MIN-AH LEE*   *Kunsan National University*

SUSAN D. RODIEK**   *Texas A&M University*

Residents' Preference for Spatial Features in Sitting Areas at Assisted Living Facilities[†]
- Focused on direct or indirect social interaction for older adults -

This study investigated residents' preferences for spatial features of sitting areas in assisted living facilities, and provides recommendations for planning sitting areas to support residents' spatial preferences and social interaction. The study participants were 69 residents of eight assisted living facilities (30+ resident capacity), located in south central Texas. A photographic comparison method was used, in which residents were shown 20 matched pairs of photos, with a single feature digitally modified in each pair, and asked to select which environmental representation they preferred. The hypothesized spatial characteristics were identified in practice based literature as those that may encourage usage of sitting areas: viewability, variety, homelikeness, and privacy. Most of the hypothesized features were preferred by participants, with the highest preference found for non-institutional furniture arrangements and naturalness, followed by increasing enclosure and variety of seating. Preference was less significant for domestic cues such as carpeted floors, divided light windows, and boundaries defined by different colored material or columns, possibly due to their physical impairments or preference for visual openness. Participants' level of mobility assistance was significantly related to their preference for some features, such as seating with people-watching capability, and carpeted floors. The findings have implications for facility architects and administrators engaged in resident-oriented spatial planning.

*Corresponding Author, Associate Professor, Dept. of Housing and Interior Design (leema@kunsan.ac.kr)

**Associate Professor, Center for Health Systems & Design, Dept. of Architecture

Key Words: assisted living facilities, spatial features, sitting areas, social interactions

Aging and Residential Care Environments

In the United States, the population of the oldest-old (those over 85 years old), was about 5.5 million in 2010, and is expected to grow to 14.2 million by 2040 (U.S. Census Bureau, 2010, 2011). Although life spans are increasing, people in the later stages of life typically have reduced physical and mental independence (Regnier, 2002). As the number of the oldest-old increases, the demand for long-term care and housing environments for older adults is expected to increase proportionally (Brawley, 2006; Brummett, 1997). Assisted living facilities offering resident-centered care and a homelike environment occupy an increasing sector of residential care facilities for older adults, fueled partly by the current culture change trend, and by the expectations of adult children who do not want to place their parents in an institutional setting (Brummett, 1997;

Marsden, 2005). In 2010, there was a total capacity of 1.23 million beds in assisted living facilities, increased from 1.04 million beds in 2007, accommodating 3.05% of the total population aged 65+ in the U.S. (AARP, 2010). More than half (54%) of all assisted living and residential care residents were age 85 or older, with monthly payments averaging from $3,022 to $4,234 per unit occupied (AARP, 2010; AAHSA *et al.*, 2009). Physical environments at assisted living facilities are intended to focus on residents' independence, privacy, and self-identity, as well as on the continuity with their previous home environments and homelike lifestyles (Eales *et al.*, 2001; Gaugler & Kane, 2005). Compared with skilled nursing facilities, assisted living facilities have been found to have more positive physical, psychological, and social effects on residents, higher quality of life scores and user satisfaction with the environments (Brandi *et al.*, 2003; Hutchings *et al.*, 2011; Robinson *et al.*, 2011) as well as having more activities for residents (Gaugler & Kane, 2005).

Social Interaction of Older Adults

Social interaction may improve health and reduce depression in later life (Isaac *et al.*, 2009). Older adults whose social networks have been disrupted by relocation may need to rebuild their social relationships to regain a feeling of connectedness with others (Dupuis-Blanchard *et al.*, 2009). Environmental characteristics can influence the level of social interaction; for example, in facilities for older adults, social support has been found to be positively associated with closer walking distance to an activity building or social spaces (Pinet, 1995; Sugihara & Evans, 2000). Interior design for enhancing the usage of social spaces is related to residents' opportunities for privacy (Zavotka & Teaford, 1997). Facility programs and policies have been also reported as influencing residents' social interaction; for example, animal-assisted therapy (Bernstein *et al.*, 2000) and pedagogical meal programs in which staff shared meals with residents at the same table (Nord, 2011) were shown to have positive effects on residents' social interaction. In assisted living facilities, the common areas used by

residents, staff, and visitors have an important role, because the atmosphere and spatial configuration of these spaces can influence the formal and informal social interaction of residents.

Importance of Resident Preferences for Sitting Area Features

Although industry professionals from different sectors have published environmental design guidelines for residential care facilities for older adults, the opinions and preferences of frail elderly residents are less well-known. Design guided by research-based consumer input is important because of differences in perception between designers and consumers, and possibly between staff or family members and residents (Marsden, 2005). Although resident-oriented studies are sometimes limited by residents' cognitive abilities or by differences between resident groups, such research is meaningful in exploring shared opinions and consistent interpretations about shared environments (Marsden, 2005). The sitting areas investigated in this study are defined as common areas with seating, including informal areas such as lobbies and hallways, which are not inside rooms specially designated for sitting; these areas are typically used by residents, staff, family members, and other visitors for socializing, and for various individual and group activities. If sitting areas are not properly planned and organized, residents are less likely to use them autonomously, and such areas may never be used. It is important to understand the features that residents prefer, because sitting areas are the main places in the facility where they can see and converse with other people, with the potential to benefit residents' quality of life through social interaction. The purpose of this study was to investigate residents' preferences for spatial features of sitting areas in assisted living facilities, and provides recommendations for planning sitting areas to support residents' spatial preferences and social interaction. Formal or informal, and direct or indirect social interaction may lead to improved mental health for residents, through replacing social relationships lost by relocating to the residential care facility.

