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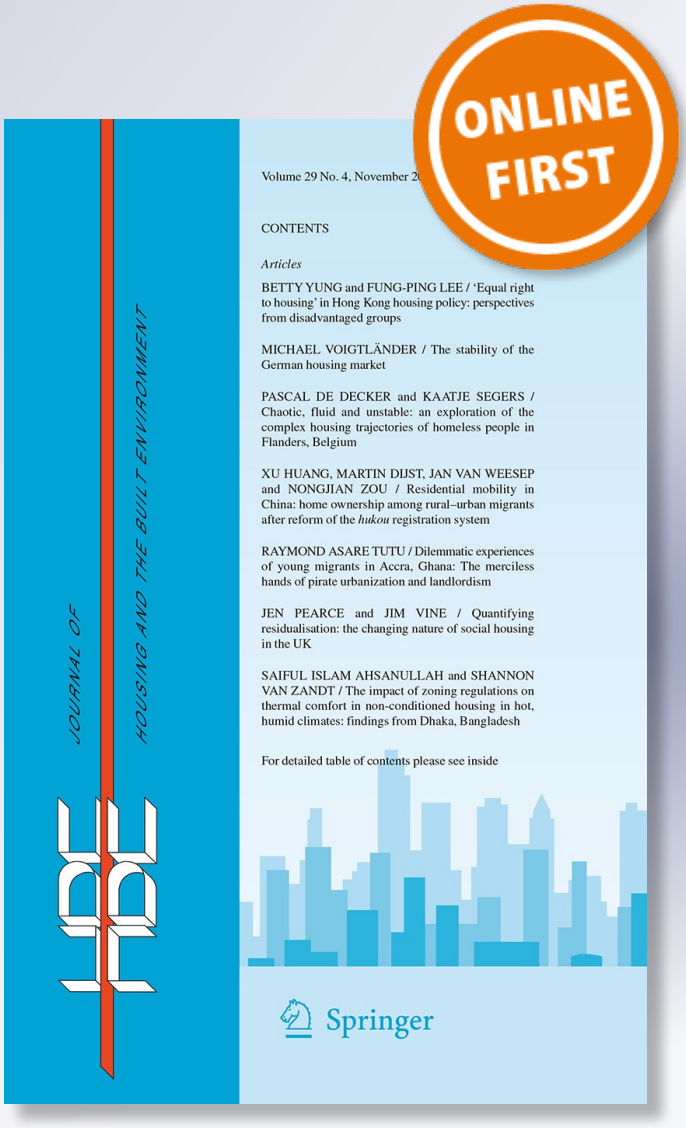

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ARTICLE

Designing for social needs to support aging in place within continuing care retirement communities

Nichole Campbell

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Abstract With advancing age and disability, continuing care retirement community (CCRC) residents relocate to the next care level as needed. Occasionally, independent living does not offer services a resident needs, yet the resident may not be ready for assisted living. Additionally, since research indicates relocation negatively impacts frail adults' health/well-being (Bernard et al. 1996), it is reasonable to ask if this approach is optimal. Might aging in place within independent living be more beneficial? Research also shows satisfying social needs is increasingly important to supporting health (Glass et al. 2006) and life satisfaction (Jang et al. 2004) as we age. How then, do we design to support resident social interaction without necessitating relocation? As aging residents experience physical declines such as limited mobility, nearby space designs become increasingly important. This study involving south eastern US, CCRC residents sought to determine how aging in place might be supported by social space designs. Using the Successful Social Space Attribute Model (Campbell 2014) as its organizing framework, this study examined independent and assisted living resident perspectives to identify factors impacting how well social spaces were liked and used, the markers of social space success. For both groups, this study identified two factors: active engagement opportunities (i.e. ways to engage with the environment and other people), and home range (i.e. resident's daily path of travel). These findings suggest guidelines for designing CCRC social spaces to support aging in place.

Keywords Older adults · Social interaction · Independent living · Assisted living · Aging in place · Interior design

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1 Background and study purposes

1.1 A missing piece in the continuum of care

Continuing care retirement communities (CCRCs) are retirement communities offering at least three care levels including independent living for healthy, active older adults, assisted living for individuals needing assistance with two or more activities of daily living, and nursing care for individuals needing a high degree of medical and daily personal care. How this works in practice is that as an individual needs more care, that person relocates to an apartment in the continuum of care's next care level within the retirement community. In the non-profit Southeastern US, CCRC examined in this research, the Executive Director expressed concern about a sub-group of independent living (IL) residents who do not fit well into the traditional care model. According to Antonucci (personal communication, October 5, 2012), these residents need more support than is available in IL but whose physical limitations do not require assisted living (AL) level care. Addressing this issue requires asking whether there is a more optimal housing solution than the current CCRC structure requiring up to three need-based relocations for residents.

The issue of relocating the ill and frail has been much studied. From many studies, we know transfers, especially when sudden and unexpected, are associated with negative outcomes such as increased depression and even serious illness and elevated mortality risk (Bernard et al. 1996; Clough et al. 1993; Gordon and Rosenthal 1996; Schiff et al. 1986). In 1992, after decades of study, Relocation Stress Syndrome was acknowledged as an official diagnosis.

> This syndrome is defined as physiologic and/or psychosocial disturbances as a result of transfer from one environment to another. The major defining characteristics include increased confusion in the elderly, depression, anxiety, apprehension, and loneliness (Mallick and Whipple 2000).

Since CCRCs are based on a stepped model necessitating relocations for increasingly frail residents, it stands to reason this current model may not optimally support resident health and well-being.

Even though part of a CCRC's appeal is the security of knowing AL and nursing care services are available, is it reasonable to assume most IL residents prefer to relocate to get additional services if their needs change? Research of elderly living in traditional housing shows the vast majority of older adults report preferring to age in place even if their needs change. Might it then be logical to assume IL residents would also prefer to age in place? One goal of this study was to see if this assumption was true.

