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# Exploring the Influence of Environment on the Spatial Behavior of Older Adults in a Purpose-Built Acute Care Dementia Unit

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**Abstract**

Limited research explores the experience of individuals with dementia in acute care geriatric psychiatry units. This observational case study examines the influence of the physical environment on behavior (wandering, pacing, door testing, congregation and seclusions) among residents in a traditional geriatric psychiatry unit who were then relocated to a purpose-built acute care unit. Purpose-built environments should be well suited to the needs of residents with dementia. Observed trends revealed differences in spatial behaviors in the pre- and post- environments attributable to the physical environment. Person-centred modifications to the current environment including concerted efforts to know residents are meaningful in fostering quality of life. Color coded environments (rooms vs dining areas etc.) to improve wayfinding and opportunities to personalize rooms that address the 'hominess' of the setting also have potential. Future research could also seek the opinions of staff about the impact of the environment on them as well as residents.

**Keywords**

spatial behavior, dementia; qualitative research, human geography

## Introduction

Gerontology is a highly interdisciplinary field that brings clinicians and social gerontologists (from geography, sociology, and psychology) together to work on issues related to the care of older populations. Human geographers and environmental psychologists have a long-standing interest in "the complex relationships between older people and the varied places in which they live and are cared for."[1] Early work by Lawton and Nahemow suggested that therapeutic environments are places that "fit" individual's abilities and foster both adaptation and competence.[2] Similarly, geographers continue to develop the notion of therapeutic landscapes as places that support health and personhood.[3]

Frail older persons living with dementia are particularly vulnerable to environments that are overly challenging in relation to their declining cognitive abilities that influence their capacity to adapt to change and to remain independent and that can also take away their ability to vocalize how well, or how poorly, their overall environment fits their needs and abilities and contributes to their quality of life over time.[2-4]

Human geographer's interest in issues of space and place fits well with aspects of dementia research, given that spatial disorientation is one of the most "persistent manifestations of dementia of the Alzheimer type strongly influencing spatial behaviors such as pacing, wandering, door testing, and eloping" and having tremendous implications for patient management and safety.[5] Indeed, older adults with advanced dementia may be placed in acute care geriatric psychiatry settings if they exhibit challenging behaviors not easily managed in the residential care environment. To date, very little research has focused on the experience of those living within these purpose-built, acute care settings.[6,7] The purpose of this research is to contribute to this gap in understanding by examining the influence of the physical environment on spatial behavior for a small number of residents who lived in a traditional geriatric psychiatry unit and who were then relocated to a purpose-built acute care unit. Studies that have examined patterns of relocation for residents with dementia are limited.[8] Research that has been done reveals conflicting results with some studies finding that mortality is increased, while others report higher rates of depression after relocation; but these rates are reduced when the relocation occurs among a group rather than among individuals.[9,10]

The physical environment plays an important role in supporting resident's quality of life and wayfinding abilities and

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debates continue about the reasons why persons with dementia wander.[11-14] Even the word wander has become problematized and is referred to in a myriad of ways from "walking" to "way-finding" to "pacing."[11-14] Theories about why persons with dementia wander are wide ranging and have focused on issues related to vision, circadian rhythms, agitation and upset, medications, social personality, and environment, but nevertheless the etiology of wandering remains poorly understood.[12-17] In their recent book, "Dementia: walking not wandering," Marshall and Allan encourage health practitioners and researchers to more deeply explore the myriad reasons that people living with dementia engage in walking.[15]

This research project describes an observational qualitative case study to compare the spatial behaviors of 6 ambulatory older adults living with dementia in an acute geriatric psychiatry care unit, who resided in a traditional hospital wing initially and who were then relocated to a purpose-built, acute care dementia environment. Six older adults experienced the same staff mix and the same care philosophy in a traditional wing and then in the purpose-built wing. These residents were observed for the same number of days in each of the 2 environments, pre-environment and post-environment. Given that the disease process of individuals was relatively stable during this short interval as well, it seems more likely that changes in spatial behavior are linked to changes in the environment.