FEATURES IN SITTING AREAS IN FACILITIES FOR OLDER ADULTS

Environmental Characteristics in Sitting Areas Extracted from Practice Based Literature

The environmental characteristics developed for this study were derived from widely-used, comprehensive practice-based books by acknowledged experts, who provided guidelines on designing facilities for older adults: Brawley, 2006; Cohen & Weisman, 1991; Marsden, 2005; Regnier, 2002. The characteristics applicable to sitting areas that were most consistently found across the sources, and useful to designers of real facilities, were summarized and categorized into five overall characteristics: "easy access," "viewability," "variety," "homelikeness" and "privacy." "Easy access" was not included in this study, because many of the predominant aspects of access (e.g., the proximity of rooms to common areas, door-opening force, or

threshold details) were not suitable for testing with photographic comparison. Within each of the four remaining characteristics, a few subcategories were identified. It was hypothesized that residents would prefer visual images of settings depicting the qualities indicated by guidelines found in the existing literature, described in the following section.

Scope of Features Tested

This study tested environmental characteristics in a purely visual manner, and did not address the acoustic, air quality, or olfactory characteristics that would naturally accompany different environmental conditions. Different types of furnishings and spatial arrangements were tested, but the detailed aspects of furniture design, materials, textures, and lighting were not feasible to test with this method. The environmental characteristics tested in this study were defined as follows:

Table 1. *Environmental Characteristics and Features Tested in the Study*

Characteristics/Features	Descriptions and Feature Examples
Viewability	
In-between space	A place outside the sitting area where people can easily look in before they enter the space; Stair landing, elevator hall, <u>balcony, vestibules</u>, nearby hallway
Semi-transparent structure	Elements that allow people to vicariously and unobtrusively preview and watch activities in sitting areas without entering; <u>Half wall</u>, <u>window</u>, door with window, semi-transparent structure; see-through design
Variety	
Variety of seating	Use <u>different types of furniture arrangements</u>; Add or place <u>seating for private conversation</u>, for <u>passive observation</u>, or for small group activities in the sitting area and in other areas;
Link to Interactive activities	Link to attractions such as a <u>mailbox</u>, kitchenette, <u>snacks & drink</u>, <u>games</u>, or event places
Homelikeness	
Non-institutional furniture arrangements	Furniture(mainly seating) arrangement to promote conversation and <u>social interaction</u>; <u>Small grouped arrangements</u>; Non-institutional furniture arrangements
Increasing domestic cues	Smaller floor area; Lower ceiling; Shelving within easy reach; Familiar housing cues such as fire place, <u>divided light window</u>; Ample and Indirect light, no glare; <u>Carpeted floor</u> instead of hard surface
Increasing naturalness	Close association to the natural environment; Landscape elements; <u>Views to the outdoors</u>; natural light from the window, <u>skylight</u>; Real indoor plants and flowers
Privacy	
Increasing enclosure	Feeling of being sheltered and protected; Sense of security by being within an <u>alcove</u>, nook, <u>large bay window</u>: Convert outside corner to inside corner
Defining boundaries	Elements that help define the sitting area, such as ceiling heights, <u>floor colors &</u> materials, <u>columns</u>, bookcases; Space-defining furniture arrangements

Underlined feature examples were extracted to be tested in this study from the following sources: Brawley (2006): Ch.12 Hearth and home: Gathering spaces, pp.165-178; Ch.14 Social living spaces, pp. 205-220. Cohen & Weisman (1991): Ch.5 Activity areas, pp. 91-127; Marsden (2005), Ch.7 Common Living Room, pp. 73-84; Regnier (2002): Ch.7 Stimulating social interaction, pp.76~95

VIEWABILITY: Having a place to vicariously watch activities from just outside the sitting area, and a semi-transparent interface that provides an opportunity to preview the sitting area before entering.

VARIETY: Having a variety of seating alternatives in the sitting area, and having links in the sitting area that connect to spaces and/or activities that may interest residents, and encourage them to use the sitting area.

HOMELIKENESS: Having an environment evocative of a single-family detached house, with non-institutional furniture arrangements, domestic cues, and natural elements.

PRIVACY: Having places in the sitting area that offer partial seclusion from other residents or from observation, where a resident can feel free from intrusion by others.

Each of these was developed with two or three specific exemplar features that allowed the environmental characteristic to be tested (see Table 1).

Background on the Environmental Characteristics of Sitting Areas in Facilities for Older Adults

There are few research-based studies on the preferences for spatial features of sitting areas in facilities for older adults, even though the practice-based literature indicates the importance of settings for social interaction, and related environmental features (Brawley, 2006; Regnier, 2002; Cohen & Weisman, 1991). The following sections describe the environmental characteristics to be tested in this study, based partly on their perceived importance to older adults.

Viewability   The viewability of sitting areas can be considered from the broader perspective of promoting residents' autonomy, choice, and control over whether to engage in social involvement. In 2003, Brandi *et al.* found that the ability to make choices was significantly related to satisfaction in older people. Kane (2001) indicated that recognizing the importance of autonomy and choice for older residents is an important component of the current emphasis on consumer-centered direction, and an integral aspect of culture change.