Facility design is an important component to support successful aging in place. As residents become increasingly frail, they need more support from their surroundings. This indicates the escalating importance of addressing resident needs through design. Although CCRCs generally offer accessibility features such as no-step entrances and grab bars to support physiological changes, this does not address the whole person and all needs for creating a full and satisfying life. More than meeting physiological changes, successful aging is also dependent upon having one's social needs met.

Focus on the importance of supporting older adults' social lives is increasing. For example, as part of their Active Aging Initiative, the World Health Organization (WHO) announced the goal of, "…provide(ing) housing for older adults in communities that encourage daily social interaction" (WHO 2002, p. 48). In a CCRC context, how then can daily social interaction be supported through design?

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While often an overlooked area of focus, addressing social needs through the built environment is vital to supporting older adults' well-being. Research underscores this premise by repeatedly finding appropriate amounts of social interaction positively impact health (Glass et al. 2006; Ybarra et al. 2008), well-being (Krause 2006; Sheehan et al. 2006), and life satisfaction (Aquino et al. 1996; Jang et al. 2004). While social interaction is important at any age, its impacts are more significant for older adults.

Not only do CCRC residents need daily social interaction opportunities, evidence suggests relationships with friends within the retirement community come to hold greater value than interactions with friends or even relatives outside the community. A study of social interaction in US, AL facilities showed, "contact with family and friends outside the facility did not significantly impact life satisfaction, but positive internal social relationships were associated with significantly higher life satisfaction" (Street et al. 2007, p. 133). From a design standpoint, this emphasizes the value of understanding how to design to support CCRC residents' social interaction.

As residents develop challenges such as mobility issues, availability of quality social spaces within the CCRC becomes increasingly important. This is because it often becomes more difficult and even less desirable to make trips beyond the retirement community. Due to the various mobility ability levels present when residents age in place, it stands to reason social space proximity to residences should be examined.

A second focus of this study was to identify environmental and other factors impacting retirement community social space success for elderly residents of varying ability levels. Thus, it considered perspectives of residents in both IL and AL situations. In doing so, the factors identified could offer design guidance for social spaces within retirement communities allowing residents to successfully age in place. The "Successful Social Space Attribute Model" (Campbell 2014), an original conceptual framework derived in a study of social space use and preferences of older adults living in a large CCRC in the Midwest, was used as the source of factors to be examined for their possible impact on successful social space design.

1.2 Understanding CCRC social space design within a theoretical framework

The "Successful Social Space Attribute Model" (Campbell 2014) is a conceptual framework defining factors impacting the social lives of retirement community residents. With time as

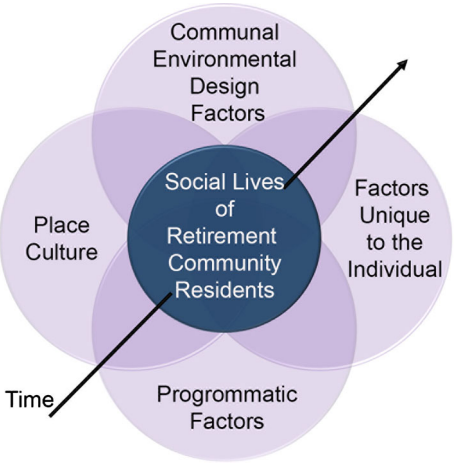

Fig. 1 Successful Social Space Attribute Model in pictorial form

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Table 1 Independent living variable tiers and individual factors unique to the individual (FUI) variables serving as predictor variables

Top Tier—Belonging Needs
Reasons to use a space—ways to actively engage with people and the environment as well as ways to passively engage
Sense of belonging/fitting in—this indicates a space comfortably supports solo visits
Professional interaction status—indicating how much paid/unpaid work in which the resident may be involved
Resident partner—indicating whether the resident lives alone or not
Time in residence—length of time the resident has resided at this location in the retirement community
Second Tier Variables—Security Needs
How private a space felt?
Socializing space preference—whether the resident prefers to interact with others on campus or in other locations
Gender
Foundation Tier Variables—Physiological Needs
Home range—proximity of social spaces to daily travel routes and apartment
Sensory issues—includes hearing, vision/light needs, and temperature preference
Mobility—including physical mobility and personal transportation for use beyond the CCRC
Age

an overarching factor impacting all others, this framework includes four main factor categories including factors programmed by the organization, the culture and norms specific to that particular group, communal environmental design factors which are those shared by the group, and the factors unique to the individual (FUI) that, despite their individual nature, can be planned for as a group. While illustrating all of these interconnected factor categories, take special note in Fig. 1 of the FUI category, which is the focus of this discussion. This factor category hosts variables impacting how well social spaces are liked and used and provides practical implications for independent living facility design.

Because of the Model's potential for providing practical implications for CCRC design, a portion of it was examined further in this study. Specifically, the model's Factors Unique to the Individual component was studied with the purpose of identifying which FUI might be useful to inform designing successful social spaces for CCRC residents of varying ability.

The FUI portion of the includes individually-related built factors, such as proximity of social spaces to each resident's apartment, and factors related to an individual's experience of a space such as residents' daily paths of travel. Although these are singular by nature, designers can still plan for these collectively. For instance, each person's typical daily path of travel varies from the others but designers can influence main circulation routes through the building's interior design. According to the level of human fulfilled, each FUI variable is assigned to one of three tiered categories: the Foundational Tier which addresses physiological needs, the Second Tier which addresses security needs, or the Top Tier addressing belonging needs. As illustrated in Table 1, the three tier layers as well as the individual variables grouped within each tier served as predictors in this study.

Another aspect of this model, important to this study, is the distinction made in defining and measuring social space success. The two social space success measures are how well liked and used spaces are. These two measures were addressed separately to understand if factors driving how well spaces are liked impact how well spaces are used equally.

