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Kaitlyn Kleibusch  
*Grand Valley State University*

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# Wayfinding & Dementia: How Design Can Improve Navigation Among Older Adults in Assisted-Living Facilities

Kaitlyn Kleibusch

Grand Valley State University

## Abstract

*As we age, our ability to navigate within the environment diminishes and can lead to increased anxiety and fear related to day-to-day mobility. While the aging population continues to grow, the number of older adults living with dementia is projected to increase substantially by 2030. Research shows 40% to 67% of individuals diagnosed with dementia will enter assisted living facilities due to complex care needs and loss of independence. The majority of existing assisted-living facilities were not designed architecturally to accommodate and compensate for cognitive impairment; therefore individuals with dementia may experience reduced spatial orientation and confusion while wayfinding through the environment. Drawing on available literature, this paper examines how architectural and interior design impacts individuals with dementia, explores how individuals with dementia interpret their surroundings, and offers insight into best design and décor practices for improved wayfinding in assisted-living facilities.*

Throughout the decades, the number of individuals over the age of 65 has increased thirty-fold since the 1870s in the United States (Moody & Sasser, 2015). The U.S. Census Bureau projects that by 2030 nearly 20% of the United States population will be 65 years old or older, and nearly 400,000 individuals will reach the age of 100 (Moody & Sasser, 2015). As life expectancy increases, the number of older adults living with complex care needs, chronic illnesses, and cognitive impairment, such as dementia, will continue to expand. The Alzheimer's Association estimates nearly five million older adults are currently living with various forms of dementia and expects these figures to grow (2016 Alzheimer's Disease Facts).

In the United States, the term *dementia* is commonly used interchangeably with the term *Alzheimer's* to describe an individual living with mild to severe forms of cognitive impairment or decline, however these terms differ significantly. *Dementia* is an 'umbrella' term used to describe a range of symptoms associated with a decline in memory and thinking skills that are severe enough to interfere with daily living (What is

Dementia?, 2016), while *Alzheimer's disease* is a progressive, degenerative disorder that attacks the brain's neurons, resulting in memory loss, decreased thinking and language skills, and changes in behavior (What is Alzheimer's?, 2016). Research conducted by the American Psychiatric Association (2007) found Alzheimer's disease to be the most common form of dementia, accounting for roughly 50% to 75% of all dementia cases among the oldest adults in the nation.

As an individual progresses through the stages of dementia, they may begin to experience a number of signs and symptoms including, intellectual deficits, mild to severe memory impairments, deteriorating language and sentence formation skills, shorter attention spans, reduced judgment and decision-making abilities, and deficits in spatial orientation and wayfinding. Spatial disorientation is "misperceiving immediate surroundings, not being aware of one's setting, or not knowing where one is in relation to the environment" (Mahoney, Vilocer, & Hurley, 2000, p.125), while wayfinding is viewed as "spatial problem-solving abilities necessary in reaching destinations when appropriate solutions are not available in memory" (Chiu, Algase, Whall, Liang, Liu, & Lin, 2005, p.761). The ability to know, remember, and navigate from one location to another is dependent on the information obtained from the environment by the working memory. The information is then transported to the hippocampus, the portion of the limbic system responsible for regulating emotion and creating long-term memories and *cognitive maps* (Davis, Therrien, & West, 2009). Cognitive maps are internal representations or memories of an environment based on the relationships among distal environmental cues or landmarks that can be recalled in the future when the individual sees and remembers the encoded cues (Davis & Therrien, 2012). Each recalled environmental cue or landmark embedded in the cognitive map helps the individual successfully navigate through the built environment (Davis & Therrien, 2012).

Researchers have found significant declines in working memory among members of the aging population, especially among older adults living with dementia. As working memory declines, a smaller amount of environmental information is collected, resulting in less information being used to develop a cognitive map (Davis, Therrien, & West, 2009). Less detailed cognitive maps created by individuals with dementia may lead to decreased motor and sensory abilities, increased safety concerns, confusion, fear or anxiety, increased difficulty learning and adapting to the

environment, and reduced spatial orientation and wayfinding abilities (Davis, Therrien & West, 2009).