Variety   Davis *et al.* (2009) noted that culture change concepts have increased the focus on environmental design that promotes residents' participation in meaningful activities. In 2010, Yang and Stark investigated the role of environmental features in social engagement among assisted living residents; many residents reported going to the lobby near the mailboxes, because of the likelihood that they would meet someone there. In addition, residents were likely to stay in the lobby because they wanted to watch people come and go from the front door.

Homelikeness   Although homelikeness is widely acknowledged to be an important goal for environments for older adults, there is no precise and standardized definition of the term. The evaluation of homelikeness in facilities for older adults may focus on whether the facility has clustered households and whether its scale is small (Verbeek *et al.*, 2009). Studies have found that older residents were likely to prefer fabric curtains, a view of the outdoors, specific dining table arrangements, non-white walls, and space for social interaction (Hung & Chaudhury, 2011; Morgan & Stewart, 1999; Neumeyer, 2009). Carpeted floors in kitchen work areas were negatively perceived but were generally accepted in other areas as long as they had low-pile and promoted mobility (Neumeyer, 2009). Family-style dining with small grouped tables reduced the occurrence of residents' problematic behaviors and increased social interaction (Davis *et al.*, 2009; Schwarz *et al.*, 2004).

Privacy   The concept of privacy is defined by the situation and context, and is an extremely important consideration in facilities for older adults such as nursing homes (Applegate & Morse, 1994). Privacy in facilities for older adults has been evaluated mainly in view of whether the facilities provide individual rooms with full baths for each resident (Hutchings *et al.*, 2011; Kane, 2001; Lum *et al.*, 2008). Regarding sitting areas, studies have found the importance of semi-private spaces for being alone, for interacting informally, and for spending time with other residents and visitors (Davis *et al.*,

2009; McAllister & Silverman, 1999; Robinson *et al.*, 2011; Roth & Eckert, 2011).

METHOD

Photographs as a Research Method

Photographs are widely used for recording observations or distributing research results in fields such as anthropology, psychology, sociology, and geography (Moore *et al.*, 2008); they have also been found useful in design-related research (e.g., Nasar, 1981; Rodiek & Fried, 2005). Photographs promote objectivity by allowing target users (who are not professional designers), to evaluate the environment in an easily-understood format, producing results that are more specific than verbal descriptions. Photographs have been shown to increase participant enjoyment and engage their attention in the research process (Pinto-Correia *et al.*, 2011). An important benefit of using photographs in research is that they make it possible to control many extraneous variables and evaluate multiple items at the same time (Jacobsen, 2007). However, it is hard to be certain that users' opinions or preferences on the basis of the photographs will be the same as those obtained when viewing actual environments, and it is suggested that photographs used in research be high-quality and as similar as possible to real environmental conditions (Jacobsen, 2007; Pinto-Correia *et al.*, 2011). This study used photographic comparison methods that have been found effective in engaging the interest and attention of elderly residents during the research process, to directly investigate their preferences for spatial features and configurations in sitting areas.

Instruments used in this Study

Paired comparisons For this study, photographs were presented as paired comparisons, in which one image in a pair displayed an example of the hypothesized feature, and the other image displayed the same photograph with the absence of this feature. Although photograph-based studies sometimes assess preferences between two comparable but distinct images, the paired comparisons for this study were created by digital manipulation of a single image. This was done to reduce the confounding variables caused by the many small differences between distinct visual images; using a manipulated version of the same image makes it possible to focus on the hypothesized variable of interest (Rodiek & Fried, 2005).

Creating the images Photographs were selected for the development of the research instrument, with images of indoor settings that demonstrated the spatial features selected to be tested in this study, relevant to sitting areas. Most of the photos had been taken by the researchers at assisted living, nursing facilities, and other residential settings for older adults over the previous ten-year period in the United States and Europe. To supplement these, the principal researcher took additional photos at facilities for seniors to demonstrate specific environmental features. Supplemental photographs were taken with a digital camera at eye level when standing, between October and November 2011, on sunny days, considering the quantity and quality of the daylight through the windows. Individual photos were selected on the basis of: (a) the typical atmosphere in this region, (b) the clarity of depicting (or lacking) the hypothesized feature, and (c) the perceived ease of adding (or removing) environmental features in the process of editing the images. Based on in-depth discussions, the research team selected and edited two or three photos per feature category, using Adobe Photoshop CS4+, to create a total of 20 paired comparisons. Photo images were edited by four interior-architecture professionals and converted to 200dpi resolution, to avoid the artifacts of image manipulation being visible in composite images at higher resolution. Compared images were carefully examined to make sure the difference between the hypothesized feature and the replaced feature was not immediately obvious in aesthetics, complexity, or any design principles and elements. The quality of the 20 pairs of photos was reviewed by two interior-architecture professionals.

Assembling the instrument Bound booklets consisting of printed color photos were prepared for showing

the visual images to older adults, as done by Rodiek and Fried (2005), who found that older adults preferred photographs they could hold and inspect thoroughly, over projected color slides, owing to the glare and distance from the images associated with a slideshow. Forty photos (20 paired comparisons) were printed on an Epson Stylus Photo 2100 on Epson heavy-weight matte finish paper (U.S. letter size) and bound as a landscape-format booklet with the paired comparison images facing each other; each photo was framed by a narrow (1/4") black strip to help participants visually focus on the image. Two different booklet formats were pretested to determine which offered the easier page turning experience for elderly participants with arthritic hands: one format wrapped the page edges with black tape to make them slightly thicker, and the other format used index tabs numbered from 1 to 20 attached to the right page of each set. The tabbed format was preferred by participants in pre-testing, and was used in the final study. Participants expressed their image preferences by placing 3" self-adhesive notes from pop-up dispensers on the preferred image in each photo pair; this method was based on Rodiek and Fried (2005), who found it to be suitable for arthritic hands, and more accurate than asking older adults to use Likert-type or interval scales, or write verbal comments, due to fatigue, cognitive issues, and time constraints.