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1.3 Factors unique to the individual influencing quality of social interaction

This study sought to identify which FUI were related to how well spaces were liked and used for IL and AL residents. Identification of FUI found in spaces well liked and well used by both groups would indicate what attributes should be incorporated into social spaces to support social needs as residents age in place.

Designers commonly address human needs in the built environment. Despite longtime understanding of the hierarchical nature of human needs, as established by (Maslow 1987/1954), addressing human needs in design has only recently been addressed hierarchically. Designers predominantly focus on addressing physiological needs such as accessibility, and sometimes, informational needs such as way finding (meaning finding your way in a space). Social needs have received less attention. Acknowledging the hierarchical nature of human needs, FUI factors are grouped into three categories: Foundational, Second, and Top Variable Tiers.

Addressing more basic foundational needs is a central consideration when designing for older adults. This is because ease with which an older adult can access spaces becomes increasingly important as individuals face aging-associated physical challenges. Accordingly, home range (a resident's daily path of travel) is considered in this foundational tier since social space proximity is relevant to mobility. Once basic needs are addressed in social space designs, mid-level needs can be addressed.

The universal human need to feel sheltered by our surroundings is addressed in the second tier of factors supporting social interaction which impact security needs. This is related to privacy, and is applicable here because appropriate amounts of social interaction versus privacy are individualized. Privacy needs vary for each person and differ according to the situation. For example, Lang (1987), in his examination of behavioral sciences in design, reported privacy needs increase when people are under stress. This implies the need for designers to address the right to choose privacy or social interaction.

Extending from this in his humanistic design theoretical framework, Marsden reports "Protective Enclosure" as one guideline to create preferred AL design. While this is related to privacy and territory, Marsden clearly states his studies did "…not address the concepts of privacy, autonomy, and control" (Marsden 2005, p. 39). Even so, Marsden's work indicates the importance of creating more private areas within social spaces as an attribute positively influencing preference. To continue this line of research, the next logical step is to address how this drives use as well as preference.

Addressing top tier belonging needs (e.g. Maslow's Love/Belonging/Self-Actualization 1987/1954), requires first determining what design attributes support not only space use logistics but social interaction itself. Related research by Carr et al. (1992) identifies active engagement, a user's direct involvement in a scene/encounter, to impact space use. Active engagement may include participating in activities or interacting socially with others.

Carr et al. (1992) examined these in outdoor public spaces. When discussing active engagement opportunities in interiors, these may include participating in a game or conversation. In interior design, one way active engagement can be supported is by clustering commercial establishments. Creating a commercial cluster makes an activity hub for people to frequently cross paths and interact. In related interior plaza research, Whyte (1980) identified presence of food and retailing as essential interior space attributes impacting use. Both provide a place to meet and reason to linger, thus supporting social interaction. In short, researchers agree locating social spaces near activity hubs is beneficial. In turn, these activity hubs help facilitate higher level social needs.

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2 Study methodology

2.1 Purpose and main research question

In order to inform the development of more consistently well liked and well used CCRC social spaces, thus supporting resident social lives, the purpose of this study was to examine factors unique to individuals utilizing selected social spaces to identify which factors predicated how well these spaces were liked and used for social interaction. Additionally this study sought to understand independent living resident perspectives regarding aging in place.

With that, the research questions this study addressed included:

- What factors unique to the individual predict how a space will be liked and used?
- Should independent living residents' needs increase, what housing options do these residents prefer to meet those needs when given the option of relocating to assisted living, relocating into another housing option such as cohabitating with younger relatives, or staying in their current independent living residence and having needed services brought to them?

Study goals were achieved using an IL and AL resident survey measuring preferences with regard to aging in place, resident assessments regarding FUI variables, and like and use of selected CCRC social spaces. The predictor variables (FUIs) were tested to see which factors could significantly predict the two outcome variables, how well spaces were liked and used, the measures of social space success.

2.2 Sample and community description

This case study focused on a CCRC in Gainesville, Florida. Like most (81 %) of CCRCs in the US, this is a non-profit organization (Ziegler Capital Markets Report, 2009). This retirement community is situated on 104 scenic acres of land which hosts 5 residential apartment buildings in addition to 45, free-standing single family cottages. Of the total 639 residential units, 96 belong to assisted living, 32 to memory care, and 511 to independent living. This community's residents were predominantly upper middle class and Caucasian. Participants were solicited by: resident Town Hall Meeting announcements, posted notices, mailed flyers, and the activities schedule. The survey event took place at the CCRC over several days. As participation incentive, residents could win custom designed university mugs. These were awarded to residents on the floors/wings determined at the end of the data collection to have the highest resident participation percentage.

Independent and assisted living residents were surveyed separately using one survey for IL, one for Jasmine Pointe AL, and one for Rose Court AL residents. Table 2 shows the breakdown of the CCRC's population into IL and AL groups as well as the age information describing each group. The AL count did include Alzheimer's care residents as this group was not included in this study.

Table 2 CCRC's population reported by management

Housing type	Total residents (as of 5-31-12)	Age range of residents	Average resident age
Independent living	445	56–100	86
Assisted living (Rose Court & Jasmine Pointe)	87	70–103	88

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From the 445 IL residents invited to participate, 179 completed surveys—reflecting 40 % participation. IL respondents included: 121 women and 58 men, aged 60–99. The majority (114 or 64 %) were 80–89 years old.

Of the 86 eligible AL residents from two AL buildings (which did not include Alzheimer's care residents), 28 Rose Court and 30 Jasmine Pointe building residents completed surveys. These 58 participants, aged 60–100+, reflected 67 % AL participation. Of the 17 male and 41 female participants, the majority (38 or 66 %) 80–99 years old.

