied to the data (Weber, 1990). Open coding developed relationship categories with axial coding connecting elements in the spaces to behavior, and selective coding created a *story* demonstrating the relationships and their importance (Creswell, 2007). The conceptual model (Figure 3) listed the majority of the predetermined categories revealed through existing literature. Open, axial, and selective coding were utilized to provide a complete analysis of data by recording the interface of behavior and physical environment. NVivo.10 computer software was utilized in the analytical process for

qualitative data coding by recording frequencies of behaviors by residents and revealing and examining connections.

The e-Survey data, with quantitative and qualitative responses, were examined for relationships with observational connections. Due to low response rate, the quantitative data was not large enough to run in a statistical package but percentages were calculated to aid in an increased understanding of the perception of staff.

Spatial Inventory Data

The majority of spatial inventory data were collected during initial observation within the secure unit with notations and images taken as the space changed during the ten week study. Utilizing the Spatial Inventory Form, (Appendix B) public and appropriate areas were documented for future investigation of interface in the study. Once each aspect was photographed and annotated, based on the Spatial Inventory Form, further examination sought characteristics the residents frequently interacted with to aid in deeper analysis. Residents' private rooms were not examined during the study in an attempt to retain residents' sense of autonomy and familiarity.

Observational Data

Observational data were transcribed immediately following each session to ensure completeness and minimize the deletion of key information. Research journal entries were also recorded after each session to capture biases, additional themes, and thoughts pertaining to the observation. Each data set was entered into Nvivo.10 and initially coded utilizing a priori codes developed from the conceptual model. Coding then continued through the use of open, axial, and selective analysis to capture behaviors and interactions of the residents. Coding continued throughout the ten weeks of observations and after all observational sessions were completed to

ensure thorough examination of existing relationships. Once all observations had been completed and data coded, further examination yielded frequencies of resident behaviors.

e-Survey Data

Survey responses were exported to a more user friendly interface (Word document) once the staff had ample time to complete the survey over a period of four weeks. Each survey question was accompanied by each respondent's answer followed by the researcher's interpretation of the responses. This format yielded increased clarity to the researcher pertaining to themes related to staff perceptions of physical space and resident behaviors. Quantitative data were converted to percentages, due to low response numbers, and utilized later in the analysis process to examine intersection and relationship among data.

Intersection of Approach

After all data were transcribed, coded and analyzed, each outcome was interlaced with another tool's outcome to examine deeper relationships. The frequencies, recorded through observational data, were examined along with survey responses to better understand the perception of staff compared to the actual behaviors of residents. Location of frequent behaviors, noted through observations, were examined along-side the spatial inventory and sought a deeper understanding and additional insight pertaining to the residents' specific behavior.

By cross-examining data between instruments, the researcher discovered intersection points that aided in answering the study's research questions.

Reliability and Validity

As a qualitative study, measures of quality were assessed for credibility, transferability, dependability, and confirmability (Creswell, 2007).

Credibility. Journaling and memos were used to minimize biases during data collection and analysis to remove the researcher as participant in the study reinforcing validity; journaling began upon initiation of the invitation letter to the facility, prior to undertaking observations.

Transferability. While findings from this study might be of interest to other facilities with populations diagnosed with Alzheimer's or dementia in institutional care, caution will need to be taken due to the small number of participants and the limitation of descriptive and correlational findings. The study may yield information other facilities and researchers can use to improve their theoretical understanding of the needs of the physical environment for their residents with dementia.

Dependability. The environment of a SCU typically remains managed and prescribed to avoid disturbance of the residents. The researcher was aware of this possibility and documented changes within the environment during observations. This documentation was considered for application and relevance to the study to enhance the examination of the interface between physical environment and behaviors.

Confirmability. Findings from this study can potentially be replicated in examining additional SCUs and their residents with Alzheimer's or dementia. Reported resident cognitive levels and demographics within the unit would reinforce comparable findings. Evidence contradicting previous findings will invite future study.

CHAPTER IV

DATA ANALYSIS AND FINDINGS

Data analyses were divided into three parts. First, findings were presented from each of three data collection instruments used in the study: the spatial inventory of the physical environment in the SCU; recorded observations of resident and staff behavior and actions; and staff members' responses to an online survey. The second section presented findings responding to the study's two research questions with discussion, followed by the third section, a discussion of the integrated findings.

Spatial Inventory

The existing conditions of the SCU were recorded utilizing the Spatial Inventory (Appendix B). The unit studied had a double-loaded corridor with resident rooms to either side. There were two primary egress exits to the exterior, one immediately at the end of this corridor and a secondary exit, leading to the secure walking garden area, off the main corridor. The third egress, by which the unit was entered, was from a corridor connected to the main nursing facility. The SCU encompassed five double occupant rooms, four on the west side facing a parking lot, and one on the east side, facing the walking garden (Figure 5). These rooms, for the purposes of this study, were considered private spaces, without transition space to the public corridor. Using the inventory, furniture and finishes and facility wear were examined.

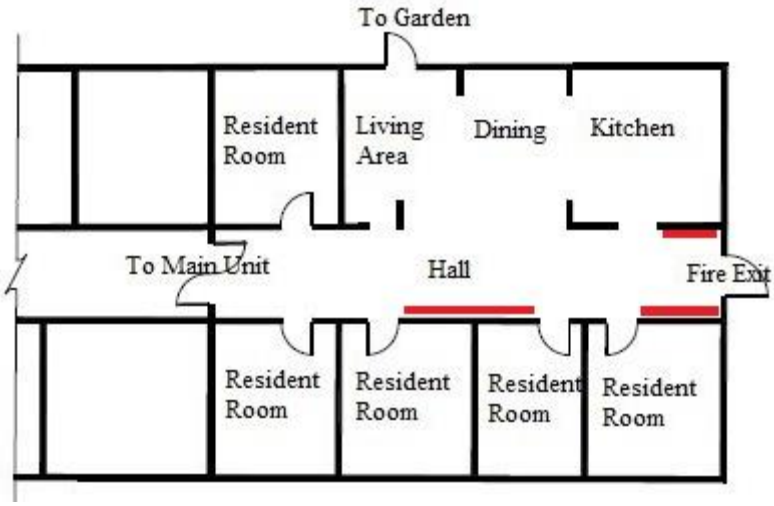

Figure 5. Annotated locational plan of secure unit.

Furniture and Finishes

Entering from the security doors, the corridor presented a neutral environment, with a beige color palette and minimal texture differentiation (Figure 6). Wall base was inconsistently applied encompassing black straight base and beige and white cove base, which in some locations had a decorative wood trim mounted above the rubber base, concurrent with the location of the wood handrail. Oak handrails were evident but not continuous, with spans without any hand rails and spans with painted chair rail interspersed along walls. The location of handrails identified by the red line in Figure 5 did not coincide with a rationale for assisted walking or wandering paths taken by residents.

The corridor walls had bulletin boards, resident artwork, and framed generic art pieces placed in a manner to potentially reduce the monotony of the neutral wall color (Figure 7). Resident names were printed on a decorative piece of paper emulating a paper scroll, enclosed in a Plexiglas sleeve, mounted to the side of the each residents' room (Figure 8).

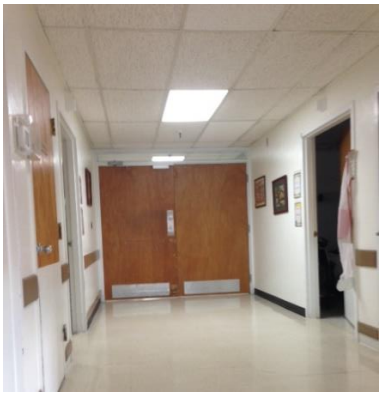

Figure 6. Neutral color palette

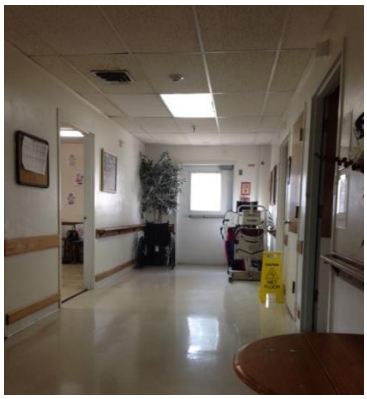

Figure 7. Examples of glare

Figure 8. Resident room designations

The ceiling plane in the corridor was a 2'x 4' exposed spline grid with standard white fissured acoustical tile and prismatic acrylic lenses enclosing the fluorescent lighting. A mirrored, surface mounted half sphere was located at the intersection point of the corridor ceiling and the living space; its purpose appeared to be to anticipate people traffic, for example when two individuals in wheelchairs crossed the threshold of these two spaces. The ceiling in the kitchen and living space was gypsum board, textured and painted white. Surface mounted 1' x 4' fluorescent box fixtures with acrylic wrap lenses were distributed in a grid pattern on the kitchen and living space ceilings.

The public spaces of the unit did not include task lighting, in the form of table or floor lamps. Natural lighting penetrated the living space and kitchen/activity areas from the windows and glass door to the garden. In Figure 9, the woven shade is extended half way down, filtering the daylight but creating a distinctive light/dark area and the contrast darkened the adjacent interior space. The corridor, having only the egress door glazing to supply natural light, was lit primarily by artificial lighting (Figure 9).

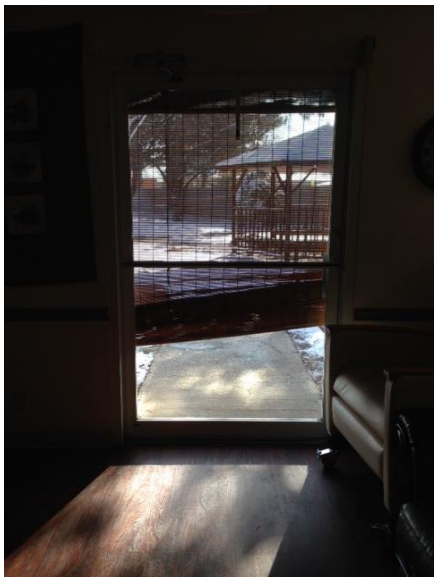

Figure 9. Distinctive light/dark contrast.

The flooring in the unit was not uniform, employing three different materials: vinyl composition tile (VCT), sheet vinyl, and wood laminate. In the corridor, reflective glare occurred on the VCT from the natural light transmitted through the glazing on the exit door and the fluorescent ceiling fixtures (see Figure 7 above). The corridor flooring VCT was a beige, speckled pattern; the kitchen flooring was sheet vinyl in a tiled neutral stone finish; and the living space was a laminate wood resembling a dark walnut finish (See Appendix B). At the threshold between the corridor and the living/kitchen areas was a half-round black rubber transition strip with a slightly raised profile.

Before moving to the spatial inventory of the living/kitchen space, along the corridor where one turned into the activity areas, were found a changing collection of upholstered seating, which varied from observational visit to visit. A side table was consistently co-located. This grouping served as a node in spatial orientation causing either a change in directional movement or opportunity to sit; this node allowed anyone sitting in this location to observe a majority of activity taking place in the unit.

Moving from the main public corridor of the unit to the multipurpose room (refer to plan in Figure 4, above), moving clockwise, around the multipurpose space were the living and kitchen/activity area which also served as the location for eating/dining. The walls were painted light beige with a minimal texture. The living space walls displayed a quilt mounted on the wall to the left of the exterior door with framed, generic art work; and the unit's month activity schedule (Figure 10) in addition to a 42" flat screen television, recessed from the wall surface. A large faux leather sofa in dark brown, and two large arm chairs upholstered in a washable light beige material were placed in front of the television located on a wood console stand.

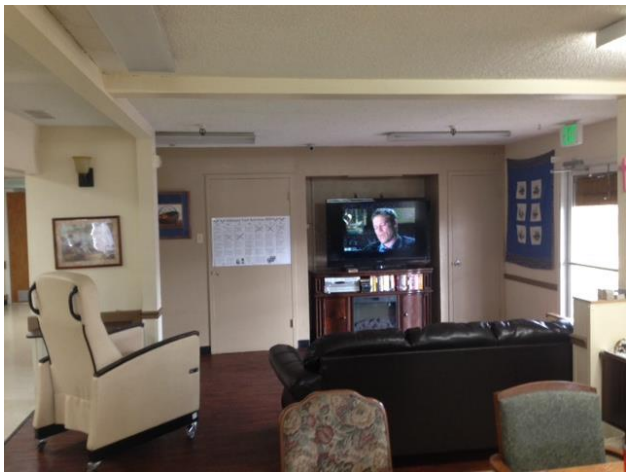

Figure 10. Living space with television, activity chart, quilt, and artwork.