The spatial behaviors we examine in this article are wandering or pacing patterns (frequency and duration), door testing, the places where residents congregate, and the need for seclusion. Wandering and pacing were recorded as number of observations wandering and respective times wandering. Door testing and the need for seclusion were construed as the most instructive for indicating a state of upset, agitation, or aggressiveness. In addition, in the literature, door testing has been linked to greater cognitive ability.[16-19] Taken together, the spatial behaviors form a composite profile of the degree to which the physical environment fits vulnerable individuals living with dementia. Given the small sample size and the qualitative nature of this project, these results are not intended to be generalizable to other settings, but some of the lessons learned have relevance in other acute care environments, especially in regard to dementia care design elements (eg, wandering loops and door murals to mask exits) for acute geriatric psychiatry residents. The remainder of this article is organized into 3 sections. The next section outlines the research methods, followed by the presentation of the research findings, and a discussion of their implications.

## Research Methods

Data were collected from a hospital in Western Canada. Ethics approvals for this study was obtained from the hospital ethics review board and from the Human Subjects Ethics Review Board at the University of Victoria. The 2 different acute care settings in which observations occurred are labeled as PRE-E (Pre-Environment) (traditional wing) and POST-E (Post-Environment) (purpose-built environment) to distinguish them. The observational data were collected by 2 nursing students and analyzed by the authors. Given that the data were observational and related to spatial behaviors, rather than coming from direct interviews, informed consent was not required. By strict protocol, the observations had no bearing or influence on the care received. Further, no changes to staff composition, care delivery models, or unit admission goals occurred during the collection period. All persons related to this unit (staff, residents, and visitors) were blinded to the study objectives to limit any external influence on resident behaviors. The nursing students spent approximately 6 months gathering data (3 months in the PRE-E environment from March 2011-June 2011 and 3 month in the POST-E environment from June 2011-August 2011). Pseudonyms are used for each resident to protect their confidentiality and anonymity.

For admission to the unit, individuals needed to be medically stable but were psychiatrically unstable due to complications related to dementia. They also required the services of a specialized multidisciplinary geriatric psychiatry assessment and treatment team to be admitted. Unlike the overall population with dementia, the majority of residents in the unit were known to engage in "aggressive" behavior (eg, physical and verbal outbursts) that prompted their admission.

The unit capacity in terms of number of residents was 10 in the PRE-E and the POST-E. The nursing staff composition was 1 registered nurse (RN) and 2 licensed practical nurses (LPNs) from 7 AM to 10 PM. From 10 PM to 7 AM, the staff were reduced to 1 RN and 1 LPN, respectively. Occupational therapy, physiotherapy, recreation therapy, social work, dietary, and pharmacy services were available to all residents.

Hospital administrators estimated that 60% of their residents were from long-term care (LTC) settings, with an average length of stay around 6 months. In comparison studies,[18] the length of stay of residents in our study is dissimilar, on average. Administrators of this study explained that longer times for some patients are likely because of the complexity of the population and the limited number of appropriate LTC beds available for these residents upon discharge. The average length of stay of patients in our study was 192 days ranging from 144 days to 311 days.

### The Physical Environment

Each of the 2 units was distinct in terms of its design, size, and functionality. The PRE-E floor plan (see Figure 1) allowed for wandering along a linear, "t-shaped" configuration. The wandering area that was available to the residents in the PRE-E was a long narrow hallway anchored by the main entrance or exit doorway on one end and the dining room doorway on the other. Rooms off the main hallway were mostly of 4-bed ward design with a sink in the middle of the wall. There were also 4 single bedrooms that contained a sink only. All residents used a common washroom and tub room that was located in the middle of the unit. The nursing station was close to the t-intersection with a television area at one end of the unit and a dining room at the other. The exits required a flat security card to leave the unit, and the doors were not camouflaged in any way. This unit was on the second floor of the building with no direct access to the outdoors.