Since this study focused on supporting informal social interaction, it is important to note how much residents liked to interact socially. If residents do not enjoy interaction, there is less reason to encourage it. It would also likely impact the ratings regarding how well spaces were liked and used. The survey question asking residents to rate how much they liked to socialize used a Likert scale with a range from 1 to 5 with 1 meaning "not at all" and 5 meaning "very much". This question in IL had a mean of 4.1 and a standard deviation (SD) of 0.972. In AL, the Mean was 4.05 and the SD 1.05. This indicates respondents desire a high level of social interaction. Because highly un-social residents would be less likely to participate in the survey than more social residents, these numbers may imply a higher preference for social interaction than actually present in this CCRC's whole resident population.

2.3 Survey instruments and data analyses

The survey asked IL and Al residents to rate various CCRC social spaces for like and use. Table 3 features the survey questions used to address these two outcome variables, like and use, as well as the corresponding Likert scale response options. Also shown, the use variable was a combined variable requiring two questions to gather resident perceptions of their frequency and lengths of visits to these selected social spaces.

Additionally, the survey asked about factors unique to each resident that may have a relationship with their like and use ratings.

Social spaces examined in this study were identified by three resident and staff focus groups. These focus groups, one for each resident group—IL, Jasmine Pointe (AL), and Rose Court (AL)—agreed by consensus on social spaces they believed were most and least successful for resident groups they represented. Unsuccessful spaces were those believed to be most under-utilized by their resident group. The IL focus group consisted of a resident from each IL unit building type (totaling 6 residents) and 3 IL staff members. When the IL focus group discussed spaces they believed were most/least successful, they named spaces from all across campus. In turn, the survey addressed these independent living social spaces that are featured in Fig. 2.

Table 3 The dependent variables and corresponding survey questions

Dependent variable	Question	Rating scale
Like	"How well do you like each space?"	(1) Don't like it–(5) love it
Combined use variable		
Use (visit frequency)	"For reasons other than to participate in The Village's staff scheduled activities, how much do you visit each space?"	(1)Never–(5) very often
Use (visit length)	"During casual visits (not including visits to attend The Village's staff scheduled activities) how would you characterize the amount of time you usually spend in each space during your visits?"	(1) None–(5) very much

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Fig. 2 Independent living social spaces chosen by the IL staff and resident focus group and inquired about on the IL resident survey

A focus group consisting of 2 residents and 1 staff member was conducted in each AL living unit. After naming all social spaces with which they were familiar, it became apparent AL residents had smaller daily paths of travel than IL residents. The IL residents tended to roam more of the campus, while the AL residents tended to stay in/near their own building. Consequently, the most/least successful social spaces chosen by Jasmine and Rose Court AL focus groups were in/near their buildings. Figure 3 shows the social spaces selected by the assisted living resident groups.

Focusing on the six spaces selected by each focus group, a resident survey operationalized all FUI variables as had been in a prior study (Campbell 2014). Like the former study, Factors Unique to the Individual variables were categorized into the three

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Fig. 3 Assted living social spaces in the Jasmine Pointe and Rose Court buildings chosen by focus group then addressed in the al resident surveys

hierarchical variable tiers. The FUIs tested in the IL survey included the following variables and variable tiers:.

Top Tier Variables—Belonging needs

- Reasons to use a space (active and passive engagement opportunities)
- Sense of belonging/fitting in
- Professional interaction status
- Resident partner
- Length of time in residence

Second Tier Variables—Security needs

- How private a space felt
- Socializing space preference
- Gender

Foundational Tier Variables—Physiological needs

- Home range
- Sensory issues
- Mobility
- Age

The previous study's survey treatment was minimally modified to reflect the specific social spaces for this CCRC. Then, the IL survey was shortened substantially to suit AL residents' capabilities and make it more applicable to these residents (e.g. AL residents were almost all widowed so the question asking about resident partners was removed because it was not pertinent). Since FUI variables not relevant to assisted living residents were not explored, AL variable tier categories did not contain all the same variables as IL

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Table 4 Significant independent variables and corresponding survey questions

Tier category	Independent variable	Question	Rating scale
Top Tier/ belonging factors	Active engagement opportunities	"How much do you like to be involved with activities (those not planned by The Village organization in the space? (these activities might include conversation, games, eating/drinking, etc.)?"	(1) Not at all–(5) very much
Foundational/ physiological Factors	Home range (proximity to home)	"How close is each space to your apartment home?"	(1)Very far–(5) very near
	Home range (proximity to other places visited daily)	"How conveniently located is each space in relationship to other places you go on a daily basis within The Village (e.g., mailboxes, parking, etc.)?"	(1) Not convenient–(5) very Convenient

data. Consequently the tier categories themselves were not explored in AL data. The only difference between Jasmine Pointe and Rose Court AL surveys was spaces asked about were those used by that resident group, which were social spaces in/near their building.

Resident surveys contained multiple choice and Likert scale format questions asking about demographics and judgments about the most/least successful social spaces for informal social interaction. The bi-polar Likert-scaled questions offered responses ranging from 1 (being the most negative response) to 5 (being the most positive). Samples of the independent variable survey questions and their Likert rating scales are shown in Table 4.

Additionally, there were two other response options: respondent did not use or was unfamiliar with the space; to decline answering. To help ensure clarity, color photographs of each space were available during surveys. To avoid unfairly biasing results, six survey versions, each listing spaces in a different order, were used randomly with each resident group.

Since this survey treatment was previously tested, construct validity was not as great a concern. However, the survey was pilot tested to ensure question clarity and further support construct validity.

Research team members conducted surveys one-on-one, in-person using Survey Monkey on iPads. This provided several advantages. As residents were surveyed, they read along on the iPad (particularly useful for hearing-impaired residents). Also, text was enlarged for low vision residents. Though un-intended, this survey procedure resulted in little missing data because residents tended to complete the survey entirely.

In all analyses, missing data were managed using multiple imputation. No outcomes were imputed. In the imputation of the other missing values, SPSS utilized all data to predict what missing data were likely to be. Multiple imputation was chosen because the sheer number of variables and resulting opportunities for missing data made a simpler method, such as list wise deletion, insufficient.