On the east wall directly behind the living space was the staff work station. This station included one standard size desk, office chair, computer and a rolling equipment cart with monitor attached. The windows on the east side of the unit had a valance with mini blinds to control morning daylight; often the blinds at the sink were not fully raised or open making the area at the sink darkened. At the other window openings, the blinds appeared to be continually fully raised.

The kitchen proper (Figure 11), contained a refrigerator, a counter with sink and window above, along with upper and lower cabinets. The cabinets stored primarily kitchen ware (e.g., paper plates, coffee mugs, paper towels, and plastic table ware). A cart, used to collect dirty or

used dishware, was located generally to the right of the counter alongside a trash receptacle. Extra chairs, not stacked, were placed in this area as well; at times, these chairs were used by residents (Figure 12).

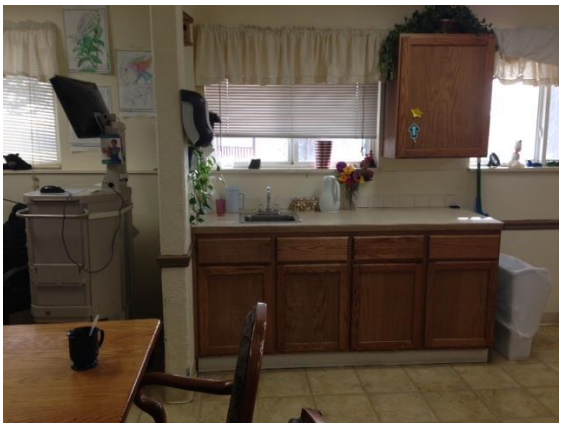

Figure 11. Kitchen sink area with cabinetry.

Figure 12. Dining/activity area.

Four square wooden tables, two each placed together, were placed in the middle of the kitchen area and used for both eating and activities (Figure 12). Each table initially was surrounded by 3-4 chairs with floral upholstery. During week 8 of the study, the chairs were replaced with wood framed chairs with easily maintained black upholstery. The back portion of the kitchen space, located along the south wall, included two small tables with extra chairs. These tables kept basic activity supplies such as puzzles, playing cards, and drawing supplies readily available to residents.

The wood chair rail (refer to Figure 12 above), in the kitchen/activity area did not match the height of the chair backs in the space. The walls in the kitchen area were decorated with resident artwork, bulletin boards, and a digital clock with a phone mounted on the west wall. On the south wall of the activity/eating area, a set of closet doors with three cabinet doors above and painted in a dark color contrasting with the neutral walls, contained activity supplies and was kept locked.

Facility Wear

Evidence of wear was apparent on flooring, door jambs and door faces within the unit; one might also consider the replacement of the activity area seating as a wear pattern although the chairs were completely replaced during the study. The first pattern of wear was where a table leg and chair appeared to have caused the removal of three layers – the protective coating, wear layer, and design layer – revealing the product's print layer which appears as a white substrate (Figure 13).

Figure 13. Significant wear of flooring in kitchen/activity area.

Next, the framed opening from the corridor had a metal that showed chipping revealing the factory undercoat (Figure 14). The height of the wear and the sharpness of the chipping suggest with wheelchairs or other equipment moving in and out of the area.

Figure 14. Chipped frame of opening.

Figure 15. Door surface wear.

The doors opening to the main corridor reflected chipped veneer vertically and horizontally (Figure 15). Doors to patient rooms showed minimal wear but the wood veneer had been covered with a wood panel on the lower portion of the door; initially these panels were painted white but at the end of the study, several were painted a light blue-green (see Figure 16 and 17) to match door frames, wall and base trim adjacent to patient rooms. This addition of color created moderate contrast in the corridor.

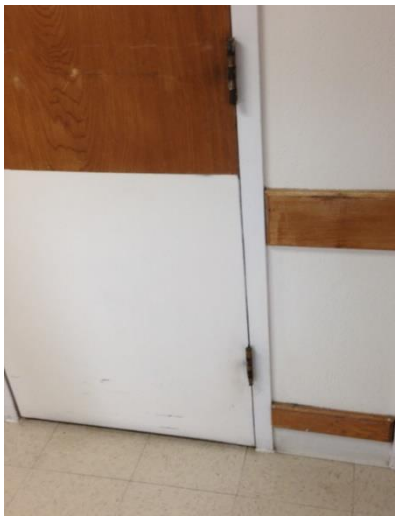

Figure 16. Initial color of panel.

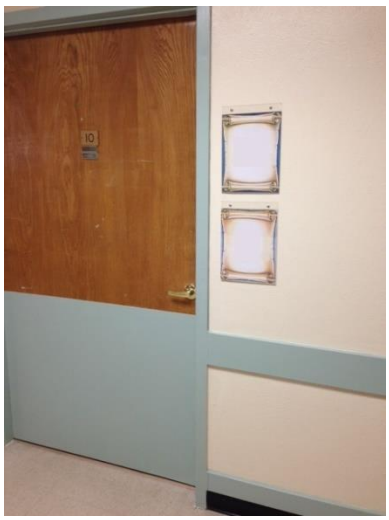

Figure 17. Color change of panel.

Discussion of Spatial Inventory Findings

The spatial inventory organized the researcher's examination of the SCU's physical space independent of on-going activity.

Corridor and pathways. The corridor shape and furniture layout within the unit appeared to promote very specific pathways. One pathway created by furniture placement appeared between the television and seating area of the living space. Additional pathways were created by the table arrangements in the kitchen areas and the straight corridor. Empirical research has revealed corridors with defined and visible ends create the potential for increased orientation by residents within the space (Marquardt & Schmieg, 2009). Although the corridor was straight, the connected living/kitchen spaces created a more open plan and greater ease of resident monitoring by staff. Morgan and Stewart (1999) found better monitoring by staff when the facility corridors created a T-shape. It is not known how individuals with dementia react when someone interrupts or crosses a visual path, such as that where the television and seating are separated by a physical pathway.

Color and contrast. The intersection of flooring in the corridor, living, and kitchen spaces demonstrated color contrast and texture in the flooring within the unit. Research findings suggest contrast in flooring can cause anxiety in individuals with Alzheimer's or cognitive deterioration (Passini et al., 2000). The black transition strip, at this intersection point, created a distinct line that could potentially become a path for residents as well as a step (Passini et al., 2000). The wood finish of the main doors, leading to the main facility corridor contrasted with the wall color within the unit, generally beige. This contrast, in addition to door location, has been noted to contribute to increased exit seeking by residents. In terms of location, when exit doors were located along a corridor instead of at the end, exit seeking by residents occurred less frequently

(Morgan & Stewart, 1999). As previously discussed, the wood trim and panels attached to the lower portion of resident doors, initially white, were repainted a light green-blue during the final observation.

Artificial lighting. The artificial light within the unit was exclusively produced by ceiling fluorescent fixtures (within an exposed spline system and surface mounted), placing lighting levels primarily at the ceiling plane and significantly above the level of table surfaces where activities or interactions took place. This type of light source is one of the least efficient in delivering adequate lighting levels for activities, communication, and interactions. Individuals with Alzheimer's also have no opportunity to makes changes to the lighting levels with the SCU.

Flooring. The flooring in the unit incorporated two materials causing significant glare. Brawley (2001) revealed that highly reflective flooring or dark flooring created conditions hazardous for individuals with Alzheimer's. The fluorescent lighting, with the reflective surface finish of the flooring, contributed to glare and reflectivity of light potentially confusing or misinterpreted by residents as holes or obstacles. Dark flooring may also appear to residents as holes or obstacles. The living space flooring material presented less sheen, but continued to create glare or reflection with the natural light.

The flooring in the kitchen/activity space had apparent and significant wear and created a "confusing pattern" to residents by its shape and finish creating a potential hazard within the physical environment (Brawley, 2001, p. S79). The wear attracted attention with residents attempting to clean it, pick up what they thought was paper, and tried to move it with their feet.

Person-centered care. Opportunities to create an environment reinforcing person-centered care appear to be neglected; first, in the creation of signage for resident rooms. Signage offered an opportunity for greater personalization by adding visual references to residents' past

experiences and familiarities (Ettema et al., 2007; Normann et al., 1999; Post, 2000). Instead signage was printed on a decorative paper for each resident avoiding visual representation of the *personhood* of the individual (Kitwood, 1997). Second, in the selection of environmental color in walls and furnishings. The physical environment need not be neutral, bland, and functional and careful selections could improve the home-like atmosphere. Third, lighting was institutional at best, underperforming due to the lamp type and ceiling mounted assembly; lack of control to dim or change lighting levels were not provided.

Observations

Unobtrusive direct observation (DO) of the 5-9 residents and a staff presence of one CNA per shift within the unit revealed diverse behaviors with the three most frequent: wandering, communication, and engagement. The researcher was stationed at the seating area found at the intersection of the corridor and the activity/kitchen areas where activities taking place were evident a majority of the time observed. Twenty-seven observations were conducted in 30 minute sessions over a 10 week period resulting in a rich narrative. Organized activities placed residents both in and out of the unit. While in the unit, staff engaged with or guided residents in coloring, folding clothes, reading out loud (by the staff member), and devotionals. As the activity schedule indicated (Figure 18), four to five activities, per day, were pre-planned and while residents were encouraged to participate they were not forced or required. At times, an activity was scheduled but did not take place. Eleven percent of the observed time residents had the choice to participate in an activity out of the unit. The number of residents observed in the unit during the off site activities ranged from two to four residents. During one observation, a resident began to dance around the unit without audible music playing and a staff member noticed his movement and said “that’s some nice dancing” and proceeded to put music on for him. Once

music began playing, another resident began to dance and the staff member asked her "do you know what kind of music this is?" - the resident responded correctly saying "jazz." Music was played within the unit during 11% of all observation sessions, and the television was on during 96% of all observations. Two specific instances recorded staff encouraging residents to watch television to distract their exiting and wandering behaviors. In one instance, a maintenance staff person was trying to exit the unit without causing added stress to a resident stating "let's come and watch television;" the resident was momentarily distracted but then continued the exit attempt. The second instance included the CNA asking two different residents if they wanted to watch television. One was cooperative while the other did not sit but looked outside the glass door continued to wander.

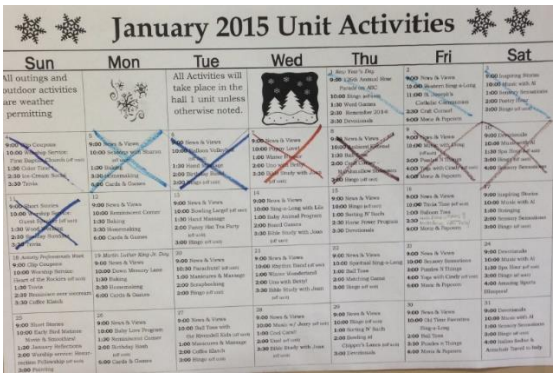

Figure 18. Unit's monthly activity schedule.

Wandering

Wandering or pacing was the most frequent behavior noted during DO, occurring 53 times during 18 observations. Wandering or pacing took place throughout the unit, but primarily followed a specific path back and forth in the corridor (see Figure 19) during 42% of the observed wandering recorded. Residents walked up and down the corridor, at times, stopped and spent a few seconds looking out the door window then continued pacing. Residents also walked (or used a wheelchair) circling the kitchen tables before moving to the corridor pathway.