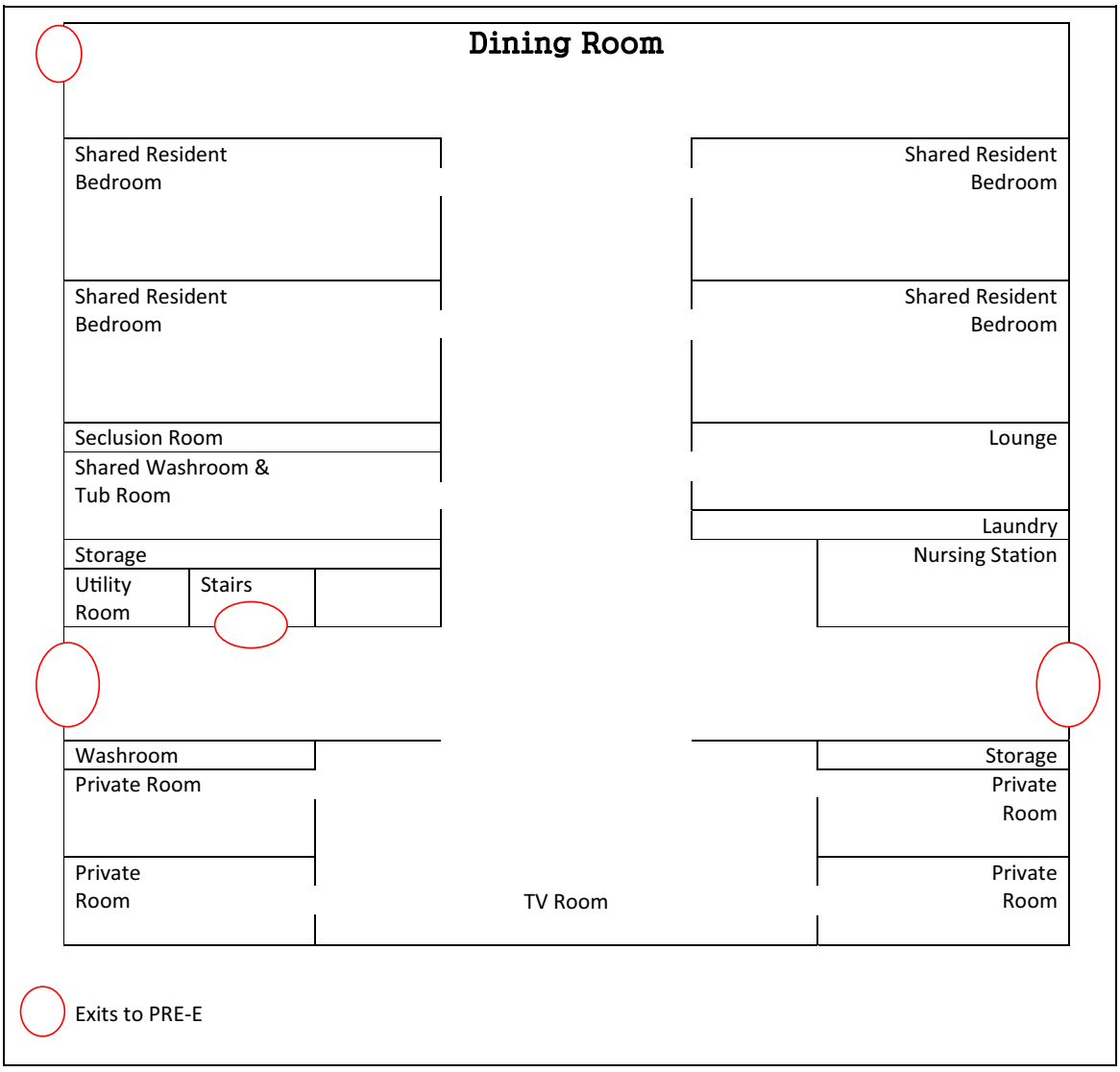


**Figure 1.** Architectural drawing of the t-shaped unit in the PRE-E.

**Figure 2.** The camouflage murals in the POST-E unit.

The new, purpose-built dementia care environment (POST-E) reflected several design changes based on current architectural and medical best-practice research.[20-24] The major design changes to be implemented were (1) the installation of camouflage murals on exit doorways to reduce door testing, (2) the development of a circular as opposed to a linear, wandering path, (3) private bedrooms with adjoining bathrooms for the majority of the residents rather than 4-bed wards, and (4) the introduction of an outdoor patio for residents.