Before the analysis, ways to combine variables within a domain were sought to avoid problems with multicollinearity. Since variables were on the same metric and had the same variability, these scores were added together to produce a composite variable. In practical terms this means highly correlated variables were combined to form a single measure of both related concepts. How this worked in practice is explained in detail in the findings section for only those variables for which it was necessary.

IL data were statistically analyzed using descriptive statistics as well as multiple regression calculated with SPSS software R version 2.15. With IL data ($n = 179$), a

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multiple regression analysis was used to identify variables predicting like and use and beta weights were examined. Due to smaller AL sample (n = 58), data were analyzed using only descriptive statistics.

The Holm (1979) method was used to control for Type I error rate. Accordingly, twelve tests of each IV were conducted including two DVs across each of six different spaces. This resulted in the most significant of the 12 p-values being tested at an alpha value of .05/12 = 0.0042. The next most significant p value was then tested at an alpha of .05/11 = 0.0045, where 11 is the remaining comparison number. Each subsequent comparison was tested similarly until one was not statistically significant. Following that, remaining comparisons were determined not significant.

3 Results

3.1 Independent living survey results

First the relationship between like and use was analyzed. IL data showed a low to moderate positive relationship (ranging from $r = .183$ to .497) between like and use. This means while similar factors may drive like and use, these impact each differently. Consequently, it cannot be assumed a factor driving how much a space is liked will equally drive use.

Then, the three hierarchical, tier categories were examined establishing whether variables combined within each tier significantly explained outcomes. These tiers included:

Top Tier—Belonging needs
Second Tier—Security needs
Foundational Tier—Physiological needs

Tier effect size in terms of R^2 with and without other tiers included was ascertained.

For tier and individual levels, dependent variables were the same. These included:

How well each social space was liked
Informal social space usage

The space use variable was defined as frequency and length of visits. Since there were two distinct dependent variables (DVs), all regressions were completed twice—once for each DV. As the multiple regression results show in Tables 5, 6, 7, 8, 9, 10, two of three FUI tiers were significant in predicting like and use at that level. For each of the two significant tiers, a single FUI variable drove each tier's significance. Also shown in Tables 5, 6, 7, 8, 9, 10, these were: home range in the foundational tier and active engagement opportunities in the top tier. Ignoring tier categories, each individual independent variable (IV) was also examined while controlling for all other variables. Individual IVs included in the regression included all FUI.

From resident-reported data analysis, two significant predictors of social space like and use were revealed. These included active engagement opportunities, a Top Tier variable, and home range, a Foundational Tier variable. From all variables in the foundational tier, which included factors such as sensory abilities (vision and hearing) and physical mobility, home range was the only consistent significant predictor of how well spaces were liked and used. Specifically, home range was a significant predictor of usage in all spaces except Tower Villa Lobby. Also, home range was a significant predictor of how well spaces were liked, but only in two of the spaces. Of the top tier variables, an active engagement opportunity was the only consistent predictor of how well spaces were liked and used. This

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Table 5 Factors unique to individual results for Lake House Commons (successful)

Variable	n	R^2	*P*	Sig. variables w/in Tier	Sig. variables *P*	Sig. variables raw beta	Sig. variables SE
Top tier/belonging needs usage	150	.274	<.001*	Active eng.	<.001*	.796	.136
Top tier/belonging needs like space	161	.247	<.001*	Active eng.	.005*	.169	.066
Second tier/security needs usage	150	.024	Not sig.	–	–	–	–
Second tier/security needs like space	161	.055	Not sig.	–	–	–	–
Foundation tier/physiological needs usage	150	.237	<.001*	Home range	.004*	.263	.324
Foundation tier/physiological needs like space	161	.154	<.001*	Home range	.002*	.114	.031

Significant variables within tiers are listed for when controlling for all other variables

* Indicates significant at .05 level when type I error rate was controlled with Holm method

All relationships expressed are positive

R^2 and *P* values for tiers are only for tiers themselves

Table 6 Factors unique to individual results for Back 9 Lounge (successful)

Variable	n	R^2	*P*	Sig. variables w/in Tier	Sig. variables *P*	Sig. variables raw beta	Sig. variables SE
Top tier/belonging needs usage	81	.459	<.001*	Active eng.	<.001*	.786	.153
Top tier/belonging needs like space	72	.251	=.002*	–	–	–	–
Second tier/security needs usage	81	.027	Not sig.	–	–	–	–
Second tier/security needs like space	72	.037	Not sig.	–	–	–	–
Foundation tier/physiological needs usage	81	.152	Not sig.	–	–	–	–
Foundation tier/physiological needs like space	72	.108	Not sig.	–	–	–	–

Significant variables within tiers are listed for when controlling for all other variables

* Indicates significant at .05 level when type I error rate was controlled with Holm method

All relationships expressed are positive

R^2 and *P* values for tiers are only for tiers themselves

variable was a significant predictor in half of the selected spaces. Variables were also analyzed when controlling for all other variables. This showed active engagement opportunities to be the best predictor of how much spaces were liked and used.

This study looked deeper into the relationship between the DVs (like and use) with residents' daily path of travel as well as the proximity of social spaces to their residence—

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Table 7 Factors unique to individual results for Tower Club Cafe (successful)

Variable	n	R^2	*P*	Sig. variables w/in tier	Sig. variables *P*	Sig. Variables Raw Beta	Sig. Variables SE
Top tier/belonging needs usage	155	.324	<.001*	Active Eng.	<.001*	.103	.085
Top tier/belonging needs like space	161	.111	Not sig.	–	–	–	–
Second tier/security needs usage	155	.047	Not sig.	–	–	–	–
Second tier/security needs like space	161	.032	Not sig.	–	–	–	–
Foundation tier/physiological needs usage	155	.344	<.001*	Home Range	<.001	.071	.036
Foundation tier/physiological needs like space	161	.095	Not sig.	–	–	–	–

Significant variables within tiers are listed for when controlling for all other variables

* Indicates significant at .05 level when type I error rate was controlled with Holm method