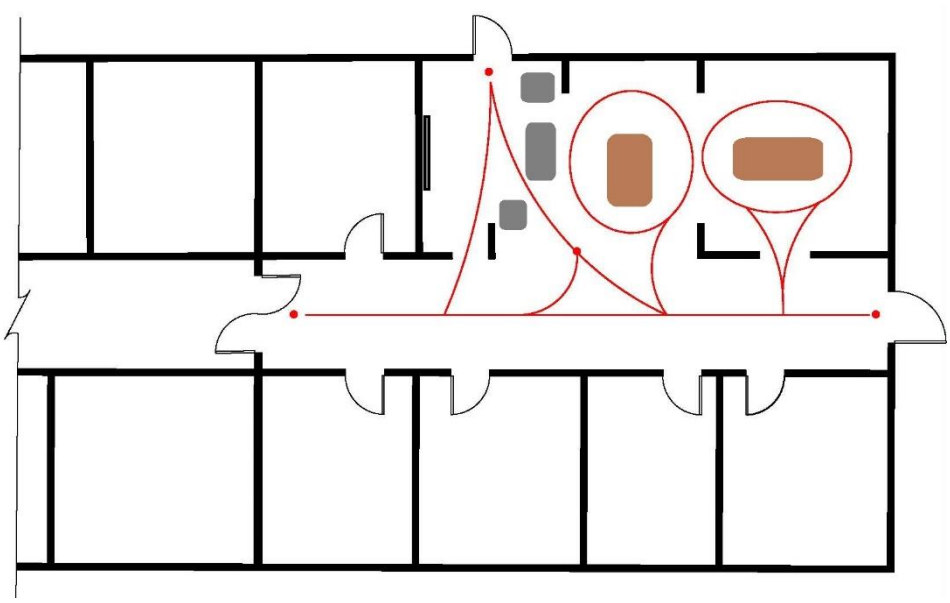

Figure 19. Observed wandering paths of residents.

Communication

Resident communication was the second most frequently occurring behavior observed 51 times. Communications encompassed: resident to resident, resident to CNA, or resident to guest and within the public areas of the unit. Communication as an exchange with others was characterized as positive, with the exception of outbursts or agitated responses. For example, when residents attempted to exit the unit they often vocally communicated their agitation and frustration (e.g., "I need to go home," "help me get out of here," "help me open this door"). Although the resident verbally communicated, these particular actions were not perceived as positive by the staff; staff responded by redirecting or somewhat ignoring these communications. These behaviors have also been defined as negative in the empirical literature (Zeisel et al., 2003). Communication, viewed to be primarily as positive included but were not limited to: thanking someone, saying "hello, how are you?", and talking about the day's schedule.

Engagement

Resident engagement was the third most frequent behavior recorded during observations (26 times). Residents participated in activities, either initiated by an activity staff person, a resident, or a CNA.

During the unit observations, three behaviors characterized as negative in the literature included aggression, confusion, and destruction, occurred the least amount of times.

Aggression

Four occurrences of aggression were documented. One instance was related to a resident experiencing physical discomfort due to abdominal pain. The CNA called for a nurse to evaluate the resident and decide if the resident needed medication. A second instance appeared to be non-specific (i.e., unrelated to specific situation or instigation). One resident was sitting at a table in the kitchen, playing/working with plastic blocks, and another resident walked up to that resident and threw one of the blocks and said "Hey! What are you doing?!" The third instance was related to a resident's attempting to exit the unit. She repeatedly said "I have to go home…" as she pushed on the main exit door with her body or her foot. As a staff member was entering or leaving the unit she would also attempt to leave the unit though unsuccessful. The fourth observed occurrence of aggression happened during the evening. The resident who normally used a wheelchair with seating sensor, was seated on the sofa in front of the television with another resident beside her. She removed the sensor pad from the wheelchair and began wrapping the electrical cord around the arms and wrist of the seated neighbor. The woman became verbally and physically aggressive with the CNA as she attempted to remove the cord from the neighbor to maintain safety.

During observations a consistent time of day when aggression was observed was not documented; rather, these occurrences were infrequent and random.

Behavior frequencies. Each behavior recorded was categorically grouped as follows in alphabetical order:

- *Active movement:* moving the body in ways other than walking (i.e., dancing, rhythmically shuffling feet, and moving/swinging arms);
- *Aggression:* physical or verbal outbursts towards another person;
- *Agitation:* physical or emotional disturbance expressed through body language, facial expression, and/or verbal communication;
- *Cleaning:* moving the hand along a surface - with or without a cloth, picking up objects/debris, and straightening furniture/objects;
- *Communication:* verbally expressing feelings, emotions, thoughts or concerns to another person;
- *Confusion:* exhibiting uncertainty regarding where they were, who someone was, or what specifically was going on in that moment;
- *Destruction:* physically abusing an object;
- *Difficulty remember room location:* difficulty recalling where a location of a person's room, even with name signage mounted on walls adjacent to occupant room;
- *Engagement:* participating in activities, and/or keeping resident's attention on an activity;
- *Entering another resident's room:* accidental or intentional entry to a resident room other than their own;
- *Exit attempt:* pushing against an exit door with foot, body, and/or hand;
- *Physical touch*: hugs, hand holding, gently touching another person's shoulder/back/hand;
- *Self-talk*: singing or talking to oneself without engaging in conversation exchange with another person;
- *Sitting alone*: isolated from other individuals by distance or choice of seating;

- *Socialization*: doing an activity with others, interactive verbal exchange, in a positive way;
- *Touching exit door:* no attempt to exit, but simply touching an exit door;
- *Wandering/pacing:* walking/wheeling through the unit in a non-direct manner, no goal or intention in movement but following a predetermined and repetitive path;
- *Wayfinding cue:* signage, furniture and decorations to enhance a resident's decision-making process determining where to go next; and
- *Wear mark:* interaction by focusing on a mark on surface of materials within unit.

Figure 20 visually summarized relative frequencies of all behaviors observed.

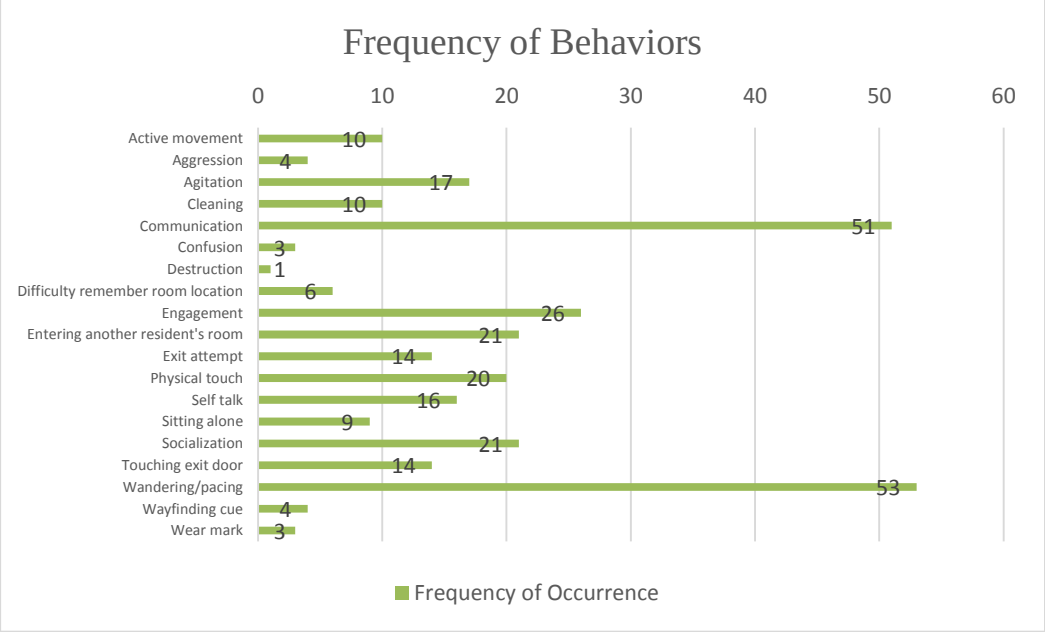

Figure 20. Observed frequencies of behaviors in the SCU.

Discussion of Observations

Research findings revealed behaviors associated with Alzheimer's to include, but not be limited to: verbal and physical aggression, wandering, and anxiety (Zeisel et al., 2003). While observations carried out during this study confirmed the existence of these behaviors among the residents other behaviors, not noted in the empirical literature, were observed. These behaviors included: *cleaning* and *physical touch*. In the majority of observed instances, residents would

initiate a cleaning motion without being motivated by staff while maintaining a pleasant facial expression and body language. Two instances were recorded when a resident was invited by a CNA to help them clean or straighten a space, and the resident did so without complaint. This invitation by staff created a greater person-centered care environment by contributing to the residents increased sense of ownership or stewardship. Research has not examined the connection between these specific behaviors deemed as every day behaviors reflecting activities familiar to a majority of individuals.

Two areas were observed to have an impact on residents: furniture location influencing behavior and maintenance of worn surfaces. Furniture arrangement in the living space provided a seating primarily focused on the television but placed in the pathway to the glass exterior door directly in the site line of television viewing which some residents appeared cognizant. Residents walked to the glass door to either view the outdoor space or attempt to exit and walked directly in front of those seated in front of the television. Due to the diminishing cognition of the residents it was unclear if disruption in site line creates disturbance.

The worn surfaces, especially flooring, appeared to attract more attention from the residents. Replacing worn materials would decrease resident distraction and a condition causing the attention of the resident to place them in a position where they could fall if they tried to clean manipulate the wear marks.

E-Survey

Three female certified nursing assistants (CNA)[4] assigned to the SCU completed the e-Survey (50%). The respondents worked in the health care field for less than five years and worked with individuals with Alzheimer's or dementia for less than four years. Two of the

[4] CNA training can be accomplished in an 8-12 week study course.

respondents (66%) reported their highest level of education to be a high school diploma with Medical Assistant certification[5] and one respondent (33%) reported earning an undergraduate degree at the bachelor's level. Findings were separated into responses concerning behavior/activity and perceptions of the physical environment.

Behavior/Activity

The staff members described a typical day in the unit as:

- "Assisting residents with activities of daily living, keeping everyone busy and calm and attempting to redirect when residents become confused, aggressive and upset;"
- "Assisting the residents with daily care. I change or toilet the residents who need assistance. Conduct activities e.g.: movie, exercise, read a book, sit and talk. And serve meals to all the residents;" and
- "Keeping the residents occupied with many activities."

When asked to list behaviors perceived as associated with a *positive* quality of life for those with Alzheimer's, responses included: happy, communicating with others, experiencing engagement related to activities, "being happy and calm most of the time," wandering around the unit, eating, and having time to explore their area. The response revealed a slight disconnect between staff and resident behaviors related to quality of life and not merely satisfaction of residents. Respondents were then asked to list behaviors associated with a *negative* quality of life for those with Alzheimer's and their responses included: wandering, crying, refusing to eat, being combative with the staff or fellow residents, refusing to participate in activities, rummage[ing] through other's things, or avoid[ing] other residents, hitting, and pushing. These responses appeared to more strongly associate with a negative quality of life than the responses from the previous question.

[5] MA training can be accomplished in a 9 month program of study.

Question 11 asked respondents to rank listed behaviors in the order of desirability for those with Alzheimer's. The top three desirable behaviors included: participating in activities (question did not seek clarification related to how activities were initiated), watching television, and listening to music (Figure 21). The three least desirable behaviors included: exiting, aggression, and rummaging and aligned with responses to the question identifying behaviors associated with negative quality of life. When staff were asked to report how frequently the residents engaged in conversations respondents indicated a range of occurrences. One individual reported very infrequent communication by residents and 66% (n = 2) of respondents reported residents engaged in conversations some the time. The three most frequent behaviors were reported as: watching television, sleeping, and wandering in the corridor. A range of frequencies was found for behaviors including: exiting, rummaging, engaging in conversations, participating in activities, and remaining in room. This range in frequencies could be due to the assigned staff of the SCU, or their perception of their behavior.