The known associations between cognitive decline, wayfinding, and spatial disorientation continue to strongly support the theoretical frameworks created by Lawton, Simon, and Nahemow in the late 1900s, including: the *Environmental Docility Hypothesis* and the *Competence-Environmental Press Model*. In 1968, Lawton and Simon established the *Environmental Docility Hypothesis* based on the German ecological gerontology model, which states “people who are subjected to restrictions on their health or cognitive ability cannot always adapt the environment to their needs and become more dependent on their environment” (Marquardt & Schmieg, 2009, p.333). The hypothesis suggests individuals with dementia lose the ability to regulate environmental factors, therefore the environment should be designed to meet their specific physical or cognitive health needs (Marquardt & Schmieg, 2009).

A few years after the Environmental Docility Hypothesis was established, Lawton and Nahemow created the Competence-Environmental Press Model that theorized “human behavior and function result from the competencies of the individual, the “press” of the environment, and the interaction or adaptation of the person to the environment” (Capsi, 2014, p. 432). This framework implies individuals with lower levels of cognitive functioning depend more on the immediate environment for spatial orientation than individuals with higher levels of cognitive functioning. In order to accommodate individuals that rely heavily on the environment for wayfinding, it is important to design buildings that maximize the person-environment relationship through dementia-friendly design techniques.

The frameworks presented by Lawton and his colleagues emphasized the importance of creating an environment to compensate for or complement the cognitive abilities held by individuals living with dementia. In the early 1990s, assisted-living facilities began shifting away from the medical model of care to the social model (Liu, Rodiek, Shepley, & Tassinari, 2015). The social model is residential in nature and provides residents with person-centered care and improved quality of life (Bunker-Hellmich, 2015). In order to provide residents with a safe environment that provides positive decision-making opportunities, the industry has embraced the culture change movement and has started to create *dementia-friendly environments*. Dementia-friendly environments support and

recognize the experiences of individuals with dementia and allow them to remain active and engaged in their lives (Davis, Byers, Nay, & Koch, 2009b).

A growing number of studies found the majority of individuals diagnosed with Alzheimer's disease become 'institutionalized' throughout the disease process due to loss of independence, increased care needs, behavioral concerns, and cognitive decline interfering with the ability to engage in a meaningful lifestyle (Marquardt & Schmiege, 2009). In 2009, the prevalence of dementia among assisted-living residents ranged from 40% to 67% and is expected to increase significantly by 2030 (Rowles & Teaster, 2016).

With the increasing number of individuals living with dementia entering assisted-living facilities, it is vital for organizations to create therapeutic environments that allow residents to maintain their freedom of choice, privacy, human dignity, and access to social and recreational activities, while accommodating wayfinding and spatial orientation needs (Passini, Pigot, Rainville, & Tetreault, 2000). In order to gain an understanding of how assisted-living design impacts wayfinding among older adults with dementia, a variety of dementia-friendly design techniques and best practices will be reviewed.

Complex built environments negatively impact our ability to navigate throughout a facility, especially for those living with mild cognitive impairments or dementia. Research conducted on wayfinding found navigation performance decreases with increased floor plan complexity, but improves with increased visual access, architectural differentiation, improved floor plan configurations, and consistent use of signage and room numbers (O'Malley, Innes & Wiener, 2015). Wayfinding and spatial orientation design techniques should be thoroughly understood and incorporated in assisted-living facility interior and exterior design. The most common environmental elements used to promote wayfinding and spatial orientation consists of: floor plan typology, lighting, flooring, tonal color and contrast, cues, and signage. The most basic element influencing wayfinding and spatial relationships is the facility's building structure.

### **Building Structure**

In assisted-living facilities, the building structure has the largest impact on an older adult's ability to navigate through the environment. The most important design feature associated with wayfinding and spatial

orientation is floor plan typology. Research suggests assisted-living facilities should be built with simple circulation systems. A study conducted by Marquardt & Schmeig (2009) analyzed the architectural characteristics of thirty assisted-living facilities to identify design features that supported the residents' spatial abilities, while promoting mobility and independence. The study focused specifically on floor plan circulation corridors and the importance of reference points. Three commonly used circulation corridor typologies were examined including, straight circulation systems, L-shaped circulation systems, and continuous path circulation systems surrounding an indoor courtyard. The study found, individuals with moderate to severe dementia were better able to orient themselves and navigate straight circulation corridors with no change in direction rather than in a circulation layout featuring a shift in direction (Marquardt & Schmeig, 2009).