All relationships expressed are positive

R^2 and *P* values for tiers are only for tiers themselves

Table 8 Factors unique to individual results for Lake House Pool (unsuccessful)

Variable	n	R^2	*P*	Sig. variables w/in Tier	Sig. variables *P*	Sig. variables raw beta	Sig. variables SE
Top tier/belonging needs usage	89	.219	<.001*	Active Eng.	=.005*	.784	.201
Top tier/belonging needs like space	65	.467	<.001*	Active Eng.	<.001*	.472	.158
Second tier/security needs usage	89	.094	Not sig.	–	–	–	–
Second tier/security needs like space	65	.021	Not sig.	–	–	–	–
Foundation tier/physiological needs usage	89	.130	Not sig.	–	–	–	–
Foundation tier/physiological Needs like space	65	.148	<.001*	–	–	–	–

Significant variables within tiers are listed for when controlling for all other variables

* indicates significant at .05 level when type I error rate was controlled with Holm method

All relationships expressed are positive

R^2 and *P* values for tiers are only for tiers themselves

two highly correlated variables combined to make the home range variable. In addition to home range, perception of location distance was examined. IL and AL residents were asked how far/near each social space was located in relation to their residence. In practice that means if a daily path of travel score was rated 4 on the 5 point scale and the space's

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Table 9 Factors unique to individual results for Cypress Lobby (unsuccessful)

Variable	n	R^2	*P*	Sig. variables w/in Tier	Sig. variables *P*	Sig. variables raw beta	Sig. variables SE
Top tier/belonging needs usage	59	.200	=.011*	–	–	–	–
Top tier/belonging needs like space	39	.223	Not sig.	–	–	–	–
Second tier/security needs usage	59	.132	Not sig.	–	–	–	–
Second tier/security needs like space	39	.309	Not sig.	–	–	–	–
Foundation tier physiological needs usage	59	.274	Not sig.	–	–	–	–
Foundation tier/physiological needs like space	39	.383	Not sig.	–	–	–	–

Significant variables within tiers are listed for when controlling for all other variables

* Indicates significant at .05 level when type I error rate was controlled with Holm method

All relationships expressed are positive

R^2 and *P* values for tiers are only for tiers themselves

Table 10 Factors unique to individual results for Tower Villas Lobby (unsuccessful)

Variable	n	R^2	*P*	Sig. variables w/in Tier	Sig. variables *P*	Sig. variables raw beta	Sig. variables SE
Top tier/belonging needs usage	102	.303	<.001*	–	–	–	–
Top tier/belonging needs like space	88	.209	=.001*	–	–	–	–
Second tier/security needs usage	102	.058	Not sig.	–	–	–	–
Second tier/security needs like space	88	.027	Not sig.	–	–	–	–
Foundation tier/physiological needs usage	102	.099	Not sig.	–	–	–	–
Foundation tier/physiological needs like space	88	.145	Not sig.	–	–	–	–

Significant variables within tiers are listed for when controlling for all other variables

* Indicates significant at .05 level when type I error rate was controlled with Holm method

All relationships expressed are positive

R^2 and *P* values for tiers are only for tiers themselves

proximity to their residence was rated 3 out 5 then these two scores were combined, giving the home range variable a combined score of 7 out of 10. Additionally, actual measurements were calculated from each respondent's front door to the social spaces. Table 11 shows each of the 7 Likert Scale categories and the distance range associated with each Likert rating.

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Table 11 Likert scores for distance measurements

Range in miles	Likert scale	Range in feet
0–1/64	7	0–82.5′
>1/64–1/32	6	82.6–165′
>1/32–1/16	5	166–330′
>1/16–1/8	4	331–660′
>1/8–1/4	3	661–1,320′
>1/4–1/2	2	1,321–2,640′
>1/2–1mi	1	2,641–5,280′

Once the appropriate Likert Scale number was assigned to each distance, actual distances and Likert numbers were entered into the data. The purpose of collecting distance and perceived proximity information was to examine the relationship between these for each resident group. This was to establish if there was a difference in the meaning of distance (what is considered close vs. far) for IL and AL residents.

The relationship between perceived social space proximity and actual distances was also examined. IL data showed residents had a good sense of how near/far space was. Specifically, IL residents considered spaces located 1/4–1/2 of a mile (1,320–2,640 ft.) from their residences far but considered spaces 1/16–1/8 of a mile (330–660 ft.) close.

To examine IL residents' attitudes toward aging in place, residents were asked where they would prefer to live if their needs changed with response options being: stay in their current residence with additional services provided to them there, move into an assisted living residence in the CCRC, or move to another housing option. A vast majority of IL residents, 165 (93 %; n = 179), reported preferring to continue living in their current residence with additional services being made available there rather than stepping through the continuum or relocating elsewhere, such as a relative's household.

3.2 Assisted living survey results

Due to AL's smaller sample size (n = 58), AL data was analyzed using descriptive statistics. Relationships found between the DVs, how well spaces were liked and used, were congruent with IL findings. This means residents did not always use spaces they liked, nor always liked spaces they used. Data show a low to moderate positive relationship (correlations range from $r = .103$ to .619) between like and use in the AL social spaces. There were two exceptions to this. First, the Rose Court data showed a strong relationship ($r = .814$) between like and use for Lake House pool area. Jasmine Pointe data showed a low correlation between like and use for Jasmine Dining Room but the relationship was negative ($r = -.241$). These findings provide further evidence suggesting like and use should be measured separately.

Beyond the relationship between the DVs, FUI independent variables were examined to look for possible relationships between each variable and how much spaces were liked and used. The following variables were tested:

- Reasons to use a space (active engagement opportunities)
- Length of Time in Residence
- Home Range
- Sensory Issues (including hearing and vision impairment)

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- Mobility (including the use of mobility aids such as walkers, wheelchairs, power chairs, etc., as well as how often residents leave campus)
- Resident Age

From these, active engagement opportunities was the only factor with a consistently positive relationship with how much selected AL social spaces were liked and used.