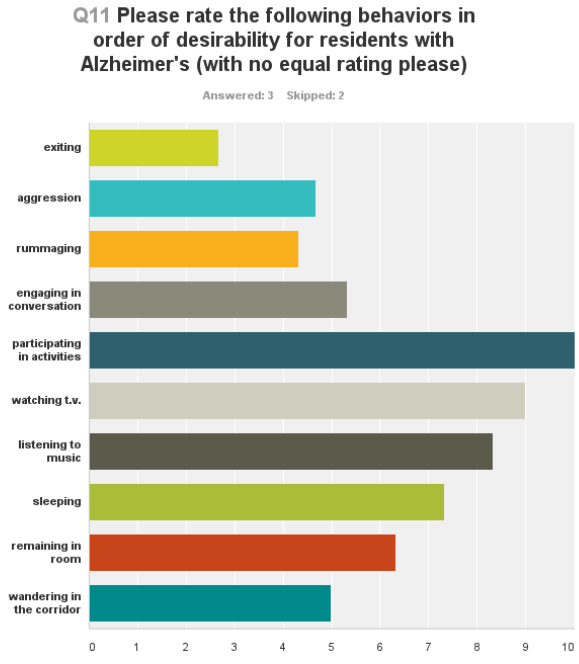

Figure 21. Staff ranking of desirable behaviors for residents with Alzheimer's (10 = most desirable).

Sixty-six percent of respondents stated they had observed sunsetting behaviors, occurring almost daily and included: wandering, attempting escape, confusion, aggression, refusing care, frustrat[ion], hit[ting], kick[ing], and push[ing]. One respondent reported no observation of sunsetting behaviors due to being assigned to the day shift. Staff may not be fully educated on the difference between sunsetting behaviors and behaviors common with Alzheimer's disease so the respondent who stated they have not observed any of these behaviors could perceive these as common behaviors of individuals with Alzheimer's. Staff were asked to rate the degree of aggression related to specific activities such as throwing furniture, banging on surfaces, slamming doors, and breaking an object. A range of residents' aggression was reported in these areas. Staff reported behaviors associated with agitation occurred within the unit (Question 23). Cursing was reported as happening less than once a week to once or several times a day. Verbal aggression, where a resident verbally lashed out at another person, was reported to happen less than once a week to once or several times a week. Hitting took place between once or several times a week to once or several times a day. Pacing or wandering was reported to take place between once or several times a day to a few times an hour or continuously for half an hour or more.

Physical environment

Specific questions examined staff perceptions of the physical environment, referencing the existing SCU, and other care environments provided a color picture prompt.

Utilizing a semantic differential scale, staff were asked to evaluate their perception of the existing unit on a 4-point Likert-like scale from calm to active; respondents perceived the unit as more calm than active (66%).

Referencing a color picture of a care facility patient room (Question 6: Appendix D. e-Survey), staff were asked about specific characteristics of the physical environment. Staff provided the following descriptions:

- "This rooms supports positive quality of life for residents with Alzheimer's because it is a comfortable environment that feels like home, it is decorated in calming colors, has a television for entertainment and an outside area with a garden. All of which support positive quality of life;"
- "Yes, there is a peaceful sense about the room. Not to[o] much happening, television for entertainment, lots of windows with nature outside, privacy available"; and
- "Yes, because they know they have things but they are put away".

Attributes of the pictured physical environment identified as supportive included: home-like atmosphere, connection to nature, available privacy, and a comfortable environment including seating. The responses showcased the range of knowledge within staff pertaining to positive quality of life for residents with dementia.

Question 7 focused on two color pictures of facility public spaces, asking staff to identify physical elements which would also have a positive impact on resident behavior. Responses included:

- "Comfortable seating next to a fireplace in a home-like environment would have a positive impact on resident behavior, because it is a calming environment;"
- "Yes, lots of sitting and well decorated, entertainment available, well lit;" and
- "Yes, because they can do any activities that they would like to do."

Again, staff identified physical elements having a positive impact on resident behavior as a home-like setting with amenities and choices of activity. Staff appeared to understand the high need for home-like atmosphere for residents to achieve a positive quality of life.

When asked what three elements in the physical environment (Question 8) were most important in creating a positive quality of life, responses included: entertainment, comfort/calm

environment, home-like, and windows, and "making sure that they have as many things as they need to, to keep them busy." To further examine conditions in the existing SCU, respondents were asked to reveal specific elements within the unit contributing to a positive quality of life for their residents (Question 9):

- "Quiet home-like atmosphere, television, games, garden area outside, flowers, music and other miscellaneous activities support a positive quality of life;"
- "Entertainment/Activities, Privacy, Calm environment;" and
- "All the activities to keep them busy."

Question 13, posited as a semantic differential regarding the staff perception of the unit as motivating, revealed 66% (n = 2) perceived the unit space as more motivating versus un-motivating.

Exploring characterizations of lighting in the unit, in Question 10 staff rated the *quality* of overhead and table surface lighting in a color picture of a living area in a care facility as adequate and rated (Question 14) the SCU's *level* of lighting as adequate. With regard to lighting quality (Question 15), respondents were given a semantic differential scale. Sixty-six percent (n = 2) perceived artificial light quality within the unit as task supportive rather than task deterring. One-hundred percent (100%) perceived the quality of natural lighting within the unit as supportive to the quality of life of residents. Two respondents (66%) perceived individual task lighting within the unit as supportive rather than a deterrent. When asked to rate the control of lighting levels within the unit relative to quality of life for the residents; 100% of respondents (n = 3) reported control of levels of light to be adequate. Staff may have perceived the SCU as a space with limited changes available thus explaining their responses to the lighting questions.

Inquiring about noise levels within the unit (Question 17), a semantic differential with a 4-point scale from noisy to quiet resulted in responses to noise levels ranging from somewhat noisy to quiet. A follow-up question (Question 18) examined the adequacy of sound control

within the unit; 66% of respondents (n = 2) perceived noise control as adequate with 33% (n = 1) perceiving control as more adequate than inadequate. Question 19 asked respondents to indicate how sound was controlled within the unit. Responses included:

- "The secure unit limits the number of people entering and leaving the unit, keeps music or television on low volume and has a small number of residents that live on the secure unit (up to 10) to control sound level;"
- "Unit is separate from other parts of the building. There is speakers in the dining area for music with volume control. Residents are asked to keep the noise level down on [their] television's in their rooms;" and
- "Our residents in the unit have been known to keep quiet because they don't like loud noise."

Four environmental attributes related to quality of life for residents were evaluated by staff (Question 21) by utilizing a 4-point semantic differential scale ranging from satisfactory to unsatisfactory. Fixed furniture was reported to be satisfactory by all respondents (100%), color contrast, resident orientation and movable furniture were also reported as satisfactory by 33% (n = 1) and more satisfactory than unsatisfactory by 66% (n = 2). These responses, related to the specific environmental attributes, could be contributed to the staff viewing the SCU as one with limited adjustments available to the physical environment.

Investigation into the overall perceptions by staff on the SCU, Question 24 provided staff with a 4-point semantic differential scale rating the unit from satisfying to unsatisfying. Two respondents (66%) perceived the unit as satisfying and one (33%) perceived the unit as more satisfying than unsatisfying. Question 25 sought staff perceptions related to the impact specific elements within the unit had on residents' quality of life (Figure 22). All respondents (100%) perceived materials (e.g., flooring), walls, and signage to bedrooms as supportive of resident quality of life. Access to outside view and visibility of exits were perceived as supportive by two respondents (66%) and more supportive than unsupportive by one respondent (33%). Staff of the

SCU, being responsible for the residents, may have never considered the impact these elements could and did have on residents.

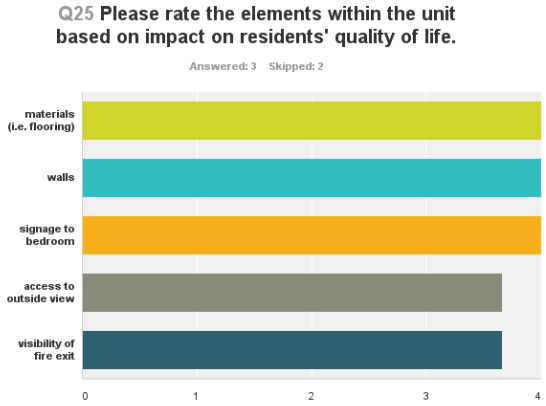

Figure 22. Staff rating of unit elements impacting quality of life (*n* = 3).

Examining improvements within the unit to increase quality of life for residents included responses such as:

- "I would suggest having an additional staff member working in the unit to help with sunsetting behaviors and engage residents while other staff is performing cares;"
- "I think the unit needs to have a larger supply closet so the residents do not have to wait for things they need. Also residents should have more privacy from their roommates;" and
- "Maybe having one more CNA in the unit so there can be more than one person getting the attention that they need."

Staff members reported, when asked why they work in this unit or chose to work with individuals with Alzheimer's or dementia, they noted being assigned or asked by the facility, enjoyment of working in the area of memory care, and a desire to learn about different people and helping with [daily] living activities.

Discussion of e-Survey Findings

Responses by the staff suggested a closer alignment to the medical model in satisfaction regarding the institutional character of the facility (e.g., lack of color and texture, evidence of

wear). Staff may be unaware or too busy to consider changes to increase person-centered care. Staff within the unit have minimal education levels (with one exception) and training focused on specific care for individuals with Alzheimer's at this facility which may also contribute to supporting the norms of the medical model – "keep them busy" in the unit to support ease of care on the part of staff. When asked about changes, responses centered on additional staff, or a larger storage closet so the residents would not have to wait so long for their activity materials. Increased education may add to a greater awareness and knowledge of care for this population.

Respondents stated positive quality of life to be associated with actions such as: watching television and being happy and calm most of the time. Watching television however, negated engagement of the individual with others in socializing but encouragement of this activity was used to keep a person occupied for a segment of time while the CNA completed assigned work or assisted another resident. Efforts to increase socialization and person to person exchanges warrant more one on one time from the staff. The perception of a positive quality of life for residents was manifested as "being happy and calm", again reinforcing care focused on a medical model rather than care of concentrated on a person-centered care approach, such as promoting activities related to residents' personhood. Increasing staff knowledge regarding quality of life for individuals with Alzheimer's may better inform staff promoting choice of actions directed at enhancing meeting the quality of life of these residents.

When queried about the *control* of lighting levels within the SCU, staff reported levels were adequate, but the unit did not contain any controls to vary intensity levels of light. Staff also reported *task* lighting as supportive but within the public spaces of the unit there were no task lights. Suggesting staff attention to what may actually be provided in the unit was not memorable to them.

Research Questions

The first research question focused attention on positive quality of life. The study defined this term as positive behaviors supported by one's physical surroundings creating a living environment directed at acknowledging the person's life experiences, opportunities for choice and decision, and activities replicating prior home/work activities for residents with Alzheimer's or dementia.

Q1: What is a *positive quality of life* for people with dementia?

Environmental physical attributes including daylight, color and texture, furniture placement and amenities recall homelike elements and serve as the foundation for the person-centered care model. Maslow's (1943, 1954) theory of Hierarchy of Needs suggested levels through which individuals move, from basic physiological needs to self-actualization with people motivated to achieve certain levels of need. Although the goal of dementia care is not self-actualization, the importance of sequentially addressing lower level needs (e.g., physiological, safety, and social) is significant to individuals with cognitive impairments such as dementia. In considering, the needs of an individual with dementia, the goal, personhood, may indicate a sequence by which their basic needs might be best met. Further, the need to make connections to the physical environment, with modest attention in the empirical research especially connected to positive behaviors contributing to a positive quality of life literature, invites an understanding of components in the environment creating a homelike, sense of place but also encouraging positive behaviors reinforcing personhood. Given the facility and actions of the staff aligned more closely to an older pattern of care, few connections to creating a positive quality of life could be made.

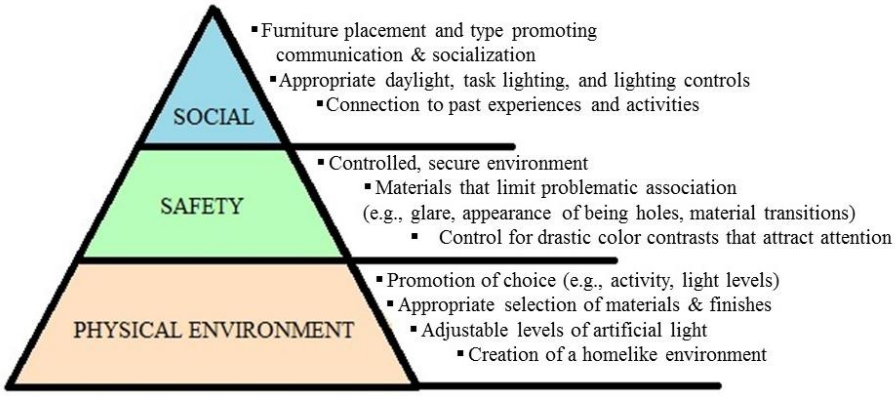

Figure 23. Levels of need to be met impacting positive quality of life for individuals with Alzheimer's and dementia. Each level calls out specific attributes discovered through the study findings.