The study also found wayfinding within straight circulation systems to be supportive for wayfinding and orientation when each of the corridors had clear, visible endings and were wide enough to accommodate the use of walking aides. Further research conducted by Marquardt (2011) showed that residents who had to walk longer distances throughout the facility or walked along a corridor with multiple *exit points* experienced increased difficulty wayfinding. Research suggests circulation systems should be short. A study conducted by Celine Pinet (1999) examined 960 residents living in a variety of residential care settings and found the social spaces closest to a resident's room were used more often than spaces that were farther away. Community spaces that are 20 feet away from a resident's room are used nearly five times more than spaces 100 feet away (Pinet, 1999). Design research has also found repetitive elements within the circulation system such as undifferentiated double-loaded corridors, alcoves, and wall recesses lead to increased confusion and spatial disorientation (Marquardt, 2011).

Research conducted by Passini et al. (2000) supported the research conducted by Marquardt (2011), however Passini and colleagues focused on the importance of reference points in circulation systems to improve wayfinding. *Reference points* or *spatial anchor points* are defined as "spaces with distinct functions (i.e. nursing station or living room) as well as elements like furniture or decorations" (Passini et al., 2000, p. 82). Passini et al. (2000), found direct visual access to a reference point within a unit or corridor improves wayfinding and promotes spatial orientation.

Reference points are also useful in memory care units with a L, V, or T-shaped corridor or a continuous path circulation system because they provide the individual with a renewed sense of orientation, and assist the individual in creating or recalling a cognitive map of the space.

## **Interior Design & Décor**

The exterior or building structure of an assisted-living facility is not the only design aspect that can affect a resident's ability to navigate throughout a space. In many instances, assisted-living facilities do not have the funds or financial stability to redesign or rebuild the facility to accommodate dementia-friendly guidelines and recommendations. However, a variety of dementia-friendly design suggestions can be implemented through cost-effective interior design changes that continue to meet the expectations and regulations upheld by the federal and state governments.

There are a significant number of interior design opportunities that can be updated or changed to promote wayfinding and spatial orientation including, but not limited to: improved lighting, glare-resistant and visuospatial friendly flooring, changes in color and contrast, the use of cues, landmarks, and signage. In order to gain a greater understanding of dementia-friendly design, we will examine the theories behind effective, interior environmental interventions that can be used to improve wayfinding in assisted-living facilities.

### **Lighting**

One of the most important interior environmental interventions that can be used to support wayfinding in assisted-living facilities is sufficient lighting or the use of light therapy. Research conducted by Martin Habell (2013), states “a person experiences a marked reduction in light when confined inside a building...while individuals receive 2,000 lux hours inside...if they are outside it is 40 times as strong at 80,000 lux... so they may experience changes or variations in spectral composition” (p.154). A *lux* is a unit of light measurement that identifies the light intensity of an area, while a *lumen* is a unit of light measurement representing the total amount of light emitted; one lux is equal to one lumen. Unfortunately, when an individual moves into an assisted-living facility due to health

concerns and dementia, the amount of time spent outside is limited. Several studies have been conducted on the positive physical health benefits of natural and artificial light, emphasizing the importance of light and light therapy for residents with dementia in assisted-living facilities. Research conducted by Marquardt (2011), found sufficient light ranging from 500 to 2,000 lux of ambient light in resident rooms and activity areas is necessary for residents to be able to see and interpret the cues, landmarks, pictures, or signage that help them orient and navigate through the facility. Researchers recommend a minimum of 500 lux in corridors with few windows or opportunity for natural light. Architects, Pollock & Fuggle (2013), conducted research on the best lighting practices for assisted-living facilities and provided a number of recommendations.

The first recommendation is to set lighting levels at least double the normal standard set for individuals in their mid-forties to ensure the best vision possible for wayfinding (Pollock & Fuggle, 2013). Second, assisted-living facilities should make use of all natural light coming into the building. The administrators, resident aides, nurses, and activities staff should take steps to host events and create inviting environments throughout the organization to encourage residents to sit by the windows for natural light exposure. In addition, translucent blinds should be used to prevent visuospatial disorientation associated with light reflections or glare off laminate flooring. In order to ensure natural light is not completely removed, the facility should use sheer curtains to allow some natural light to enter each resident's room. Lastly, "spotlights should be avoided because they produce dark shadowy areas around the beams which may be visually confusing to residents and detract from their ability to navigate safely in the environment" (Pollock & Fuggle, 2013, p. 440).