Influential variables A brief survey form was prepared to collect residents' characteristics that could influence their preference for spatial features in sitting areas. Based on Pinet (1995), characteristics that may influence their use or preference for social spaces in residential facilities consisted of cognitive and physical disability, personality, and demographic status. The current study included residents' subjective health and level of mobility assistance, to investigate the influence of personal illness and physical disability. Residents with severe cognitive disability were not eligible for this study. Personality could not be measured due to time limits for the survey in each facility. General demographic characteristics that did not excessively invade residents' privacy were collected, such as age, gender and length of

residence. In addition to residents' characteristics, the building height of each facility was collected, as a possibly influential variable. Gender and building height were coded as dummy variables. Real age (years) and length of residence (month) were entered for coding. Residents' subjective health (1.poor to 4.excellent) and mobility assistance (1.wheelchair to 4.no assistance) were coded as 4 points Likert-scale (refer to Table 3)

Pilot Study

A small pilot study was conducted at an independent living facility (ILF) for older adults located in central Texas. A second pilot was conducted at an assisted living facility (ALF) in the same region. The ILF had a similar spatial composition to that of general ALFs, with all the individual resident units and common areas in the same building. The reason why the first pilot was performed at an ILF was that ILF residents were more able to contribute to meaningful discussion about the quality of photos, booklets, and the facilities they were living in, since the aim of the pilot study phase was to evaluate the reliability and suitability of the photos and booklet as research instruments. Using an ILF for the first pilot study also allowed a higher number of ALFs to participate in the main study, as the intention was to include as many ALFs as possible in this geographic region. Based on the first pilot test, the research team revised the photographic booklet and conducted a second pilot study at an ALF, with more deliberate focus on the reasons why specific features were preferred or not. Both pilot tests were performed in February 2012, with four residents at one facility and three residents at the other, with each pilot taking about an hour. The images were large enough to see without glasses and the researcher did not explain where a different feature was in each image (please refer to "Data collection and Analysis").

The residents did not have difficulty in using the booklets, and they fully understood what was required of them. In addition, the residents preferred the booklet with the tabs more than the one with the taped edges. A few things were found that needed to be revised in the prepared photos. First, there was a case where residents' preferences were not influenced

by the hypothesized feature because of the influence of other environmental factors seen in the photo. In testing "viewability," the feature example showing a balcony (in-between space) was disliked by some residents, because it was located on an upper level, and reportedly evoked a fear of falling down. The photo was revised by adding the image of a person walking with a walking-aid in the corridor of the balcony, to visually demonstrate the efficacy and safety of the balcony railing. In "homelikeness," some residents preferred a hard floor to a carpet, because a carpet evoked the danger of tripping and falling down or difficulty in operating wheelchairs and assistive walking devices. All the carpets in the photo images were revised to depict short pile and firm surfaces. In "privacy," an area carpet that defined a spatial boundary was replaced by using different colors of flooring. After several rounds of revision, the final 20 paired images were printed and bound for the main survey (Table 2).

Data Collection and Analysis

This study was conducted in the seven-county region encompassed by the Brazos Valley in south-central Texas, and was approved by the Human Subjects Board of a major university. Based on the directory of assisted living facilities registered with the Texas Department of Aging and Disability Services (http://www.dads.state.tx.us/providers/ALF/al.pdf), nine facilities were identified as meeting the inclusion criterion of having at least 30 resident "lie capacity," and were invited to participate. All facilities were sent the approved recruitment materials, and eight of the nine eligible facilities agreed to participate in the study. The one facility that declined to participate had a very low census of residents at the time of the study, and could not recruit enough eligible participants. In the participating facilities, all residents deemed by administrators as being capable of a meaningful response on the survey forms were eligible for inclusion. Residents with difficulty in seeing and hearing but the ability to respond to the survey with assistance were considered eligible. Residents unable to move without staff assistance or with dementia or substantial cognitive impairment were excluded. Several days or weeks in advance, all

eligible residents were invited to participate in the study by the facility administrator, using a prepared script.

Residents were seated around a table in a common area of the building at a scheduled time. After completing a brief written survey, each participant was given a photo booklet and asked to make their selections by placing self-adhesive notes on the preferred images. The researcher mentioned that there was a different feature in each paired images, but did not explain where it was. A facility staff member was present at each session and assisted the researchers to address any questions that might arise. Some participants who were comparatively slow or who experienced difficulty in selecting photos received assistance from the researchers or staff members, who were reminded not to influence their decisions in any way. Each session consisted of about 6 to 12 residents and took about an hour. At a typical session, there were one or two participants who needed assistance with the photo booklets, and three or four people available to help (including the research team and a staff member or two). After participants completed their selections, each booklet and questionnaire was reviewed to check for missing items. The survey was performed in April 2012 with a total of 69 residents from 8 assisted living facilities participating in the study. Of the cognitively intact residents living in the facilities, the rate of participation ranged from 21% to 42%. About 14% of participants were male, compared with the average percentage of the male residents in participating facilities ($M = 23.8\%$).