In this manner positive quality of life can be linked to the concept of person-centered care. Both concepts focus on the acknowledgment and replication of life experiences of the person by creating a familiar and personal environment surrounding the individual. Maslow's underlying theory could be extended (Figure 23) providing a) a physical environment offering choice, b) safety in terms of an environment connecting one's past through activities or behaviors, and in a controlled secure space, and c) a social environment, encouraging communication and socialization. By viewing person centered care and a positive quality of life for individuals with Alzheimer's as interconnected one could create physically and psycho-socially enriching environments for residents of SCUs. The findings suggested some aspects of a positive quality of life were exhibited in the SCU, but others were not, and in fact the survey responses presented a different picture of life in the unit than did the direct observations.

Behaviors promoting positive quality of life acknowledged: communication and engagement with one's surroundings, an environment with spatial attributes similar to those found in home environments, allowances for independence and choice, and behaviors typical for people with dementia, although perhaps considered at the edge of norms for proper behavior

(e.g., loud talking, talking to oneself). Observational data indicated staff accustomed to controlling for outbursts or aggressive actions, and injury and downplaying the extent of communication activity, for example. Staff controlled for disruptive behaviors observed as a norm for dementia care. The physical environment of the unit attempted to replicate an environment similar to reality with functions of space to creating familiarity easing transitions from prior living conditions to the SCU through:

- Use and enjoyment of the living space;
- Making spatial choices in where they wanted to be and what they wanted to do; and
- Encouraging activities as opportunity for engagement and communication.

The survey asked staff to rate specific environmental attributes related to the quality of life of residents. Data confirmed these attributes as evident through observation of resident choice and staff characterizations of space. Staff interaction with residents also reinforced the promotion of resident engagement and communication. However, given staff indications of need for additional help to meet the needs of residents might suggest understaffing as a major contributing factor to actions directed toward control versus opportunity.

The synergistic findings from each of the data collection instruments suggest these residents in fact received care primarily directed toward the medical model and not necessarily constructed to provide person-centered care. Residents were encouraged to watch television instead of completing appropriate tasks that would create enjoyment and connect to their life prior to developing the disease. A deeper examination of each resident's past experiences, talents, and strengths would increase the facility's knowledge related to each resident's person-centered care needs.

Despite the fact this unit was an adaptive renovation of a traditional nursing home wing, the areas created paralleled those of what might be typically considered as 'homelike.' Positive quality of life would be supported by homelike attributes, such as appropriate lighting levels, upholstered furnishings, art, grouped seating at tables and in social groupings to encourage socialization, and amenities including food as well as materials that encourage making, access to the outdoors through windows, passages and exit doors, and color and décor of space to minimize institutional perception.

During the observations, the slight changes in the physical environment produced staff comments such as: "they look nice," "they are incredibly uncomfortable," and "when did they get these?" No awareness of acknowledgement of the change in the environment was observed by the residents. Another change to the physical environment occurred during the last observation. The panel attached to the lower portion of resident doors, closest the main entry doors, and trim work, were repainted from a light beige to a medium blue-green (see Appendix B).

While the first question framed *positive* quality of life, the care model a resident experiences impacts this notion of quality either positively or negatively, suggesting perhaps the question requires restructuring to examine simply quality of life of residents with Alzheimer's. This restructuring would provide a foundation for future research related to various aspects of Alzheimer's care related to the person's well-being.

Q2: Does the physical environment in a Special Care Unit for individuals with dementia-like conditions promote positive behaviors in the residents?

Figure 24 suggests when physical environments for individuals with Alzheimer's offer choice residents become one 'step' closer to their positive quality of life and the potential for an increase in positive behaviors.

The physical environment of the SCU, impacted residents' quality of life by promoting positive behaviors through furniture allocation, natural lighting, and schedule signage. The schedule signed sought to promote socialization and engagement of residents. Areas that contributed to negative behaviors included: variation in flooring height and color, finishes and wayfinding signage.

Furniture within the space created pathways for residents to move through the unit and created potential social spaces to encourage interaction and communication. However, pathways crossing the line of vision of residents watching television, for example, worked at odds to creating a place for actual socialization to be uninterrupted. The placement did generate choices for residents with greater cognitive capacity to make the decision to locate themselves in the television seating area, but for those who were directed by staff to sit in this area, and those wandering through the area, this diminished the level of socialization that occurred.

Areas with greater amounts of lighting, whether natural or artificial, appeared to attract residents to that location. Residents often sat at one of the kitchen tables and played cards, worked puzzles, colored/drew, ate, or simply sat. This space provided the greatest variation in light levels with a combination of overhead fluorescents with natural lighting supplied by the windows. In addition to the kitchen area, the living space benefitted from daylight as well. At times residents sat in the living area and looked outside initiating a verbal communication between other residents. On days when the sun caused harsh glare in the living area, the woven shade was lowered and appeared to decrease distraction or agitation of the residents. The shade

(Appendix B) allowed the residents to partially see outside, but filtered daylight coming into the unit. An additional aspect of the physical environment that promoted positive behaviors of residents was the layout of the facility and furniture. The open layout of the unit's activity area and kitchen space allowed residents to view their destination options from the corridor node if they were walking the corridor and provided the CNAs visibility of most residents while in these spaces. Table 1 summarizes the intersection of behaviors with physical elements in the SCU. Key areas of the physical environment in the SCU mimicked areas of home, in a direct way, without apparent divisions of space to confuse or agitate residents. Communication exchanges reflected the second highest behavior over the 10 week span of observations with these instances highest among resident to resident (54%) versus the lowest resident to staff (4%) (see Table 1).

Table 1

Observed Positive Behaviors of Residents and Location(s) of Activity

	Cleaning	Verbal Communication	Engagement	Helping	Physical touch
Door	Wiping corridor doors with towel	"Do you know how to get out of here?"			Takes hand and brings away from door
Hall	Wiping doors and walls with towel	One stationary & one moving through hall-wandering		Mobile helps wheelchair resident move over threshold	Holding hands as walking, hug, touch knee, rubbing hand, hand on arm
Table	Wiping, straightening chairs, dusting, removes dishes after meal	Kitchen table(s)-during activity, meal, or alongside staff	Kitchen table(s)-drawing/coloring, activities in unit, folding clothes, UNO, puzzles, cleaning	Pushing another resident's chair in while he/she is sitting in it	Kitchen table(s)-patting hand or shoulder
Living	Wiping floor with hand, picking up small pieces of paper	Sitting beside another on sofa	Sofa-television unit activity	Pulls jacket back on other's shoulder, helps with jacket zipper	
Quotes		"Feel better than yesterday?", "How are you?", "Good to see you", "What time is it?", "I need/have to go home", "I don't know where to go", "I don't know what to do"			

Spatial interfaces were also observed to instigate negative behaviors. The black transition piece, covering the seam between flooring types, created frustration and deterred smooth transition and movement through the space for mobile as well as wheelchair bound residents. Through body language and facial expressions, residents manifested their frustration related to this struggle, but became persistent in moving in the direction originally intended. At times, though, this struggle encouraged positive behaviors in another resident as one, fully mobile, resident would help the resident in a wheelchair get over the transition piece. That action

appeared to increase happiness, if only momentarily, of the residents involved and increased interaction between the two.

Finishes with high degree of reflectivity potentially contributed to negative behaviors of the residents. Although glare and reflectivity were not specifically examined within the study, empirical research suggests glare can increase confusion among individuals with Alzheimer's (Brawley, 2001).

Existing wayfinding signage within the SCU potentially contributed to negative behaviors of residents due to the lack of differentiation between room signage. With no variation between signage, at times residents became confused with where their private room was located. CNAs would point out the signage to the resident during times of increased confusion and uncertainty of room location.

Differences in Staff Responses versus Observed Behaviors

Having a staff survey and direct observations allowed for a comparison revealing inconsistencies was well as commonalities between perceived and actual behaviors of residents. Communication and resident wandering were the most inconsistent perceptions between survey responses and observational records.

Communication

Observational data revealed differences in the occurrences of communication among residents when compared to staff responses. While 51 instances, occurring in 19 observational sessions, of resident engagement in communication were observed (see Figure 7), staff perceived communication as occurring very infrequently. This contrast in results began to demonstrate staff actions as potentially inured to the positive behaviors of residents. Communication, as a positive behavior took place while residents wandered or paced, negative behavior, through the unit and

as they passed another resident, CNAs, or the observer. Communication among passing residents was short and at times and seemed irrelevant to happenings within the unit. For example, a resident stopped another resident's husband in the corridor and asked "do you know how high the cars are?" The location of the 'television' seating prompted communication among residents sitting near the glass door leading to the walking garden. These residents talked about the weather outside, animals that would walk past the door, or one would talk about going outside creating an interactive social interface – certainly indicative of personhood.

Wandering

Staff were asked about the occurrences of wandering in the unit based on a scale where 1 represented very infrequent wandering and 4 represented very frequent wandering. Two respondents (66%) rated wandering of the residents at a scale of 8 out of 10; one respondent (33%) rated this behavior as a 9 out of 10. This behavior occurred most frequently during observations (53 times) of residents. Figure 8 visually illustrated path(s) residents took during their wandering or pacing in the unit. The majority of wandering or pacing behavior took place in the corridor of the unit. During resident wandering, the individuals often stopped at the exit door to look outside for a moment. Residents were considered to be wandering if they covered the same floor space more than twice during the course of one observational time frame. Frequency of behavior was also counted when the resident moved away from the major wandering path. Although differentiation of resident doing the wandering was not noted, six out of the nine residents contributed to the frequencies of wandering behaviors.

The physical environment created the wandering path taken by residents given the long corridor and furniture layout of the activity area. The furniture layout caused residents to pass in front of those watching or sitting in front of the television as they were walking to the glass door

leading to the garden. Although this SCU was adapted from the existing nursing facility, it may be worthwhile to enhance socialization by relocating or enhancing the 'living area' to change this condition. Pathways created within the unit enabled movement through the space but care should be taken in spacing furniture to allow for fluid movement for those in wheelchairs in order to reduce frustration of residents.

Behavioral-Physical Interaction

Findings derived from the data collected investigated the intersection of behavioral-physical interactions. Few intersections were be identified outwardly indicating a key relationship critical to reinforce person-centered care. Potential relationships indicating promise include:

- Spatial location of recurrent resident communication points;
- Opportunities where furniture or objects were added or deleted; and
- Locations of lounge type seating and furniture in general influencing movement.

Summary

The study revealed minimal connections between the physical environment and behaviors contributing to positive quality of life for individuals living in the SCU and reinforcing person-centered care versus the medical model. Lighting, color contrast, and facility layout had the greatest impact and the potential to influence resident behavior. Observational data revealed inadequacies of lighting, materials, and color to meet the needs of residents with dementia producing glare, perceived 'holes' with dark colors or materials were encountered, and institutional materials versus those providing a home-like environment.

For design practitioners engaged in the design of these special units, empirical evidence applied during planning and design stages would inform the spatial structure, space allocation, and the creation of activity spaces enhancing the resident experience and at the same time

providing a therapeutic environment. A void remains regarding empirical research surrounding measures reinforcing the positive behaviors of individuals with Alzheimer's. Armed with such information, designers and architects would be empowered to shift the focus during early design stages toward providing spaces promoting positive behaviors to support person-centered care during the design process. By promoting positive behaviors the physical environment may contribute to a reduction of negative behaviors.

CHAPTER V

SUMMARY AND RECOMMENDATIONS

This study sought to identify relationships between behaviors and the physical environment for individuals in a SCU with Alzheimer's or dementia. Through data collected from the spatial inventory, observational data, and survey responses, analysis of qualitative and quantitative data contributed to the development of a snapshot of life in a SCU. The physical environment was found to shape certain behaviors by the residents including micro-focusing on materials transitions, communicating, and even the path taken for wandering. The findings also revealed several issues meriting further discourse: the construction of meaning relative to positive quality of life, the model of care supported by the SCU, attributes important in facility renovations for dementia care, and caretaker understanding of dementia care supporting personhood. The findings reshaped thinking about the initial conceptual model, drawn from the literature, adaptations based on findings.