## **Flooring**

Assisted-living facilities utilize a wide variety of flooring options that may impact a resident's ability to navigate. In order to ensure residents with dementia can safely and independently navigate throughout the unit or facility, the following flooring techniques are recommended. When transitioning from one flooring type to another, adjacent floor types should be laid to blend together. If the flooring is laid incorrectly or the contrast is too significant, it may appear as a step and lead to visuospatial disorientation (Pollock & Fuggle, 2013). To avoid creating a step-like

appearance at floor transitions, flooring should be selected with similar light reflectance values (LRVs) and use a transition strip similar in color to blend the floor patterns. Each flooring option should incorporate warm tones because older adults experiencing visuospatial disorientation or declining eyesight can easily see them (Pollock & Fuggle, 2013).

Furthermore, any flooring used in resident rooms or commonly visited spaces by residents should be slip-resistant and flat to allow residents to walk comfortably without shoes or with a gait belt, and should not contain any bold patterns, speckles, or sparkles due to the possibility of disorientation or distraction (Pollock & Fuggle, 2013).

### **Tonal Contrast/Color**

Prior research in dementia care assumed opposing colors, such as red and yellow, adequately assisted older adults and individuals living with visual impairments to differentiate between two objects or surfaces (Color & Wayfinding, 2011). Despite the differences in hue, the luminosity or brightness of select colors appear to be the same to an individual who is visually impaired, and does not produce an adequate tonal contrast for effective navigation (Color & Wayfinding, 2011). A number of assisted-

living facilities have tried using color-coding techniques to help residents with dementia successfully navigate throughout the environment, however, it was found ineffective due to significant changes in the eye's lens during the aging process. Over the years, research has found that as the eye's lens ages, the perception of color decreases and it becomes increasingly difficult to differentiate between dark shades and light tones on the blue end of the color spectrum (Benbow, 2013). Research conducted by Pollock & Fuggle (2013) found the yellowing of the eye's lens negatively impacts the ability to differentiate between blues, violets, and greens on the color spectrum, which makes it difficult to use color-coding to improve wayfinding.

In order to create a supportive wayfinding environment, designers, architects, and assisted-living administrators must utilize color and tonal contrast to compensate for visual impairment and positively influence wayfinding. Research conducted by Benbow (2013) recommends designers and administrators create corridors with light colored entryways, dark doorjambs, lightly colored laminate, wood, or carpet, and dark

colored furniture to allow residents with dementia to differentiate between doorways and corridors while navigating throughout the facility.

Since contrast is more important than hue when designing a dementia-friendly environment, LRVs should be considered when designing corridors, entryways, and resident rooms. Research conducted by Stirling University found the “acceptable LRV contrast needed for older adults to differentiate between surfaces is an LRV greater than 30” (Benbow, 2013, p. 9). Based on this recommendation, Pollock & Fuggle (2013) suggest using wall skirts that are 30 LRVs darker or lighter than the LRV used on the floor to highlight the door from the surrounding environment. The Trust Housing Association (2011) suggests similar techniques should be used to help older adults with dementia differentiate between the walls and the ceiling, as well as the flooring and upholstery. This would allow residents to gain an appreciation and understanding of the size of the space and improve orientation. When applying various hues and textures to help differentiate the space, Benbow (2013) suggests utilizing matte paints and surfaces to avoid disorienting reflections and glares on the surfaces within the unit.

## **Cues/Landmarks**

The ability to navigate is essential in new, “large-scale spatial environments that cannot be viewed in total from a single vantage point” (Davis et al., 2009a, p.744). Individuals use a variety of wayfinding strategies to successfully find their way through a built environment. The most commonly used strategies include simple landmark navigation and place learning. *Landmark navigation* allows individuals to “travel from one landmark to another while learning directions and turns based on the route created sequentially between landmarks” (Davis et al., 2009a, p. 744). *Place learning* is a method individuals use to generate and store a detailed mental representation of the environment in a cognitive map that can be recalled to help individuals effectively navigate from one place to another (Davis et al., 2009a, p. 744). In both wayfinding strategies, visual cues play an active role in environmental learning, navigation, and the creation of a cognitive map.