The positive relationship between active engagement opportunities and how well spaces were liked ranged from $r = 0.044$ to 0.458. The relationship between active engagement opportunities and use ranged from $r = 0.029$ to 0.716.

Omitting Jasmine Pointe data, home range was found to be positively related to how much AL social spaces were liked and used. This positive relationship ranged from $r = 0.098$ to 0.962. These findings are consistent with IL findings.

The Jasmine Pointe data, however, regarding home range was not as consistent. For instance, one space (Tower Club Café) showed a low, negative correlation ($r = -.277$) between home range and like. Similarly, exceptions were found between home range and use in the Jasmine Pointe big Living Room ($r = -.022$) and Tower Club Cafe ($r = -.218$). It is likely Jasmine data was more inconsistent than Rose Court regarding home range because Jasmine residents could not accurately assess relative distance. To respond to the home range question properly, residents needed to understand how relatively near/far social spaces were in relation to their daily path of travel and their residence.

Perceived proximity of social spaces in relationship to actual distances was examined in AL data also. This intended to: (1) determine if residents could accurately judge how near/far spaces were, and (2) quantify distance ranges AL residents considered far/near compared to distance ranges IL residents considered near/far. In AL, Rose Court residents had a clear understanding of how near/far a space was from their residences. Rose Court residents considered spaces located 1/16–1/8 mile (330–660 ft.) from their residences far but considered spaces within 1/64–1/32 miles (82–165 ft.) close. Jasmine AL data regarding perceived and actual distances was difficult to interpret. Jasmine residents did not appear to have any clear understanding of how relatively far/near spaces were, which might be due to these particular residents' characteristics (perhaps increased incidences of early Alzheimer's) and/or due to the more complex plan configuration and larger scale of the Jasmine Pointe building. While we can only speculate why, it may be beneficial in future studies to do a brief Alzheimer's test (e.g., the clock test) to ensure respondents are Alzheimer's-free and thus capable of making accurate replies to survey questions.

4 Conclusions

According to AARP, 90 % of elders living in traditional housing desire to age in place (Farber et al. 2011). One advantage of living later life in a CCRC versus traditional housing is the security of knowing assisted living and nursing care are readily available should the need arise. Even so, this does not mean residents want to physically move from IL units to AL units to receive additional care. This case study showed there was a strong desire among the CCRC's IL residents to stay in their IL residence and have healthcare services available to them there. In fact, 93 % of IL residents asked about this preference report preferring to age in place rather than move to AL or another housing option, such as into another family member's home. Thus, we can no longer assume planned retirement community residents are more accepting of relocating if needs change. Indeed, there may be a market-driven reason for a paradigm shift in how CCRCs are designed and run. This

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new way to design and think of IL as a facility to age in place is termed here as enhanced independent living (EIL). While this facility type provides independent living, this name indicates it is specifically designed and offers appropriate programming to support residents aging in place.

This new insight regarding the desire to age in place in IL raises an interesting question: how do we design an enhanced independent living facility to deviate from the organization-centered model and actively support aging in place? Knowledge of how the individual's environmental competence is impacted by age/accident (Lawton 1974) has already shaped CCRCs' designs as indicated by inclusion of accessibility features. CCRCs typically offer features like no-step entrances, non-glare surfaces, and grab bars to accommodate residents' physiological changes. However, addressing physiological needs is not all that is needed to facilitate successful aging. As noted, satisfying social interaction needs is particularly key to achieving life satisfaction for the elderly (MacNeil and Teague 1987).

This study's findings resulted from examination of IL and AL residents' liking and use of their CCRC social spaces as predicted by Factors Unique to the Individual residents (FUIs). Consequently, findings suggest design approaches for addressing resident social interaction needs. Further, looking at commonalities between IL and AL residents' data sets revealed design cues regarding supporting social space success as residents' capabilities change.

In this study, like and use were determinants of social space success. Until recently, it was unknown whether variables driving how well spaces were liked and used impacted these to the same degree or even if the same factors impacted these outcomes. This study's findings indicated like and use should be examined separately. This is because findings from resident input regarding the twelve AL and six IL social spaces studied indicated the correlation between like and use was only low to moderate. While there was a relationship, it was not strong enough for like to be considered synonymous with use. This means we cannot assume residents who like a space will automatically use it. Instead we must understand what factors drive like and use and incorporate factors driving both into social spaces.

Existing environmental preference research, which focuses exclusively on how well spaces are liked, indicates environments become less preferred when they do not meet users' physiological needs (Brown et al. 1999; Kaplan et al. 1989). From this, we can infer substantial variations in lighting or acoustics, which impact vision and auditory functioning, would influence how much residents reported liking spaces. For instance, had there been particularly poor lighting in some of the selected spaces but not others, low vision residents likely would report liking those spaces consistently less than high vision residents. The research team's preliminary physical space assessment did not find noticeable or notable measurable differences in basic environmental characteristics like lighting, acoustics, and room temperature in the selected spaces. Additionally no relationship was found in the study's formal data analysis between resident sensory capabilities (vision and hearing variables) and how well the spaces were liked and used. This was further indication the selected spaces did not vary substantially in terms of lighting and acoustics. From there, it could be assumed selected spaces did not have substantial variation in their lighting and acoustical qualities and any further findings would build upon rather than duplicate earlier preference research.

Based on other previous research, it was hypothesized social spaces located within residents' home range (residents' typical daily path of travel and proximity of social spaces' to their residence) would be an important factor driving use. By passing a space

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regularly, it was postulated residents' curiosity may be piqued by action or amenities in the space. This, in turn, might draw residents in, perhaps to interact socially. Combined with the fact many older adults have mobility issues, this makes convenience of spaces located along residents' daily routes seem important. While no relationship was found between physical mobility itself and the outcome variables, this study strongly supported this home range theory construct. In the Foundation Tier, addressing physiological needs, the only significant variable was home range for both IL and AL residents. In other words, social spaces are more likely to be well used and liked if oriented along residents' daily path of travel.