Positive Quality of Life Influenced by Evidenced Care Model

Defining the meaning of positive quality of life is a complex process particularly when working with a population diagnosed with Alzheimer's. Figure 24 shows the trilogy of staff perceptions and actions, resident behaviors, and the physical environment which shapes, when all things are headed toward a person-centered care and positive quality of life for residents of SCU's serving individuals with dementia conditions. However, achieving a state where the physical and socio-behavioral environment align to form a supportive environment is fraught with failure when staff are unaware of their behaviors or take action which negate the development of an individual's personhood. As noted throughout the analysis, actions by staff

support a medical model of care rather than creating and environment in which positive behaviors supported by physical surroundings create a living environment acknowledging the person's life experiences, provide opportunities for choice and decision, and offer activities replicating prior home/work activities for residents with Alzheimer's or dementia.

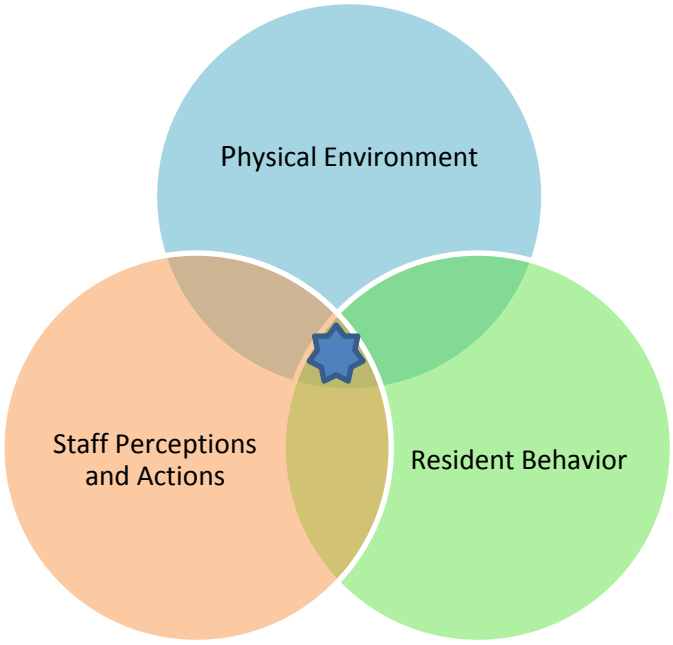

Figure 24. Intersection where positive quality of life is attainable.

Model of Care: The Reality

The study revealed the presence and institutionalization of a medical model of care focused on managing behaviors versus promoting communication and socialization. These characteristics included: distraction instead of engagement of residents, lack of personalization in physical environment and care, along with an apparent disconnect to the individuals' life prior to developing the disease. As a medical model of care, actions taken by staff did not allow for optimum engagement of the residents but rather encourages a minimization of negative behaviors. Removal of negative behaviors, within this population, is desirable but unrealistic due

to the cognition of these individuals and their gaps in connecting reality to the present given mental deterioration.

Physical inventory findings revealed an absence of personalization and connection to residents' past experiences. Survey responses confirmed misunderstanding of what was entailed in constructing a positive quality of life for individuals with Alzheimer's. Staff's perceptions were more closely related to the medical model with a concentration of actions directed toward deterring negative behaviors instead of emphasizing the positive characteristics of behavior. Observational data revealed similar aspects of care, such as encouraging television watching instead of engagement and keeping residents busy to allow the staff to finish their own work tasks unrelated to interaction with the residents. It is also interesting that staffing levels have a high resident to staff ratio, yet time spent with such interactions was minimal.

The Physical Environment in Dementia Care

The physical environment impacts resident behaviors. Spatial layouts and replication of home-like qualities and space use need to be evident. Encouraging communication and socialization, rather than vacant stares at a television set would reinforce a person-centered approach. Given the wandering and rummaging activities that are demonstrated with the disease, creating a wandering path with views or nodes of interest would cause residents to reflect or stop; this path could also be supplanted with 'rummage stops' to add curiosity and exploration to their actions. Placing seating in the wandering path did not cause interactions to occur, but rather these social spots should be created as destinations.

Construction and maintenance issues were noted in the SCU. Inconsistent flooring transition height, inadequate artificial lighting, color palette, and facility maintenance require care and attention to promote home-like qualities for individuals with dementia-like conditions.

This attention could contribute to increased socialization of residents, decreased fall risks, and an overall increase in positive behaviors of residents.

Care Giver's Knowledge

The knowledge and *understanding* a care giver has for the population he or she is caring for is vitally important. Understanding what the individuals need both physically and psycho-socially contribute to their well-being. A care giver armed with appropriate and significant knowledge for their 'patients' can potentially make their job easier by being proactive. This knowledge should also encompass elements of care that have the potential to impact a resident's positive quality of life such as how to encourage communication or activities that would place them in communication opportunities with staff or other residents

Invisible Behaviors

Research has no specifically examine two behaviors observed in the SCU of individuals with Alzheimer's and were discovered during the study: cleaning and physical touch. These behaviors, when performed by a fully cognitive person, are not significant to research their potential impact on quality of life. Individuals with dementia have a unique psychological need that cleaning and physical touch appear to fulfill; these are actions that were certainly part of their lives for a majority of individuals and they are recalled as their mental cognition declines. Both behaviors likely connect the individual with their life prior to the disease and potentially contribute to their individual positive quality of life.

Positive Behaviors

The majority of behaviors examined in the empirical literature primarily has focused on those associated with negative behaviors. This empirical focus on negative behaviors may have

been influenced by the medical model utilized in so many care facilities in the past, but certainly offers opportunity to connect the care environment with that of a person-centered care model.

Study Limitations

This case study must be recognized for its limitations in subject, participation of staff, rigor, and findings. The study focused efforts on one facility in Fort Collins, Colorado with a SCU housing individuals with Alzheimer's or dementia. The severity of Alzheimer's in each individual living in the unit was unknown to protect residents' privacy. Data collection also took place during the winter, one season of four experienced in Colorado, accommodating academic timelines. A year-long investigation might reveal different behaviors and interfaces due to varying environmental conditions within and outside the unit. Areas of deeper investigation also became more apparent once observations were initiated. For example, although color *contrast* was examined, for example, the specific application of color within the physical environment and its relative impact on residents was not examined.

The survey language and that of the observational tool reflected inconsistencies in terms; the survey utilized the term *conversation* while the observation utilized the term *communication*. Deeper examination and pilot testing of the tools prior to implementation may have revealed this inconsistency in terminology.

Challenges Encountered

The population examined within this study posed their own limitations for data collection. The cognitive abilities of individuals with late stage dementia limited direct inquiry with residents for interview or in-depth communication. This population, considered vulnerable, received a high degree of protection not only from administrators of the unit but also consistent

with IRB protocol requirements. Protection from added anxiety and agitation caused by research observers within the unit limited data gathering procedures.

Another limitation that must be considered was the response rate of the staff dedicated to the unit. The number of staff with assignments in the unit included a small number of individuals (n = 6) therefore the response rate appeared extremely low and only included three individuals or 50% of these individuals. Staff dedicated to the unit had a multitude of responsibilities during their shift potentially reducing their available time to complete the survey; but it should be noted three staff members did not take the effort to take the survey. Administrators intended to have the staff complete the survey on company computers and during the staff member's work shift.

Instrumentation

Instrumentation selection for this study was guided by the population characteristics. The e-Survey may have met with greater import if pre-tested for content reliability. After an initial pre- or pilot test, the survey might have been adjusted to improve comprehension by the respondent on the topics of inquiry. Direct unobtrusive observation was successful as a means to gathering data, however, the observational instrument might have been expanded to include other indicators of residents' positive quality of life, longer time period for data collection in one sitting, and photos of the existing physical environment from each observation. Photos could allow the researcher to visually see how the unit changed from visit to visit, adding validity.

Recommendations for the Facility

Specific areas within the unit, once changed, could increase positive behaviors thus impacting residents' quality of life:

Flooring

The flooring in the unit, as previously discussed, showed wear, was inconsistent in type and color, and created various hazards for the residents. Replacing the flooring material throughout the unit, including resident rooms, would provide a consistent color, sheen and level for the residents to utilize. Extreme care should be taken during the selection process to avoid glare and reflection from the flooring surface. If chosen correctly, the flooring material and light fixtures and lamps could potentially work together and create minimal glare within the unit.

Lighting

The lighting within the unit should include fixtures supplying task oriented light (e.g., table or floor lamps) in addition to overall light. Fixtures providing dimmable light should be included within the unit to aid in proper lighting for residents.

Artwork

Currently, the unit's walls primarily showcase generic art work, but by changing these pieces to specifically appeal to current residents a stronger home-like atmosphere could be created. If a resident painted or drew pieced prior to developing the disease, the unit potentially could showcase these pieces and create a connection to the resident's long-term memory. Art that resident complete during their stay within the unit could be displayed in a more organized and appealing fashion creating more home-like characteristics.

Room signage

The signage for each resident's room was a missed opportunity to display specific and personal attributes of each resident (i.e. hobbies, family, religion, and career). These attributes could create a stronger connection between the resident and their room location. Visually

displaying characteristics of the personhood of the resident would increase person-centered care and potentially increase the residents' wayfinding.

Color

The change in color of the door panels and wall trim yielded an opportunity for the facility to note any behavioral changes in residents related to exit seeking and attempts. A step further in contributing to decreasing exit seeking and attempts by residents would include painting the main doors, leading to the main facility, a color creating less contrast to the wall color.

Future Research

Three areas for future examination can be identified regarding the interface of behavior and physical environments of individuals residing in an SCU. First, lighting design has the potential to impact positive behaviors, and by understanding the color and quality of lighting for this population, positive behaviors have the potential for promotion rather than deterrence. A future examination of artificial and natural lighting, in combination, as well as independent from one another may reveal different behavioral conditions.

Second, investigation into the application of environmental color and texture as it relates to these SCUs may potentially increase an understanding of the relationship between the physical environment and residents' behaviors. Findings from a direct examination of color and texture could better educate designers on their materials and finishes selections and the potential impact their decisions can have on the residents.

Finally, examining the connection between quality of life and cleaning for SCU residents with Alzheimer's. The act of cleaning appeared to create a greater sense of ownership and

stewardship. By examining this task, person-centered care within SCUs could create this greater sense of ownership among residents.

Implications

This study provided an opportunity to gain initial understanding of the relationship between the physical environment and behavioral characteristics of individuals with Alzheimer's residing in one specific SCU. The study revealed new areas of needed empirical research potentially helping to justify changes to the physical environment experienced by those with Alzheimer's in order to promote positive behaviors and increase quality of life. Findings from this study invite replication and expansion of procedures and findings to inform facilities on how to change the physical environment to better assist their residents in maintaining a positive quality of life.