Also, in the POST-E, attention was given to reducing environmental stressors and increasing the hominess of the new space by measures such as incorporating clocks, memory boards, and individual photos in bedrooms or entries to bedrooms, for residents; ensuring clutter free hallways, and increasing opportunities for natural light in the unit.

In the POST-E, the camouflage murals on the entry and exit doors (the emergency exit doorway and activity room doorway

**Table 1.** Resident Characteristics.

| Patient Number | Pseudonym | Age | Dementia Type | Relevant Medical Diagnoses | Pre-admission Environment |
|---|---|---|---|---|---|
| 1 | Phil | 78 | Mixed with BPSD | Hypertension | Long-term care |
| 2 | Rick | 76 | Mixed with BPSD | Seizure disorder, anemia | Long-term care |
| 3 | Allison | 79 | Mixed | Hypertension, osteoarthritis | Long-term care |
| 4 | Tim | 76 | Mixed with obsessive compulsive features | BPH, glaucoma | Home |
| 5 | Mary | 59 | Frontotemporal | Hypertension, fractured foot (occurred during data collection) | Long-term care |
| 6 | Evan | 79 | Mixed with paranoid features | Heart disease fractured hip (occurred pre-data collection) | Home |

Abbreviations: BPSD, behavioral and psychological symptoms of dementia; BPH, benign prostatic hyperplasia.

of the unit) were depicted as book cases (Figure 2). For staff, the main entrance or exit doorway, the emergency exit doorway, and the activity room doorway were locked and only accessible by security swipe cards.

## Residents

As noted, we could only examine the spatial behaviors of 6 residents, since these were the only individuals who had occupied the traditional wing and purpose-built unit for a similar duration. This is one of the challenges of conducting research with a geriatric psychiatry population in an acute care setting that can only support a small number of more complex residents with dementia. In this case, all residents studied were ambulatory and each had been diagnosed with one or more forms of dementia and were known to engage in aggressive behavior that prompted admission in this unit.

In terms of background demographic characteristics of residents, the mean age was 74.5 years and the gender mix was 4 men and 2 women. Besides a diagnosis of dementia, on average they had 2 or more comorbidities that included cardiovascular diseases, musculoskeletal ailments, or sensory/neurological disorders (Table 1). Persons with delirium were excluded from being admitted to this unit; however, if they developed delirium during their stay, and, if the medical treatment could be safely administered, they were permitted to stay on the unit. In our study population, no residents were deemed delirious during the observation period.

## Observational Data

In both environments, residents were observed during their most active time of day, mostly between 2 PM to 5 PM. Observational data were collected by the 2 researchers for a total of 39 days in a 6-month window of time (19 days in the PRE-E and 20 days in the POST-E). During the observations, the nursing students stood in close proximity to the main doorways in both the study locations in order to acquire data and also far enough away to ensure that they would not interfere with each resident's behavior. To measure resident's congregation behaviors, the student nurses recorded where the residents were located at 15-minute intervals, during the overall recording period (2 PM to 5 PM). Congregation data were assigned a place location, for example, hallway, dining room and so on, and these data were then graphed to determine where residents tended to spend their time.

The nursing students recorded the start and stop time every time a resident began to pace within the 3-hour observation period as well as the date and time the behavior occurred. Following the collection of data, a resident's total pacing time and frequency of pacing events per day were then calculated, and PRE-E data were then compared to POST-E data for each resident.