Research conducted by Davis et al. (2009a) examined how working memory ability in older adults is related to wayfinding performance in the presence of salient or non-salient visual cues. Davis & Weisbeck (2016)

define a cue as “a piece of information that aids the memory in retrieving details that are not recalled immediately or without prompting” and can have properties related to the number of cues in an area, complexity, salience, and stability (p.37). Davis et al. (2009a) recognized medical environments tend to have limited visual range because they are built with long, double-loaded corridors, neutral-colored walls, equally-spaced doorways, uniform carpeting throughout the facility, and lack differentiating visual cues. With a significant amount of research indicating visual cues and landmarks improve spatial awareness and wayfinding among older adults, Davis et al., (2009a) conducted a virtual reality study to determine whether cue salience and cue complexity affected place learning differently in individuals over the age of 65. Each participant was trained to use the joystick to navigate throughout the virtual space, and was required to locate a hidden platform with the assumption that the participants would use the cues to create a cognitive map and locate the hidden platform with increased speed after each consecutive trial (Davis et al., 2009a). To examine the effect of cue salience and complexity, each participant was tested under four cue conditions, the simple salient cue condition, the complex salient cue condition, the non-salient cue condition, and a control condition. Each condition presented the scenario of a large room with four walls.

The simple salient cue condition contained four large, high-contrast, black and white cues with simple drawings of a star, fish, kite and tree (Davis et al., 2009a). The walls of the room were black, the floor and ceiling were white, and each picture had a white background and a black picture. The complex salient cue condition had a gray floor, white ceiling, and four varying walls. Two of the walls were made of gray cobblestone, one was blue with gray arches, and one wall was brick. Each visual cue or picture mimicked realistic photographs of a car, a sunset, a yellow flower, a cactus, a tribal mask, a door, and two windows (Davis et al., 2009a). The non-salient cue condition had white walls, a white ceiling, and a white floor. Only two cues were present on opposite walls one picture featured a gray moon landscape, and the other was a gray and brown abstract photograph. The control condition was the same as the simple salient cue condition, however the walls were purple, and the pictures changed places between trials. Davis et al. (2009a) found salient cues produced better place learning curves among older women opposed to non-salient cues.

The study also found complex salient cues were more effective at enhancing place learning than simple salient cues. The findings from the study found older adults are more dependent on the immediate environment than younger adults, and that visual salient cues play a significant role in wayfinding and orientation for aging adults. The study concluded simple salient cues may not provide enough information to consistently help older adults successfully navigate through the built environment. Therefore, salient visual cues should be purposefully placed within assisted-living facilities to promote effective wayfinding.

Contrasting with Davis et al., (2009a), research conducted by Kessels, van Doormaal, & Janzen (2011) examined “memory for objects relevant for navigation such as landmarks at decision points, compared to memory for objects presented along the route but in irrelevant locations” (p.3). In the study, twenty-one Alzheimer’s patients were recruited from a memory clinic in Lievensburg Hospital, in the Netherlands. All participants were “instructed that they would watch a film of a virtual maze with objects placed on tables, representing a virtual museum” (Kessels et al., 2011, p. 2). Each participant was then instructed to read the name of the objects out loud as they were presented, focus on the objects children would like to play with (i.e. toys), and pay attention to the ‘route’ they navigated through during their virtual journey. After watching the film, the participants were asked to complete a recognition test requiring them to indicate whether the object was or was not presented during the virtual journey by pressing a ‘yes’ or ‘no’ button (Kessels et al., 2011). The study found non-decision point objects were more accurately recognized than less-attended items. However, objects placed purposefully at decision points were remembered less frequently while the unattended objects were remembered accurately (Kessels et al., 2011). Overall, the study found Alzheimer’s patients recalled unattended items at decision points more accurately when compared to attended objects purposefully placed at decision points (Kessels et al., 2011). Kessels et al. (2011) determined facilities cannot intentionally place an object at a decision point and assume each resident will connect the object to the given space, therefore the object will not become a true landmark or assist with successful navigation.