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APPENDIX A

Studies Examining Behavior and Physical Space

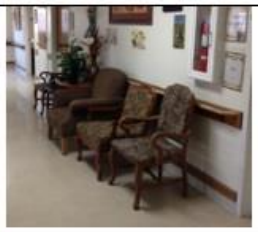
Author, year	Source	Behavior	Physical Space	Both
Alessi, Yoon, Schnelle, Al-Samarrai, & Cruise, (1999)	*Journal of the American Geriatrics Society*	X		
Ancoli-Israel, (2003)	*Behavioral Sleep Medicine*			X
Barnes, (2002)	*Ageing and Society*		X	
Brawley, (1992)	*American Journal of Alzheimer's Disease and Other Dementias*		X	
Brawley, (2001)	*Aging and Mental Health*		X	
Cama, (2013, July)	*Healthcare Design Magazine*		X	
Cohen-Mansfield, Marx, & Rosenthal, (1986)	*Journal of Gerontology: Medical Sciences*	X		
Cohen-Mansfield, Thein, Marx, Dakheel-Ali, Murad, & Freedman, 2012	*The Journal of Clinical Psychiatry*			X
Curyto, Van Haitsma, & Vriesman, 2008	*Research in Gerontological Nursing*	X		
Daly, McCarron, Higgins, & McCallion, (2013)	*Journal of Clinical Nursing*	X		
Devlin, & Arneill, (2003)	*Environment and Behavior*		X	
Dickinson, McLain-Kark, & Marshall-Baker, (1995)	*The Gerontologist*	X		X
Dilani, (2001)	*Scandinavian Healthcare Design World Hospitals and Health Services*		X	
Elmstahl, Annerstedt, & Ahlund, (1997)	*Alzheimer Disease and Associated Disorders*			X
Evans, (2003)	*Journal of Urban Health: Bulletin of New York Academy of Medicine*		X	
Garce, (2002)	*Journal of Interior Design*			X
Gruber-Baldini, Boustani, Sloane, & Zimmerman, (2004)	*Journal of the American Geriatrics Society*	X		
Gu, Zhang, & Hu	*Culture Computing*		X	
Hanford, & Figueiro, (2013)	*Journal of Alzheimer's Disease*		X	

Helmes, Csapo, & Short, (1987)	*Journal of Gerontology*	X		
Marquardt, (2011)	*Health Environments Research & Design Journal (HERD)*		X	
Marquardt, & Schmieg, (2009)	*American Journal of Alzheimer's Disease and Other Dementias*		X	
Morgan, & Stewart, (1999)	*Qualitative Health Research*		X	
Netten, (1989)	*International Journal of Geriatric Psychiatry*		X	
Olinger, (2012)	*Journal of Interior Design*		X	
Passini, Pigot, Rainville, & Tetreault, (2000)	*Environment and Behavior*			X
Passini, Rainville, Marchand, & Joanette, (1998)	*Journal of Architectural and Planning Research*			X
Reisberg, Borenstein, Salob, Ferris, Franssen, & Georgotas, (1987)	*Journal of Clinical Psychiatry*	X		
Volicer, Harper, Manning, Goldstein, & Satlin, (2001)	*American Journal of Psychiatry*	X		
White, M. (2014)	*Environments for Aging Magazine*		X	
Zeisel, Hyde, & Levkoff, (1994)	*The American Journal of Alzheimer's Care and Related Disorders & Research*			X
Zeisel, Silverstein, Hyde, Levkoff, Lawton, & Holmes, (2003)	*The Gerontologist*			X

APPENDIX B

Spatial Inventory Form

Space	Floor	Base	Walls	Doors	Casework
Hall	12x12 VCT beige tile	Beige vinyl baseboards	Textured beige	Wood or wood veneer, bottom half painted white	Wood chair rail, wood handrail, metal doorframe
Image				 	
Living	Wood laminate		Textured beige	1 to exterior (walking/garden)	
Image					
Dining/ Kitchen	Vinyl (looks like 12x12 tile)	Dark beige vinyl baseboards	Textured beige	No doors. Several windows (slide sideways instead of up and down)	Wood chair rail

Image	 				
Space	**Seating**	**Lighting**	**Ceiling**	**Other**	
Hall	3 chairs all upholstered	2x4 fluorescents	2x4 ceiling tile	Glass door at end or hall. Double wood doors-entry	
Image					
					
Living	Faux leather sofa, arm chair	fluorescents	drywall	TV & movies	
Image					
Dining/ Kitchen	Upholstered chairs, 2 types.	fluorescents	drywall	2 large wood tables	
Image					

APPENDIX C

Observation Form

Date: _____

Time: _____

Duration of observation: _____

Auditory environment: Music playing: Yes No Conversations: Yes No

Weather (description):

_____

Activity Behavior	Individual	Spatial interaction (area, contact)	Notes
Wandering			
Agitation			
Interaction			
Interruption			

Activity Behavior	Individual	Spatial interaction (area, contact)	Notes
Social Communication			
Engagement			
Sun setting			
Physical aggression (social)			
Physical aggression (self)			

Activity Behavior	Individual	Spatial interaction (area, contact)	Notes
Moving Furniture			
Stationary Behavior	**Individual**	**Spatial interaction (area, contact)**	**Notes**
Sitting alone			
Sitting with other(s)			
Singing/humming (alone)			

APPENDIX D

Staff e-Survey

Patterns of behavior in Alzheimer units: Examining the role of physical

Dear Participant;

I'd like to introduce myself; my name is Christine Apple and I am a graduate student conducting my thesis research at Colorado State University in the Design & Merchandising department. We are conducting a research study on the relationship of the physical environment and behaviors of individuals with dementia-like diagnoses within special care units. We believe that characteristics of the physical environment can promote or deter quality of life. The project is called Patterns of Behavior in Alzheimer Units: Examining the Role of the Physical Environment Interface. The Principal Investigators are Dr. Katharine E. Leigh and Dr. Laura Malinin; I am the Co-Principal Investigator.

We would like to invite you to share your thoughts about your experience with the special care unit by participating in an anonymous online survey which will take approximately 30 minutes. Your participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent and stop participation at any time without penalty.

We will not collect your name or personal identifiers. When we report and share the data with others, we will combine the data from all participants. While there are no direct benefits to you, we hope to gain more knowledge on how the physical design of Alzheimer's care units can improve and benefit the resident and staff in creating an improved quality of life for residents.

While there are no known risks in your participation, it is not possible to identify all potential risks in research procedures, but the researchers have taken reasonable safeguards to minimize any known and potential (but unknown) risks.

Should you have any questions about the research, please contact me at Christine.Apple@colostate.edu. If you have any questions about your rights as a volunteer in this research, you may contact Evelyn Swiss, CIP ,IRB Coordinator, at 970-491-1381. Again, thank you very much for supporting research focusing on Alzheimer care and the completion of my graduate studies.

Sincerely, Christine Apple, Graduate Student

1. Please indicate your decision to participate in this study.

- I choose to participate in this study
- I choose to not participate in this study. I have not worked in the special care unit
- I choose to not participate in this study. I do not wish to be a part of this study.

Patterns of behavior in Alzheimer units: Examining the role of physical

This study asks you to think about the secure unit for individuals with dementia or Alzheimer's.

In this study 'positive quality of life' is defined as the reduction of negative behaviors and disturbance of residents, and an increase in autonomy

In this study elements in the physical environment include the structure, furniture, fixtures and equipment (FF&E), items people can touch or interact with

In this study sunsetting behaviors are defined as confusion, aggression and restlessness among individuals with dementia or Alzheimer's during the sun setting hours.

Patterns of behavior in Alzheimer units: Examining the role of physical

***2. In your own words, please describe a day in the unit.**

***3. For residents with Alzheimer's or dementia, please describe behavior you perceive as supportive of a POSITIVE quality of life.**

***4. For residents with Alzheimer's or dementia, please describe behavior you perceive as associated with a NEGATIVE quality of life.**

***5. Please use the word pairs below to characterize your perception of the existing unit.**

calm				active

Please view the following image and answer question 6

***6. Looking at the picture above, does this room support positive quality of life for residents with Alzheimer's? How? Please describe.**

Patterns of behavior in Alzheimer units: Examining the role of physical

Please view the following two images and answer question 7

Please view the following image and answer question 7

***7. In the photos above, are there physical elements that would have a positive impact on resident behavior? Please describe.**

***8. From responses to Question 6, what three elements in the physical environment are most important to creating a positive quality of life?**

Patterns of behavior in Alzheimer units: Examining the role of physical

***9. In the secure unit within your facility what physical elements support a positive quality of life?**

Please view the following image and answer question 10

***10. In the picture above, please rate the quality of overhead and table surface lighting in the space.**

	adequate			inadequate
overhead and table lighting				

Patterns of behavior in Alzheimer units: Examining the role of physical

***11. Please rate the following behaviors in order of desirability for residents with Alzheimer's (with no equal rating please)**

	least desirable									most desirable
exiting										
aggression										
rummaging										
engaging in conversation										
participating in activities										
watching t.v.										
listening to music										
sleeping										
remaining in room										
wandering in the corridor										

***12. How frequently to these behaviors occur daily within the secure unit? (with no equal rating please)**

	very infrequent				some of the time					very frequent
exiting										
aggression										
rummaging										
engaging in conversation										
participating in activities										
watching t.v.										
listening to music										
sleeping										
remaining in room										
wandering in the corridor										

***13. Please use the word pairs below to characterize your perception of the existing unit.**

unmotivating			motivating

***14. Please rate the control of levels of light within your secure unit related to quality of life for residents:**

adequate			inadequate

Patterns of behavior in Alzheimer units: Examining the role of physical

***15. Please rate the lighting quality within your secure unit related to quality of life for the residents:**

	support tasks			deters tasks	N/A
Artificial lighting					
Natural light					
Individual lighting					

***16. In your experience within the secure unit, have you observed sunsetting behaviors from the residents? If so how frequently and what behaviors?**

***17. Please use the word pairs below to characterize your perception of the existing unit.**

noisy			quiet

***18. Please rate the control of sound within your secure unit related to quality of life for the residents:**

adequate			inadequate

***19. Please describe how sound is controlled within the secure unit.**

***20. Are there improvements you would suggest specifically to improve residents' quality of life in the secure unit? Please describe.**

***21. Please rate the following environmental attributes for your secure unit related to quality of life for the residents:**

	satisfactory			unsatisfactory
Fixed furniture				
Color contrast				
Resident orientation				
Movable furniture				

Patterns of behavior in Alzheimer units: Examining the role of physical

***22. Please rate the degree of aggression you have observed in the unit.**

	aggressive			not aggressive
throwing furniture				
banging on surfaces				
slamming doors				
breaking an object				

***23. Below is a list of behaviors considered as agitated. Please indicate how often they are manifested in the unit by residents over the past 2 weeks.**

	Never	Less than once a week	Once or several times a week	Once or several times a day	A few times an hour or continuous for half an hour or more
Cursing					
Verbal aggression					
Hitting (including self), Kicking, Pushing, Biting, Scratching, Aggressive Spitting (include at meals)					
Other aggressive behaviors or self-abuse including: intentional falling, making verbal or physical sexual advances, eating/drinking/ chewing inappropriate substances, hurt self or other					
Pacing, aimless wandering, trying to get to a different place (e.g., out of the room, building)					
Repetitive sentences, calls, questions or words					

***24. Please use the word pairs below to characterize your perception of the existing unit.**

unsatisfying			satisfying

***25. Please rate the elements within the unit based on impact on residents' quality of life.**

	not supportive			supportive
materials (i.e. flooring)				
walls				
signage to bedroom				
access to outside view				
visibility of fire exit				

Patterns of behavior in Alzheimer units: Examining the role of physical

***26. Please indicate your gender?**

- male
- female
- prefer not to disclose

***27. How many years have you worked in the health care field?**

- Less than 5 years
- 5-10 years
- 10-15 years
- more than 15 years

***28. How many years have you worked with individuals with Alzheimer's or dementia?**

- 0-4 years
- 5-9 years
- 10-14 years
- 15 or more years

***29. Other than this facility, please check the types of patient care experiences in which you have interacted with an individual(s) with Alzheimer's or dementia?**

- Family
- Relative
- Friend
- Co-worker

Other (please specify)

***30. Please rate your level of work satisfaction using the following scale:**

	satisfied			unsatisfied
work satisfaction				

***31. Using the following scale, please rate your level of satisfaction in working with individuals with Alzheimer's or dementia:**

	satisfied			unsatisfied
Alzheimer's care satisfaction				

Patterns of behavior in Alzheimer units: Examining the role of physical

***32. Please select the highest level of education attained:**

- High school
- Undergraduate
- Graduate
- Doctorate

Other (please specify)

***33. What type of training resulting in a degree or certificate do you currently hold?**

- LPN
- RN
- AA
- BA/BS
- MA/MS
- PHD
- MD
- MPH
- Medical Assistant

Other (please specify)

***34. Why did you choose to work with individuals with Alzheimer's or dementia:**

APPENDIX E

Colorado State University
Knowledge to Go Places

Research Integrity & Compliance Review Office
Office of the Vice President for Research
321 General Services Building - Campus Delivery 2011 Fort Collins,
CO
TEL: (970) 491-1553

NOTICE OF APPROVAL FOR HUMAN RESEARCH

DATE:	December 03, 2014
TO:	Leigh, Katharine, 1574 Design and Merchandising Apple, Christine, 1574 Design and Merchandising, Malinin, Laura, 1574 Design and Merchandising, Miller, Nancy, 1574 Design and Merchandising
FROM:	Swiss, Evelyn, Coordinator, CSU IRB 2
PROTOCOL TITLE:	Patterns of behavior in Alzheimer units: Examining the role of the physical environment interface.
FUNDING SOURCE:	NONE
PROTOCOL NUMBER:	14-5069H
APPROVAL PERIOD:	Approval Date: December 03, 2014 Expiration Date: November 02, 2015

The CSU Institutional Review Board (IRB) for the protection of human subjects has reviewed the protocol entitled: Patterns of behavior in Alzheimer units: Examining the role of the physical environment interface. . The project has been approved for the procedures and subjects described in the protocol. This protocol must be reviewed for renewal on a yearly basis for as long as the research remains active. Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.