The type of door-testing behavior engaged in by the residents was recorded (the date and the exact time); the residents attempted to open the door. All the data recorded for each of the resident's door-testing behaviors were then itemized and tallied in an excel spreadsheet at the end of each observation period (PRE-E and POST-E). Three different types of door-testing behaviors were observed using the template developed by Kincaid and Peacock.[19] Type 1 is related to the severity of door-testing behavior and separated into 4 more additional categories (Mild—characterized as a resident walking up to the door and pushing or pulling once calmly and walking away; Moderate—referring to a resident walking up to a door pushing or pulling the door for less than 1 minute and not requiring staff to intervene; Moderate or Severe—characterized by the resident walking up to a door pushing or pulling for more than 1 minute, with staff needing or not needing to redirect away from the door; and finally, Severe—categorized by a resident's door testing with exerted force and exhibiting agitation or hostility, and staff members needing to intervene to direct resident away from the door regardless of total time at door). Type 2 door testers known as "elopers," are characterized by a resident waiting patiently for someone to walk out the door and then trying to exit through the door themselves. Type 3 door testers are characterized by a resident using a team effort to leave, for example, more than 1 resident working to open the door. The categories utilized for this study were not mutually exclusive, for example, it was possible to have a resident engaging in Type 1 and 3 behaviors at the same time (eg, using mild, Type 1 door-testing behavior by 2 residents together (Type 3). The

**Table 2.** Resident Pacing Events Per Day.

| | PRE-E | | | POST-E | | |
|---|---|---|---|---|---|---|
| Resident | # Pacing Events | # Days observed | Mean Pacing Events/Day | # Pacing Events | # Days Observed | Mean Pacing Events/Day |
| 1 | 61 | 14 | 4.4 | 22 | 8 | 2.8 |
| 2 | 128 | 15 | 8.5 | 27 | 9 | 3.0 |
| 3 | 134 | 16 | 8.4 | 36 | 16 | 2.2 |
| 4 | 123 | 17 | 7.2 | 35 | 17 | 2.1 |
| 5 | 170 | 15 | 11.3 | 26 | 9 | 2.9 |
| 6 | 52 | 7 | 7.4 | 30 | 15 | 2.0 |

**Table 3.** Resident Mean Time Pacing Per Pacing Event.

| | PRE-E | | | POST-E | | |
|---|---|---|---|---|---|---|
| Resident | # Minutes Pacing | # Pacing Events | Mean Time Pacing, minutes | # Minutes Pacing | # Pacing Events | Mean Time Pacing, minutes |
| 1 | 204 | 61 | 3.3 | 120 | 22 | 5.5 |
| 2 | 1126 | 128 | 8.8 | 298 | 27 | 11.0 |
| 3 | 661 | 134 | 4.9 | 370 | 36 | 10.3 |
| 4 | 852 | 123 | 6.9 | 288 | 35 | 8.2 |
| 5 | 1090 | 170 | 6.4 | 194 | 26 | 7.5 |
| 6 | 278 | 52 | 5.4 | 205 | 30 | 6.8 |

**Table 4.** Resident Door-Testing Patterns.

| | | Type 1 | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Resident | Environment | Mild | Mild /Moderate | Moderate | Moderate /Severe | Severe | Type 2 Elopers | Type 3 Team Work |
| 1 | PRE-E | – | – | – | – | – | – | – |
| | POST-E | 2 | – | 1 | – | – | – | – |
| 2 | PRE-E | 12 | – | 17 | – | – | – | – |
| | POST-E | 9 | – | 3 | 1 | – | 3 | 1 |
| 3 | PRE-E | 8 | – | 9 | 1 | – | – | – |
| | POST-E | 4 | – | 2 | – | – | – | 1 |
| 4 | PRE-E | 6 | – | 5 | 2 | – | – | 10 |
| | POST-E | 2 | – | – | – | – | – | – |
| 5 | PRE-E | 26 | – | 20 | – | – | – | 6 |
| | POST-E | 2 | – | 3 | 1 | – | 1 | – |
| 6 | PRE-E | 1 | – | – | – | – | – | – |
| | POST-E | 2 | – | 4 | – | – | 1 | – |

**Table 5.** Number of Seclusions by Resident.

| Resident | PRE-E Number Seclusions | POST-E Number Seclusions |
|---|---|---|
| 1 | 2 | 1 |
| 2 | 1 | 9 |
| 3 | 1 | 0 |
| 4 | 5 | 0 |
| 5 | 6 | 12 |
| 6 | 3 | 0 |

number of seclusions was simply recorded as the number of times any resident needed to be secluded for agitation or aggressive behavior on any observational day.