The data were manually retrieved from the booklets and analyzed with SPSS 12.0. The characteristics of the participants were described by frequency, percentage, and mean. Their relationships were investigated by Pearson's correlation coefficients. A one-sample t-test was used to determine whether the mean of the measure of preference was greater than 50% for each environmental characteristic and 0.5 for each feature example considered as a general preference because the measure of preference for each environmental characteristic was calculated as the percentage of feature examples where the hypothesized photos were preferred, and the measure

Table 2. *Samples of Paired Photo Images for Feature Examples*

Feature Examples	A*	B
-Viewability		
In-between space : Vestibules		
Semi-transparent structure: Half-structure		
-Variety		
Variety of seating: for conversations		
Link to Interactive activities: Mailboxes		
-Homelikeness		
Non-institutional furniture arrangements: Seating for social interaction		
Increasing naturalness: Views to the outdoors		
-Privacy		
Increasing enclosure: Large bay window		
Defining boundaries: Columns		

* The images in column A are hypothetically preferred

of preference for each feature example was coded as 1 for the selection of the hypothesized photo and as 0 for the other. For example, in viewability, if a resident preferred only two hypothesized photos of four paired feature examples, the measure of preference in viewability was 50%. The differences by independent variables such as building heights, gender, age, length of residence, health and mobility assistance in preference for environmental characteristics and feature examples were analyzed by linear regression and binary logistic regression. In linear regression, the measure of preference (%) for

each environmental characteristic was input as a dependent variable. In binary logistic regression used when the dependent variable is a dichotomy, whether the hypothesized photo was preferred (1) or not (0) for each feature example was entered as a dependent variable.

RESULTS

The characteristics of participating residents are presented in Table 3. Slightly more than half the

Table 3. *Characteristics of Participating Residents (N=69)*

	Frequency	Percent	Mean
Building heights*			
One-story	36	52.2	
Low-Rise	33	47.8	
Gender			
Female	59	85.5	
Male	10	14.5	
Age			
- 69	5	7.2	
70-79	10	14.5	
80-84	14	20.3	83.93 years old
85-89	20	29.0	
90 -	20	29.0	
Length of residence			
less than 1 year	24	34.8	
1 -2 years	28	40.6	24.38 months
3 years +	17	24.6	
Health**			
Poor	1	1.4	
Fair	17	24.6	2.93
Good	37	53.6	
Excellent	14	20.3	
Mobility assistance**			
Wheelchair	19	27.5	
Walker	31	44.9	2.19
Cane	6	8.7	
No assistance	13	18.8	

* It means the heights of the buildings that the participants were living in
** Health and mobility assistance were coded as 4 Likert-type scale

participants were living in one-story facilities (52.2%). The majority were female (85.5%), with 78.3% over age 80($M = 83.9$ years). The participants had been living in their current facilities for one month to nine years ($M = 24.4$ months), with 75.4% of them living there two years or less. Length of residence did not determine their eligibility to participate, because the study did not involve evaluation of the facilities they were currently living in. The majority of participants (73.9%) reported good or excellent health status ($M = 2.93$ on 4-point Likert scale). The majority used some form of mobility assistance (44.9% used walkers, and 27.5% used wheelchairs; $M = 2.19$ on 4-point Likert scale). All of these characteristics were used as independent variables for analyzing the residents' preferences for spatial features in sitting areas.

Table 4 shows a Pearson's correlation among the characteristics of the participants. Health status was significantly related to building height at a level of $p < .05$. That is, participants who were living in one-story facilities were likely to have a lower level of health status.

A one-sample *t*-test was used to examine the

mean difference in preference for each environmental characteristic and feature example. Table 5 shows strong preferences for the hypothesized images in all four environmental characteristics at $p < .001$. The participants preferred the hypothesized photos an average of 63.41% (for privacy) to 74.15% (for homelikeness). Table 6 also shows a statistically significant preference for the hypothesized images in most of the feature examples. Participants especially preferred the feature examples in homelikeness such as furniture arrangement for a small group (*Measure of preference* = .87) or for social interaction (*Measure of preference* = .80), and increasing naturalness through views to the outdoors (*Measure of preference* = .86) or a skylight (*Measure of preference* = .78). Some feature examples such as the balcony to preview sitting areas (*Measure of preference* = .61), divided light window for increasing domestic cues (*Measure of preference* = .52), and different colored material and columns for defining boundaries (*Measure of preference* = .58, .48) did not show a statistically significant preference for the hypothesized images.

The measures of preference for the four main environmental characteristics were compared across

Table 4. *Pearson's Correlation among the Characteristics of the Participants*

	Building heights	Gender	Age	Length of residence	Health	Mobility assistance
Building heights	-					
Gender	-.064	-				
Age	-.112	.155	-			
Length of residence	-.083	-.038	.062	-		
Health	-.262*	.132	.112	.038	-	
Mobility assistance	-.133	-.163	-.007	-.129	.235	-

* $p < .05$

Table 5. *Preference for Hypothesized Images by Environmental Characteristics*

Environmental Characteristics	Measure of preference	Standard error	*t*
Viewability	66.30	3.378	4.827***
Variety	66.90	2.609	6.481***
Homelikeness	74.15	1.932	12.501***
Privacy	63.41	3.288	4.077***