Despite the mixed results on cueing and landmarks, a number of studies have found effective techniques to improve the creation of the cognitive map and allow residents with dementia to navigate successfully.

Research conducted by Brush, Camp, Bohach, & Gertsberg (2015) reiterates studies by Davis et al. (2009a) and Kessels et al. (2011) suggesting the effectiveness of environmental cues are strengthened when they are bold, varied, and distinctive. Kessels et al. (2011) found unintentional cues were remembered more often than intentional cues, and as a result, assisted-living facilities should place a variety of brightly colored paintings of familiar objects, quilts, or furniture at decision points to increase the likelihood of residents defining a landmark for navigation. Additional studies conducted by Habel (2013) and Benbow (2013) recommend using personalized cues such as a photo of the resident, the residents name, and personal memorabilia from the past to improve navigation to and from a resident's room. The effectiveness of cueing and landmarks vary significantly among residents. Person-centered care can provide unit staff and administrators with the knowledge to effectively create useful cues and landmarks for the residents.

## **Signage**

Similar to visual cues, the use of signage in assisted-living facilities is not well understood or utilized effectively to promote wayfinding and spatial orientation for residents with dementia. Over the years, research on signage in assisted-living facilities has found residents with dementia require multiple forms of environmental support to achieve independent wayfinding and mobility. Signage is one of the most commonly used environmental supports in organizations regardless of the industry, however the appropriate use of signage in assisted-living facilities is essential for successful wayfinding. The types of signage commonly found in assisted-living facilities include: typographs, pictograms, photographic labels, individual portraits, or resident name cards on a residential suite (Marquardt, 2011). In order to promote effective wayfinding, research suggests improving the pictorial elements, legibility, lettering, and location of the signs.

Research conducted by Benbow (2013) recommends combining pictorial elements and simplistic nomenclature to promote effective wayfinding for individuals living with dementia. A general example of bathroom signage with the previously discussed elements would include: the word 'toilet' instead of bathroom, and a universal picture of a toilet. This signage format would allow individuals with dementia to identify the

restroom in a timely manner in response to the combination of simplistic language and visual cues. Research conducted by the Trust Housing Association (2011) reiterated the importance of using universal imagery of common objects to avoid further confusion or disorientation. For example, the Trust Housing Association (2011) recommends assisted-living facilities use a picture of an old, traditional phone for memory care unit signage rather a picture of a modern-day smart phone, because the photograph is not familiar or recognizable to the resident population.

Another area to consider when developing signage is legibility and lettering. Research conducted by Brush et al. (2015) recommends the lettering on signage should use a capital letter followed by lowercase letters and be highly contrasted from the graphic and sign background. The legibility of the sign should be clear and concise, and free of excess words, phrases, or decoration. The Trust Housing Association (2011) recommends all signs use sans serif fonts, and avoid using decorative, italic, script, condensed, or extended typefaces. Despite the recommendations presented in the literature, it is essential that the facility adhere to the laws and regulations required by the Americans with Disabilities Act (ADA).

The location and placement of signage is associated with the effectiveness of wayfinding for residents with dementia, because individuals with dementia are more likely to walk with their head slightly tilted toward the ground (Benbow, 2013). Unfortunately, many residents with dementia are unaware of the signs placed throughout the facility and do not use them to navigate. In order for the environment to compensate for cognitive impairments, signage should be mounted with the lower edge no higher than four to five feet from the ground (Benbow, 2013).

Dr. Rebecca Davis (R. Davis, personal interview, November 10, 2016), from Grand Valley State University, supported the proposed signage recommendations presented by Benbow (2013) and Brush et al. (2015), but reiterated the importance of using brightly color-contrasted signs that “pop” out from the background and to avoid black-and-white colored signs. She also recommended that facilities disassociate their color scheme or organizational theme when creating signage for the facility. Many assisted-living facilities use neutral or visually appealing signage to maintain a polished, modern design, however the majority of the signage is ‘camouflaged’, and cannot be seen by residents living in the facility. A recent study conducted by Dr. Davis, that utilized eye-tracking software for virtual wayfinding found older adults with dementia tend to look at

the handrails along each of the corridors while navigating. This evidence suggests the best placement for signage is just above the handrails at the end of a corridor. The implementation of these dementia-friendly design techniques will improve wayfinding and orientation, as well as reduce any agitation, confusion, or fear associated with navigation or mobility.