## Findings

In this section, the findings are presented in 4 tables (Tables 2-5) and 1 graph:

(1) aggregate behavioral mapping of spatial congregations, (2) number of pacing events per day (3) mean pacing time per day, (4) door-testing behaviors, and (5) number of times residents required seclusion in each environment.

Several specific trends are evident in these data with some qualifications. First, in terms of aggregate behavior mapping of the uncontrolled spaces in which people moved and congregated (Figure 3), several patterns were evident. In the PRE-E, it was clear that residents liked to congregate around the nursing station predominantly and also in the television area. In the

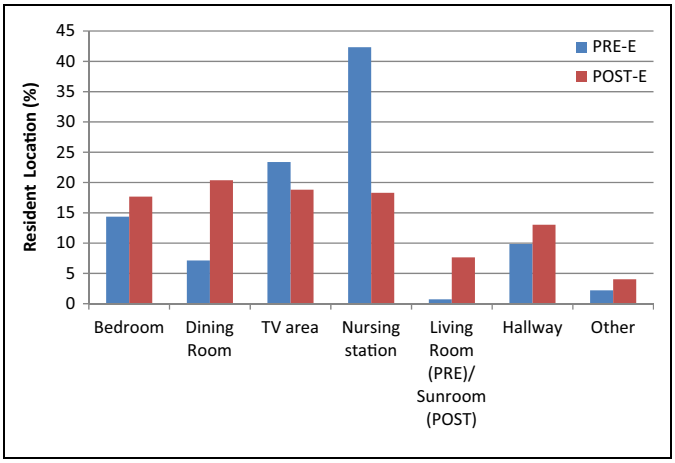


**Figure 3.** Behavior mapping: patient congregation patterns when unaccompanied.

POST-E, patients spent 24% less time in the nursing station area and more time in their bedrooms and the dining room. In the POST-E, there were slightly more seclusions. Despite the fact that there was no patio in the PRE-E, residents only used the patio sparingly in the POST-E during the study period. The administrators feel that this was because the doors to this space were locked during data collection as staff were unsure about giving residents independent access to this secured outdoor space initially following the move.

There is a clear trend toward decreasing numbers of pacing events per day for all residents from the PRE-E to the POST-E. However, the second table reveals that the amount of time that individuals paced actually increased slightly in the POST-E, with the exception of Allison whose mean pacing time increased by more than 5 minutes per pacing event. Slight increases may be attributable to the walking loop having no real beginning or dead ends versus the t-shaped floor plan in the original unit. An examination of the resident's door-testing behaviors revealed small variations. Mild and moderate Type 1 door tests decreased for Rick, Allison, Tim, and Mary. For Mary, the decreased number of door tests was dramatic, from 26 and 20 to 2 and 3, respectively, in the POST-E. Type 3 kinds of door tests were also considerably reduced for these 4 individuals. Only Evan appeared to exhibit increases in his Type 1 door testing, and Rick and Mary were the only patients to exhibit eloping-type behaviors in the POST-E. Looking across these data, the new environment had an overall effect on reducing door testing.

With regard to the need for separation, for Phil, Allison, Tim, and Evan the incidents of seclusion decreased, while for Rick and Mary the need for seclusion increased dramatically. To summarize the findings with reference to individual residents, Rick and Mary exhibited reduced pacing times but both revealed a substantial increase in the need for seclusions in the new environment which could suggest that their adjustment to their new surroundings was not as seamless as desired. The fact that Mary broke her foot during the observation period would certainly seemed to have affected her behaviors and experience in difficult-to-predict ways. Phil exhibited slightly more door testing in the new environment. Both Tim and Evan exhibited a reduction in need for seclusion, and Tim's door testing similarly decreased while Evan's increased minimally.