Mean, standard error, and one-sample *t*-tests at test value 50%
*** $p < .001$

Table 6. *Preference for Hypothesized Feature Examples*

Feature Examples	Measure of preference	Std. Error	*t*
Viewability			
In-between Space			
Balcony	.61	.059	1.837
Vestibule	.72	.054	4.147***
Semi-transparent structure			
Window	.64	.058	2.632*
Half-structure	.68	.057	3.206**
Variety			
Variety of seating			
Different type of furniture	.67	.057	2.915**
For conversations	.71	.055	3.820***
For watching	.68	.057	3.206**
Link to interactive activities			
Mailbox	.62	.059	2.096*
Snack & drinks	.71	.055	3.820***
Game table	.62	.059	2.096*
Homelikeness			
Non-institutional furniture arrangements			
Small grouped arrangement	.87	.041	9.049***
For social interaction	.80	.049	6.092***
Increasing domestic cues			
Carpeted floor	.62	.059	2.096*
Divided light window	.52	.061	.359
Increasing naturalness			
Views to the outdoors	.86	.043	8.318***
Skylights	.78	.050	5.650***
Privacy			
Increasing enclosure			
Large bay window	.75	.052	4.854***
Alcove	.72	.054	4.147***
Defining boundary			
Different colored floor	.58	.060	1.332
Columns	.48	.061	-.359

Mean, standard error, and one-sample *t*-tests at test value 0.5
*$p < .05$, **$p < .01$, ***$p < .001$

the characteristics of the participants by linear regression. A significant difference was shown in the preference of the images for homelikeness by mobility assistance (Table 7), where the participants using more mobility assistance were less likely to prefer the hypothesized images for homelikeness.

The binary logistic regression was used to analyze the participants' preference of the images for the 20 feature examples across the independent variables. A significant difference was shown in the

Table 7. *Preference for Hypothesized Images in Homelikeness across Mobility Assistance*

Environmental Characteristics	Independent Variable	Unstandardized Coefficients		F
		B	Std. Error	
Homelikeness	Mobility assistance	5.625	1.742	10.424[**]

[**]$p < .01$

Table 8. *Preference for Hypothesized Feature Examples across Independent Variables Depicting Statistical Significance*

Feature examples	Independent Variables	O.R.	95% C.I.	
			Lower	Upper
Variety				
Variety of seating				
For watching	Mobility assistance	1.769[*]	.999	3.133
Link to interactive activities				
Mailbox	Health	.462[*]	.218	.982
Game table	Building heights	3.125[*]	1.116	8.752
	Age	.905[*]	.836	.979
Homelikeness				
Increasing domestic cues				
Carpeted floor	Mobility assistance	2.492[**]	1.328	4.675
Increasing naturalness				
View to the outdoors	Gender	.170[*]	.037	.777

[*]$p < .05$, [**]$p < .01$
Categorical Variable Coding: Parameter(1) - Building heights (One-story: 0, Low-rise: 1), Gender (Female: 0, Male: 1)

feature examples of variety and homelikeness across the independent variables (Table 8). In variety, participants who were relatively independent in mobility were more likely to prefer the images of the seating arrangements for watching ($p < .05$). That is, the participants who required a higher level of mobility assistance such as wheelchairs did not place meaningful value on the variety of seating arrangements for watching. The participants who were younger or living in multi-story facilities preferred the space linked to the game table ($p < .05$). However, the mailboxes were more preferred by people who reported worse health status ($p < .05$), while healthier people were more likely to prefer the added pictures on the wall. Participants requiring less mobility assistance were more likely to prefer carpeted rather than hard floors ($p < .01$). On the other hand, views to the outdoors through the full window were more likely to be preferred by female than male participants ($p < .05$).

DISCUSSION

This study investigated assisted living residents' preferences for spatial features in sitting areas, using photo images. As a research instrument, the photo booklets successfully collected information from elderly residents, without age-related problems such as noticeable fatigue or distraction during the image selection process. The photo booklets were found to be an appropriate and economical instrument to investigate the environmental opinions and attitudes of participants who were functionally or physically frail, with minor levels of cognitive impairment.

The results of this study support most of the environmental characteristics selected to be tested from the practice-based design literature, with participants significantly preferring photos showing the hypothesized features. Most of the feature examples in the areas of viewability and variety were preferred by the participants except the example

showing an upper-level balcony to preview sitting areas (the balcony had also not been highly preferred in the pilot study, and careful revision of the images had not changed participants' attitudes toward the balcony). One of the possible considerations is regional characteristics of south-central Texas where this study was conducted. The residents who have lived in single story homes in a suburban area throughout their lives might not have been accustomed to the stairs and upper-level balcony. Design guidelines relevant to viewability through feature examples such as a stair landing or balcony, indicated in the design literature, were found in this study to potentially make residents feel uncomfortable, and should be studied further to determine their recommended applicability for older adults.

The most preferred environmental characteristic was homelikeness, although there were considerable differences in preference among the feature examples in homelikeness. The participants preferred a non-institutional furniture arrangement and naturalness the most, while showing a lower level of preference for domestic cues such as carpeted floors or a divided light window. According to the participants' informal comments, a divided light window obstructed their outside view, even though they said the window looked prettier and more homelike. Carpeted floors were still pointed out as being inconvenient for mobility assistance devices such as wheelchairs or walkers, even though the flooring images were re-edited to display a carpet with short strands that did not look overly soft.