## **Conclusion**

With a rapidly aging population and five million Americans living with various forms of cognitive impairment and dementia, it is important to understand how physical and cognitive decline impacts the ability to navigate within an individual's environment. As an increasing number of older adults move into assisted-living facilities, design factors need to promote ease of wayfinding. The emphasis should be placed on creating therapeutic environments that foster independent mobility, spatial orientation, and wayfinding. Despite the lack of comprehensive research and case studies on wayfinding, dementia, and design, researchers have identified a variety of environmental design elements that positively impact an individual's ability to create detailed cognitive maps of their environment, regardless of cognitive ability. From an architectural perspective, research suggests new assisted-living facilities should be built with short, straight, single-loaded corridors that have clear visual endings and incorporate opportunities for natural light. Older facilities and facilities with complex corridor designs are encouraged to focus on developing or incorporating reference or spatial anchor points along corridors to assist individuals orient within the environment, and facilitate the development of a quasi-detailed cognitive map.

Assisted-living facilities can create supportive environments for individuals with dementia by ensuring appropriate lighting and materials are used throughout the building. The literature recommends assisted-living facilities light hallways and corridors that receive little to no natural light with a minimum of 500 lux, and light resident rooms and community living spaces such as dining areas with two times the standard lighting levels to reduce disorienting shadows and improve vision for successful wayfinding (Pollock & Fuggle, 2013). Old lighting fixtures containing spotlights should also be removed and replaced with light bulbs that disperse light throughout the space. This may assist individuals with dementia differentiate between varying colors and surfaces. Interior

designers should work with administration to select slip-resistant carpet that incorporate warm, neutral tones and avoid bold patterns and speckled designs (Pollock & Fuggle, 2013).

Despite our desire for visually appealing, branded color schemes, assisted-living facilities caring for individuals with dementia should be encouraged to create color-contrasting environments. Research by Benbow (2013) suggests utilizing contrasting colors to assist individuals define and differentiate between doorways, door jams, flooring, and furniture. Best practice for contrasting colors includes selecting colors that are 30 LRVs darker or lighter than one another to reduce visuospatial disorientation. In addition to color contrasting, visual cues at decision points and signage are key aspects of wayfinding that should steer away from organizational branding and color schemes. Research on the effectiveness of environmental cues is mixed, however all studies related to cueing, wayfinding, and dementia show environmental cues are strengthened when they are bold, unintentional, varied, and distinctive. Assisted-living facilities are encouraged to place brightly colored, familiar objects at decision points to improve wayfinding. Additionally, assisted-living facilities are highly encouraged to abandon small, branded signage and adopt large, brightly colored signage with simplistic signage including basic language and photographic labels. This will allow individuals with dementia to easily identify, recall, and navigate throughout the organization.

In order for assisted-living facilities to successfully create supportive wayfinding environments for individuals with dementia in the future, they must be willing to take risks and adopt dementia friendly building design and décor techniques, challenge the status quo, over-emphasize the relationship between floor plan typology and the placement of environmental cues, and educate the general public and community about evidence-based practices associated with dementia friendly design. As the assisted-living industry continues to support individuals with dementia, it is the responsibility of the direct care team, managers, architects, and designers to create salient environments, and adopt design techniques that allow individuals to navigate successfully and independently, while improving quality of life and overall well-being.

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# About the Author

Kaitlyn Kleibusch received her Bachelor in Psychology with a biology minor from Aquinas College in 2015, and her Master of Health Administration with a concentration in long-term care from Grand Valley State University in 2017. While in graduate school, she participated in Grand Valley's 12<sup>th</sup> Annual Art & Science of Aging conference, developed a social determinants of health learning module for students enrolled in health professions, and earned a certificate in Interprofessional Education. She is an active member in a number of nationally and internationally recognized academic honor societies including, Phi Kappa Phi, Upsilon Phi Delta, Omicron Delta Kappa, and Psi Chi. Kaitlyn currently serves as a Product Manager at Priority Health, and aspires to improve member health and well-being through innovative employer solutions, and hopes to increase health literacy throughout the state. When not at work, Kaitlyn enjoys reading political biographies, spending time with family, and sight-seeing in Northern Michigan.