Findings also provided insight into residents' perception of social space proximity compared to actual distance. Comparing IL and AL data on this informs us about how perceptions of space proximity change as residents develop higher levels of disability. This study tells us social spaces at greater distances may be desirable to younger, healthier residents but some key social spaces must be located very nearby for frail residents.

Particularly noteworthy were distances residents perceived as a nearby versus far away when Rose Court AL data were compared to IL data. Since Rose Court AL residents judged spaces located at much shorter distances as close compared to IL residents' perception of close space distances, this has design implications to support residents aging in place, specifically to address the home range variable to improve social space success. To explain further, while we know home range tends to shrink as disability increases, these new findings start providing parameters for locating spaces in residents' home range. Findings suggest 1/32 of a mile (165 ft.) from a resident's home may be the outer edge of more frail individuals' home range. While this cannot be generalized and used prescriptively, this provides a starting place when deciding upon overall plan configurations (e.g. linear vs. centralized plan), and plan scale. In other words, a more compact plan configuration and smaller scale plan appear more suitable for aging in place.

Also important insights were found regarding actively engaging in spaces. In previous research on outdoor social spaces, Carr et al. (1992) found active engagement opportunities, ways to directly engage in a scene, should be available to promote space success. Confirming this, this study's results suggest availability of active engagement opportunities in CCRC social spaces was positively related to both how well liked and used social spaces were for IL and AL residents. In the Top Tier, the only significant variable was active engagement opportunities. In IL data, the Top Tier had a medium to large effect size (R^2 ranged from .111 to .459) due almost entirely to the active engagement opportunities variable. Of the significant predictors of like and use for IL, and consistently having a positive relationship with like and use in AL, the presence of active engagement opportunities was the most key variable, followed by home range. This indicates providing opportunities to get involved in action in a space—whether a conversation or a card game—is crucial to social space design in this proposed aging in place CCRC model, named by the researcher as "enhanced independent living" (EIL).

Regarding social hubs' arrangement and content, Whyte recommended clustering food and retailing in interior pubic plazas (1980). In a retirement community, this is suitable as well. Both food and retailing offer a purpose for meeting and reason to linger, which are active engagement opportunities. Plainly, researchers agree locating social spaces near activity hubs is a good idea (Marcus and Francis 1990; Carr et al. 1992).

Based on findings regarding home range's relationship to social space use, one crucial facet in developing activity clusters for enhanced independent living facilities is ensuring some social spaces are located in very close proximity to residences to accommodate more frail residents. To accomplish this, a smaller, more compact plan configuration would be

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better than a larger-scale, linear one. To further optimize nearby location of key spaces, retail, food services or other potential social spaces may need to serve multiple roles to help minimize travel distance to social spaces. An example of spaces serving multiple roles could be applied in retirement community communal dining rooms, which typically are centrally located and offer three meals daily. However, outside of meal hours, this substantial amount of square footage is left empty and rather than consistently contributing to an active social scene. To apply these concepts, during off-hours additional amenities (e.g., coffee, games, snacks, etc.) could be made available in this otherwise empty dining room space. Additionally, having dining facilities, commonly located quite near residences, serving multiple roles provides the opportunity for dining space to serve a key social function particularly for residents who are not physically able to travel to further away social spaces.

It is also important to note this study had a couple limitations. For instance, this study utilized self-reported data to assess how well spaces were liked and used. Accordingly, residents self-reported on length and frequency of their space visits. Since self-reported data is known to suffer inaccuracies, the addition of observational data would provide a more thorough picture of actual space use.

Also while many of the IL residents replied to questions about more popular spaces (e.g. 161 out of 179 people responded to the question asking how much they like Lake House Commons), many fewer responded regarding less popular spaces (e.g. 39 out of 179 responded to the same question about Cypress lobby). With this, it was less likely significant variables could be found in less successful spaces. Likely, some variables important to the design of successful CCRC social spaces did not show up in the analysis of spaces with fewer respondents.

In summary, this article explored the idea of aging in place in IL rather than relocating residents when their needs increase. Considering there is much research suggesting relocation of the ill and frail have many negative health/well-being consequences (Bernard et al. 1996; Clough et al. 1993; Gordon and Rosenthal 1996; Schiff et al. 1986) this is an important topic for discussion.

In further supporting health and well-being, satisfying social needs plays an increasingly important role with age. This study identified factors to support social needs for active and frail residents. By addressing social needs across a range of ability levels, this provides evidence for designing facilities for older adults to age in place. Key factors associated with how well social spaces were liked and used for AL and IL residents included: active engagement opportunities and home range. Resident perceptions of space proximity compared to actual distances provided evidence which helps inform plan configuration scale and shape. This study's findings have useful implications for the future of CCRC design.

5 Implications for practice and research advancement

By indicating two of the three FUI variable tiers are relevant in creating successful social spaces, this study highlights the value of looking at emotional needs in addition to physical needs when designing CCRC social spaces. Through addressing residents' needs more holistically, social space designs are better positioned to be successful over time. These findings provide important theoretical insight for researchers and the design discipline. It is important these findings' implications about space use be checked using observational data

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instead of self-reports. This will alleviate concerns these findings may have resulted from possible inaccuracies in self-reported data.

To further advance research, the Successful Social Space Attribute Model's original framework, or more specifically the Factors Unique to the Individual portion of the framework should be examined in other housing contexts to test its broader applicability and understand how the Model's components impact one another.

For design practitioners, these findings are valuable for two reasons. First, while these findings may appear at first glance to be simply common sense, they may not be common knowledge for all practicing designers. Second, this study supplied research-based evidence to support implementing design strategies for designers, their clients who build and manage CCRC facilities, and older adults seeking a retirement community that supports satisfying social lives for residents of any age or ability level.

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