A similar result was shown for privacy, where participants preferred the feeling of enclosure obtained through a large bay window and alcove. Although previous studies have reported the importance of space for informal interaction being partially screened from view in common areas (Davis *et al*, 2009; McAllister & Silverman, 1999; Roth & Eckert, 2011), in this study, participants did not show a marked preference for boundaries defined by columns or different flooring material. Even though floor boundaries were defined only by changing the color of the floor, many residents appeared to be concerned that this could cause them to trip and fall, or that the columns would block

their vision. The participants preferred the sitting areas made by an alcove or large bay window that increased the feeling of being sheltered; however, they did not care much about defining boundaries for a lounge or dining hall that were bigger sitting areas, and shown in the hypothesized images.

The characteristics of the participants did not substantially influence preference for the hypothesized images, as only 5 feature examples out of 20, were significantly different in preference. However, the participants' independence in mobility was important for the preference of the feature examples of carpeted floors and seating arrangements for watching (which again supports the above discussion). Appropriate floor materials that satisfy both safety and convenience, as well as meaningful space for watching, arranged for older residents who require a higher level of mobility assistance are desired. On the other hand, the result that mailboxes linked to a sitting area were more preferred by participants with lower health status is worthy of notice. As Yang and Stark (2010) stated that the place near mailboxes meant the expectations of meeting someone, the residents who have a lower health status, relatively limited in activity scope, might be more interested in the practicality of having mailboxes nearby, so they can easily meet someone every day. A view to the outdoors through the full window showed a gender difference which could not be clarified, because the number of male participants was much lower than that of females. Based on comments from a couple of male participants, they viewed the full window as unnecessary; thus a gender difference is expected in the attitude toward naturalness or the use behavior of the sitting area, especially with regard to the corridor with a window.

LIMITATIONS AND IMPLICATIONS

The generalizability of this study is limited by the fact that all participants were from the same geographic region, and only a selected number of examples were tested for each environmental characteristic. In the photo composite process, the research team attempted to make the each feature

example in a compared image set look equivalent in terms of their visual complexity and aesthetic appearance. However, as the research team was required to select example images that were able to show clearer comparisons, and there were many possible ways to edit the features, the researchers' bias might have influenced the composition of the design elements, even though the photo composite process appears to be an effective way to compare diverse environmental features. Even though four interior-architecture professionals edited the 20 pairs of photos and two other design professionals reviewed the quality of photos for this study, having consensus by a large number of experts would add further validity to the study. Overall, the results of this study offer only a partial solution to successful spatial usage in facilities for older adults, because many other factors, such as facility programs, types of activities, and staff policies, all are known to be influential factors in public area usage.

Further studies could conduct in-depth interviews with residents and staff, to better understand environmental perceptions, motivations, and behavior. In-depth interviews with participants might help to deeply analyze the reasons for their preferences or non-preferences, and the relationships of the preferred feature examples to diverse contextual environments in facilities, as well as the participants' characteristics, to further interpret the quantitative results. Behavioral observation could contribute additional understanding to the way residents interact in sitting areas. It is anticipated that the results of this study could be adapted for other types of residential care facilities, because of similarities and overlaps in levels of care. However, it would also be valuable to study the difference in preferences between residents of assisted living and other types of facilities, as this study found a slight difference from the results of the pilot study that might be related to residents' health, cognitive ability, or independence of mobility. Detailed design guidelines could be presented through the investigation across the residents' characteristics in various facilities for older adults.

This study has significance in terms of using photo-comparison research methods to make it easier for assisted living residents to communicate their preferences for specific environmental features. The quantitative findings of this study provide information about resident-oriented spatial planning that may be useful to facility architects and administrators in assisted living facilities - rapidly becoming the most prevalent type of residential environment for the elderly – for the purpose of encouraging social interaction, thereby promoting the wellbeing and quality of life of residents.

REFERENCES

AAHSA, AHSA, ALFA, NCAL & NIC (2009). *2009 overview of assisted living.*

AARP Public Policy Institute (2010). *Assisted living and residential care in the states in 2010.* http://www.ahcancal.org/ncal/resources/Documents/residential-care-insight-on-the-issues-july-2012-AARP-ppi-ltc.pdf

Applegate, M. & Morse, J. M. (1994). Personal privacy and interactional patterns in a nursing home. *Journal of Aging Studies, 8*(4), 413-434.

Bernstein, P. L., Friedmann, E., Malaspina, A. (2000). Animal-assisted therapy enhances resident social interaction and initiation in long-term care facilities. *Anthrozoos: A Multidisciplinary Journal of the Interactions of People & Animals, 13*(4), 213-224.

Brandi, J. M., Kelley-Gillespie, N., Liese, L. H. & Farley, O. W. (2003). Nursing home vs. assisted living: The environmental effect on quality of life. *Journal of Housing for the Elderly, 18*(1), 73-88.

Brawley, E. C. (2006). *Design innovations for aging and Alzheimer's.* Hoboken, NJ: John Wiley & Sons, Inc.

Brummett, W. J. (1997). *The essence of home: Design solutions for assisted living housing.* New York: Van Nostrand Reinhold.

Cohen, U. & Weisman, G. D. (1991). *Holding on to home: Designing environments for people with dementia.* Baltimore, MD: Johns Hopkins University Press.

Davis, S., Byers, S., Nay, R. & Koch, S. (2009). Guiding design of dementia friendly environments in residential care settings: Considering the living experiences. *Dementia, 8*(2), 186-203.