On a case-by-case basis, none of the patients seems to have exhibited a clear downward trend in all of the observed behaviors. It seems that only Allison who was described as having dementia without aggression exhibited a decline in all the observed spatial behaviors: pacing times, pacing events, and a reduction in both door-testing behaviors and need for seclusion. Taken together, these findings may suggest that Allison is adapting well to her new setting and that it fits well with her needs and her level of competency. Beyond these individual trends, the findings show that the PRE-E and POST-E did influence the spatial behaviors of the residents and not always in predictable linear ways.

## Discussion

Spatial disorientation is common in the latter stages of Alzheimer-type dementia. Given this and the growing prevalence of this disease, more research is needed to provide evidence about the features of dementia care environments that enhance person-environment fit, quality of life, and that reduce agitation for vulnerable older adults living with dementia.[25-28] In this section, we review the main goal of this study, summarize the observed trends in relation to the features of purpose-built dementia care environments, and conclude with study limitations and future directions.

The goal of this study was to examine how the physical environment influenced the spatial behaviors of an understudied population, that is, a small sample of residents living in a traditional acute care hospital, who were then moved to a purpose-built dementia care hospital wing. The findings from this research assert that the spatial behaviors of patients were influenced in different ways by the physical design (PRE-E and POST-E) of the acute care space. This assertion is supported by the fact that the staff mix and the care regimes did not change, given that resident illness trajectories were fairly stable in the compressed 6-month period of study.

By definition, purpose-built design features should offer greater support and flexibility for residents and better meet the needs of those complex residents living with dementia. Therefore, in this study, reductions in pacing events and pacing times and a reduced need for seclusions were anticipated in the POST-E. Observed trends revealed that the number of pacing events decreased for all 6 residents from the PRE-E to POST-E. However, interestingly, mean pacing times increased for all residents, slightly for 5 residents, and substantively for Allison, whose pacing time more than doubled from 4.9 to 10.3 minutes per pacing event. These patterns are also likely to reflect the different space configurations, that is, the wandering loop design in the POST-E having no real beginning and end, as opposed to the t-shaped layout of the PRE-E setting. In terms of the number of seclusions, these did not diminish uniformly for all residents; they decreased for 4 residents, while they increased dramatically for 2 of the residents, for

Rick (from 1-9) and Mary (from 6 to 12). Here, it must be noted again that Mary broke her foot during the PRE-E observation period and this may have amplified her frustration in the POST-E. In addition, it could be that pain and/or pain medications for her broken foot also had an impact on her frustration and agitation levels related to walking.

Patterns of door-testing and spatial congregation behaviors also differed from the PRE-E to the POST-E, again reflecting the likelihood of environmental influence. The wall murals on the door exits had some influence but were not completely effective in masking doors and deterring such behaviors. Reasons for this might be that some residents were still cognitively aware of people coming in and out through these doors despite their bookcase camouflage.

Although we cannot make direct linkages between spatial behaviors and features of the new environment, we can draw some connections to the positive dementia design features noted in the literature and adopted in the purpose-built care environment studied here.[20] The new purpose-built wing (POST-E) represents a smaller, more compact, and concentrated setting consisting of mostly private rooms with bathrooms. In our study, more residents spent time in their rooms and in the dining room rather than congregated around the nursing station. These types of activity patterns suggest a better adjustment in the new setting[3,11-13] A circular wandering loop has replaced a t-shaped layout. Research by Thomas[29] found that wandering loops were positive for allowing people to walk without hitting dead ends, a factor that seems linked to the increased amount of time-spent pacing in the new environment. Another positive environmental feature found in the new wing and underscored in the literature is lighting that affords a sense of brightness and airiness.[20,21,27] In the new wing, a bright sun room (referred to as the living room in the POST-E) as well as the outdoor patio also offered new places for the residents to congregate. The spatial location data in this study reported that the residents utilized the sunroom space quite quickly after the move.