If approval did not accompany a proposal when it was submitted to a sponsor, it is the PI's responsibility to provide the sponsor with the approval notice.

This approval is issued under Colorado State University's Federal Wide Assurance 00000647 with the Office for Human Research Protections (OHRP). If you have any questions regarding your obligations under CSU's Assurance, please do not hesitate to contact us.

Please direct any questions about the IRB's actions on this project to:

IRB Office - (970) 491-1553; RICRO_IRB@mail.Colostate.edu
Evelyn Swiss, IRB Coordinator - (970) 491-1381; Evelyn.Swiss@Colostate.edu

Swiss, Evelyn

Evelyn Swiss

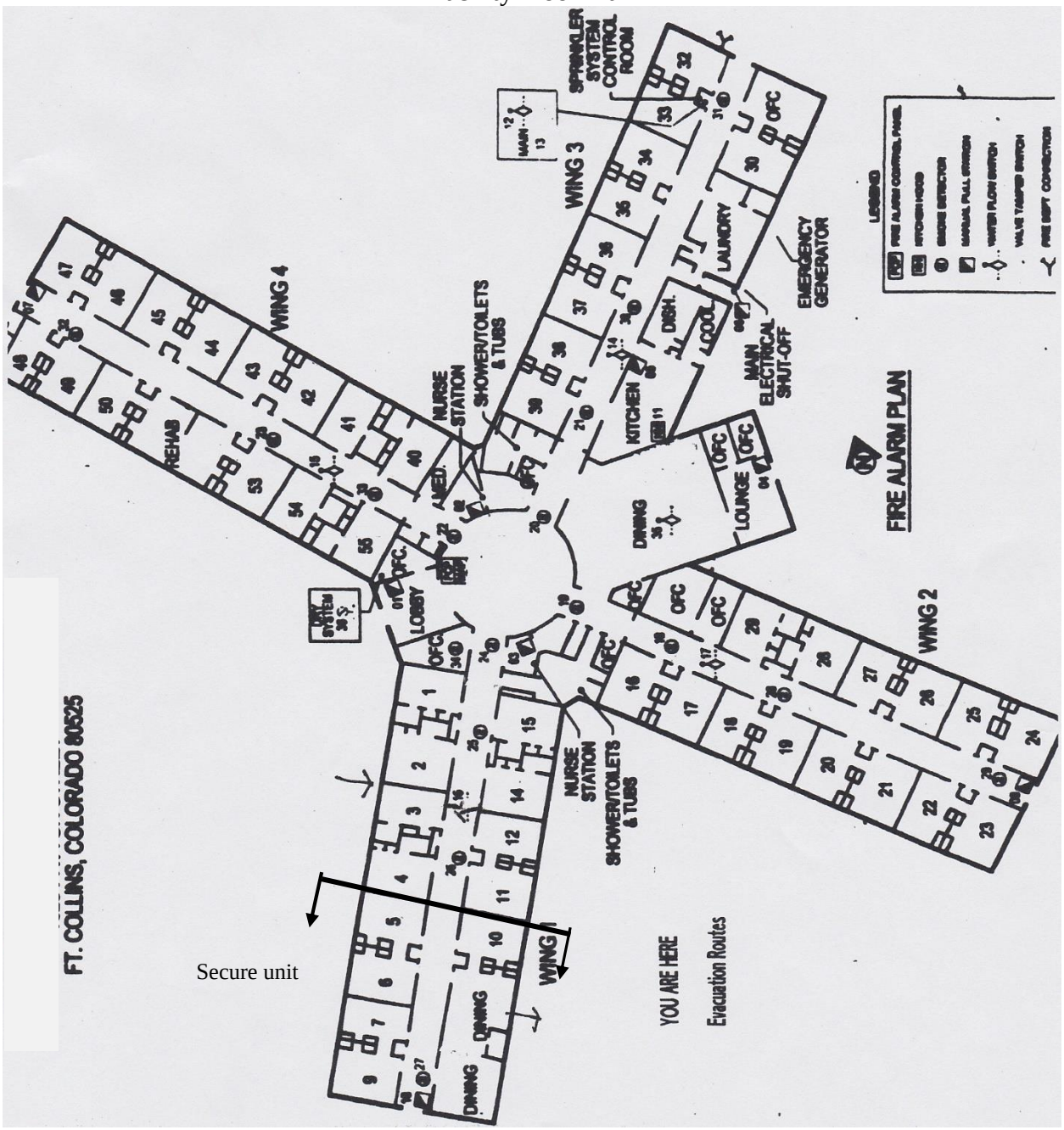
Swiss, Evelyn

Approval is to recruit up to 20 participants with the approved recruitment and consent cover letter. Because of the nature of this research, it will not be necessary to obtain a signed consent form. However, all subjects must be consented with the approved electronic cover letter. The requirement of documentation of a consent form is waived under § _ _.117(c)(2).

Approval Period:	December 03, 2014 through November 02, 2015
Review Type:	EXPEDITED
IRB Number:	00000202

APPENDIX F

Facility Floor Plan



APPENDIX G

Letter of Invitation to Study

Department of Design and Merchandising
251 Aylesworth Hall SE
Fort Collins, Colorado 80523-1574
(970) 491-5042
FAX: (970) 491-4855
http://www.dm.cahs.colostate.edu/

17 September 2014

Ms. Linda Dollar
Rehabilitation & Nursing Center of the Rockies
1020 Patton Street
Fort Collins, CO 80524

Dear Ms. Dollar:

I enjoyed our phone conversation last week and am following up with additional information seeking your support in a letter that will be submitted with my Institutional Review Board application. My advisor, Dr. Katharine Leigh, has actually worked extensively with your facility through her service-learning projects and strategic planning coursework providing me with insights helpful in my request! The focus of my research proposes to examine the impact the physical environment may have on individuals with dementia or Alzheimer's and behaviors supported by specific spatial entities. A majority of the evidence-based design research has focused on primarily on care, behaviors, and lighting and acoustics. My study encompasses an area less visible in knowledge repositories but significant in creating quality of life within institutional settings for this population.

My research plan entails two means of data collection; an electronic survey supported by Survey Monkey to which staff working in the SCU are invited to participate, and observations taken from the unit as unobtrusively as possible. We realize that you may need approval from your administrator for us to conduct this work, therefore, I have assembled key pieces for review to achieve this approval (see attachments). The value of this research lies in its contributions to evidence-based design. I hope that your board will understand and support this work as a key to future planning and decision-making for facilities like yours.

My timeline is to receive your support in the form of a letter by Friday, October 17 at which time I will submit the IRB application to receive protocol approval. I have also included short bios for myself and my two advisors; Dr. Leigh has extensive design, research, and strategic planning expertise in health care and is very sensitive to your needs.

Please do feel free to call Katharine and myself, and if you prefer, we could meet with you at your availability to review the information enclosed. Thank you very much for your time!

Regards,

Christine Apple
Research Assistant and Co-

APPENDIX H

Letter of Support

27 October 2014

Ms. Christine Apple, Co-PI
Colorado State University
Campus Delivery 1574
Fort Collins, CO 80523

Dear Ms. Apple;

Rehabilitation and Nursing Center of the Rockies will be pleased to participate in your study, Patterns of behavior in Alzheimer units: Examining the role of the physical environment interface. We understand our commitment will be to provide you with access to the secured unit in our facility in which residents with dementia reside, for the purposes of a physical space inventory and scheduled observations. We will also assist you in distributing the electronic survey to staff members working in this secured unit to obtain their impressions of space use. We request confirmation in writing of IRB protocol approval before you begin your study.

We would appreciate you sharing your findings in a summary report to us when you complete your thesis with the Graduate School at Colorado State University. We look forward to working with you.

Sincerely,

Tony Hanlon

APPENDIX I

Letter of Fully Informed Consent

Department of Design and Merchandising
251 Aylesworth Hall SE
Fort Collins, Colorado 80523-1574
(970) 491-5042
FAX: (970) 491-4855
http://www.dm.cahs.colostate.edu/

Dear Family member of resident;

I'd like to introduce myself; my name is Christine Apple and I am a graduate student conducting my thesis research at Colorado State University in the Design & Merchandising department. We are conducting a research study on the relationship of the physical environment and behaviors of individuals with dementia-like diagnoses within special care units. We believe that characteristics of the physical environment can promote or deter quality of life. The project is called *Patterns of Behavior in Alzheimer Units: Examining the Role of the Physical Environment Interface*. The Principal Investigators are Dr. Katharine E. Leigh and Dr. Laura Malinin; I am the Co-Principal Investigator.

We would like to inform you of this study and provide an option to either consent for your resident or opt them out of the study. This study will include observation of residents living in the secure unit of The Rehabilitation and Nursing Center of the Rockies. This observation will be non-intrusive and not interfere with their daily activities. The intent of this study is to gain more knowledge on how the physical design of Alzheimer's care units can improve and benefit the resident and staff in creating an improved quality of life for residents.

We will not collect the name or personal identifiers of your resident. The intent of this research is to better understand what staff can do for residents and thereby improve the lives of these residents.

While there are no known risks in your participation, it is not possible to identify all potential risks in research procedures, but the researchers have taken reasonable safeguards to minimize any known and potential (but unknown) risks.

Should you have any questions about the research, please contact me at Christine.Apple@colostate.edu. If you have any questions about your rights as a volunteer in this research, you may contact CSU IRB at: RICRO_IRB@mail.colostate.edu; 970-491-1381. Again, thank you very much for your support.

Sincerely,

Christine Apple, Graduate Student Katharine E. Leigh, PhD Associate AIA, LEED AP BD+C, NCIDQ

Laura Malinin, PhD, AIA

APPENDIX J

Letter of Invitation to Survey

Department of Design and Merchandising
251 Aylesworth Hall SE
Fort Collins, Colorado 80523-1574
(970) 491-5042
FAX: (970) 491-4855
http://www.dm.cahs.colostate.edu/

[date]

Dear Participant;

I'd like to introduce myself; my name is Christine Apple and I am a graduate student conducting my thesis research at Colorado State University in the Design & Merchandising department. We are conducting a research study on the relationship of the physical environment and behaviors of individuals with dementia-like diagnoses within special care units. We believe that characteristics of the physical environment can promote or deter quality of life. The project is called *Patterns of Behavior in Alzheimer Units: Examining the Role of the Physical Environment Interface*. The Principal Investigators are Dr. Katharine E. Leigh and Dr. Laura Malinin; I am the Co-Principal Investigator.

We would like to invite you to share your thoughts about your experience with the special care unit by participating in an anonymous online survey which will take approximately 30 minutes. Your participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent and stop participation at any time without penalty.

We will not collect your name or personal identifiers. When we report and share the data with others, we will combine the data from all participants. While there are no direct benefits to you, we hope to gain more knowledge on how the physical design of Alzheimer's care units can improve and benefit the resident and staff in creating an improved quality of life for residents.

While there are no known risks in your participation, it is not possible to identify all potential risks in research procedures, but the researchers have taken reasonable safeguards to minimize any known and potential (but unknown) risks.

Should you have any questions about the research, please contact me at Christine.Apple@colostate.edu. If you have any questions about your rights as a volunteer in this research, you may contact Janell Barker, Human Research Administrator, at 970-491-1655. Again, thank you very much for supporting research focusing on Alzheimer care and the completion of my graduate studies.

Sincerely,

Christine Apple, Graduate Student