Dupuis-Blanchard, S. Neufeld, A. & Strang, V. R. (2009). The significance of social engagement in relocated older adults. *Qualitative Health Research, 19*(9), 1186-1195.

Eales, J., Keating N. & Damsma, A. (2001). Seniors' experiences of client-centered residential care. *Aging and Society, 21*, 279-296.

Gaugler, J. E. & Kane, R. A. (2005). Activity outcomes for assisted living residents compared to nursing home residents. *Activities, Adaptation and Aging, 29*(3), 33-58.

Hung, L. & Chaudhury, H. (2011). Exploring personhood in dining experiences of residents with dementia in long-term care facilities. *Journal of Aging Studies, 25*, 1-12.

Hutchings, D., Wells, J. J. L., O'Brien, K., Wells, C., Alteen, A. M. & Cake, L. J. (2011). From institution to home: Family perspective on a unique relocation process. *Canadian Journal on Aging, 30*(2), 223-232.

Isaac, V. M., Stewart, R., Artero, S., Ancelin, M. L. & Ritchie, K. (2009). Social activity and improvement in depressive symptoms in older people: A prospective community cohort study. *American Journal of Geriatric Psychiatry, 17*(8), 688-696.

Jacobsen, J. K. S. (2007). Use of landscape perception methods in tourism studies: A review of photo-based research approaches. *Tourism Geographies, 9*(3), 234-253.

Kane, R. A. (2001). Long-Term care and a good quality of life: Bringing them closer together. *The Gerontologist, 41*(3), 293-304.

Lum, T. Y., Kane, R. A., Cutler, L. J. & Yu, T. C. (2008). Effects of green house nursing homes on residents' families. *Health Care Financing Review, 30*(2), 35-51.

Marsden, J. P. (2005). *Humanistic design of assisted living*. Baltimore, MD: Johns Hopkins University Press

McAllister, C. L. & Silverman, M. A. (1999). Community formation and community roles among persons with Alzheimer's disease: A comparative study of experiences in a residential Alzheimer's facility and a traditional nursing home. *Qualitative Health Research, 9*(1), 65-85.

Moore, G., Croxford, B., Adams M., Refaee, M. Cox, T. & Sharples, S. (2008). The photo-survey research method: Capturing life in the city. *Visual Studies, 23*(1), 50-62.

Morgan, D. G. & Stewart, N. J. (1999). The physical environment of special care units: Needs of residents with dementia from the perspective of staff and family caregivers. *Qualitative Health Research, 9*(1), 105-118.

Nasar, J. L. (1981). Visual preferences of elderly public housing residents: Residential street scenes, *Journal of Environmental Psychology, 1*, 303-313

Neumeyer, R. R. (2009). *Effects of interior spatial features on use and perception of space: An exploratory study in two assisted living facilities in Oregon*. Master's thesis, Oregon State University.

Nord, C. (2011). Individual care and personal space in assisted living in Sweden. *Health & Place, 17*, 50-56.

Pinet, C. (1995). *Nursing home design: Characteristics of social spaces and social behavior of residents*. Unpublished doctoral dissertation. The University of Wisconsin-Milwaukee.

Pinto-Correia, T., Barroso, F., Surova, D. & Menezes, H. (2011). The fuzziness of Montado landscapes: Progress in assessing user preferences through photo-based surveys. *Agroforest Syst, 82*, 209-224.

Regnier, V. (2002). *Design for assisted living: Guidelines for housing the physically and mentally frail*. New York: John Wiley & Sons.

Robinson, J., Shugrue, N., Reed, I., Thompson, N., Smith, P. & Gruman, C. (2011). Community based versus institutional supportive housing: Perceived quality of care, quality of life, emotional well-being, and social interaction. *Journal of Applied Gerontology, 30*(3), 275-303.

Rodiek, S. D. & Fried, J. T. (2005). Access to the outdoors: Using photographic comparison to assess preferences of assisted living residents. *Landscape and Urban Planning, 73*, 184-199.

Roth, E. G. & Eckert, J. K. (2011). The vernacular landscape of assisted living. *Journal of Aging Studies, 25*, 215-224.

Schwarz, B., Chaudhury, H. & Tofle, R. B. (2004). Effect of design interventions on a dementia care setting. *American Journal of Alzheimer's Disease and Other Dementias, 19*(3), 172-176.

Sugihara, S. & Evans, G. W. (2000). Place attachment and social support at continuing care retirement communities. *Environment and Behavior, 32*(3), 400-409.

Texas Department of Aging and Disability Services (2011). *Facility directory: Assisted living.* http://www.dads.state.tx.us/providers/ALF/al.pdf

U.S. Census Bureau (2010). *The older population in the United State: 2010 to 2050.* http://www.census.gov/prod/2010pubs/p25-1138.pdf

U.S. Census Bureau (2011). *The older population: 2010.* http://www.census.gov/prod/cen2010/briefs/c2010br-09.pdf

Yang, H. & Stark, S. L. (2010). The role of environmental features in social engagement among residents living in assisted living facilities. *Journal of Housing For the Elderly, 24*, 28-43.

Verbeek, H., Rossum, E. V., Zwakhalen, S. M. G., Kempen G. I. J. M. & Hamers, J. P. H. (2009). Small, homelike care environments for older people with dementia: a literature review. *International Psychogeriatrics, 21*(2), 252-264.

Zavotka, S. L. & Teaford, M. H. (1997). The design of shared social spaces in assisted living residences for older adults. *Journal of Interior Design, 23*(2), 2-16.