Several design dimensions could still be improved in the new unit. First, the POST-E although new and modernized, does not reflect a homey-type atmosphere and one likely to be highly familiar to residents.[15,20] Color schemes that reflect different functions, for example, eating areas versus bedrooms are not found in the POST-E. These help residents to differentiate function and also promote wayfinding.[15,23] The new POST-E unit is essentially monochromatic in color (ie, off-white/pale yellow) in all the rooms. This design may be appealing to staff and visitors but not necessarily benefit the residents. Future studies should focus on color schemes and asking the staff for their impression of the new POST-E and ways to enhance homey environment for residents to yield important data for improving the POST-E as a workplace as well.[22]

Several limitations are raised in this study. First, the number of residents observed is small, although ultimately in this type of study the sample will always be small, given the limited capacity ($n = 10$) of this acute care geriatric psychiatry unit and other units like it. Second, the way that the data were collected and recorded was likely subject to some measurement error, given the need for the nursing students to observe multiple individuals at one time and in multiple places. In this vein, other techniques and technologies could be used to gather observational data. Technologies such as Global Positioning System units with indoor tracking capabilities may be one such avenue for generating data to enumerate behaviors with fewer errors. With respect to door testing, physical and verbal behaviors (eg, calm or outbursts) were not recorded along with observed behaviors, so it is difficult to interpret whether the door testing itself was associated with greater or lesser levels of agitation for individuals. Future studies should focus on attempting to combine these data. It may also be relevant to consider that the "adjustment" period for people in the new environment may not have been long enough. Some evidence suggests that older individuals with cognitive challenges may need 4 to 6 weeks to acclimatize to new settings and to adopt 3 data collection periods including before, immediately after, and then 4 to 6 weeks after the move.[22,27] In this study, there was essentially no adjustment period marking the collection of observational data. Incorporating one would make it easier to tease out how the move itself influenced residents although research has suggested that better adjustments occur when residents move as a group as in this case.[8-10] At a finer scale of analysis, some studies have found that pacing increases after meals and during shift changes, so the observational period used in this study between 2 PM and 5 PM, which captured shift changes, was appropriate.[3,17]

In terms of additional study limitations, if individuals with dementia wander to return to a place that has meaning for them, for example, homey and familiar places, then research could include capturing information on level of agitation and aggression, concurrent with other observational data, and particularly in the context of understanding if door testing caused agitating and if wandering seemed associated with agitation or calm. This is one direction that research is moving into, and both qualitative and quantitative studies are needed here. Such studies can be linked to geographical concepts of sense of place, place attachment, and therapeutic landscapes. These avenues of study support a deeper understanding of how behaviors are linked to the need to reconnect with more familiar environments or to efforts by individuals to find themselves in places that feel more like home, that is, more familiar than foreign.[3-4]

Overall, the observed trends are revealing but limited by small numbers of residents although generalizable results were not the goal of this study. Although people may wander to get exercise, this does not tend to be mentioned among the reasons associated with wandering for residents with dementia.[15] In addition to exercise, an increase in pacing could also contribute to better sleep at night if a resident is tired in a beneficial way from their walking exertions during the day. Recording sleep patterns before and after a move may therefore be helpful in understanding how well persons are adjusting to their new environments. As noted, the links between cognitive ability and door testing need to be further explored since it may be that an increase in mild door testing could also be interpreted as a positive sign of cognitive wellness rather than as a negative sign of

agitation. Similarly, in this way, it becomes important to record perceptions about how the door testing is experienced, that is, does it seem like it is occurring on the basis of mild curiosity or does it promote an angry outburst and agitation?

Despite the implementation of many dementia care design features added to the POST-E, staff needed time to adapt to the new space and the new care approaches that could be adopted as a result. In our study, staff showed some hesitance in adopting these new design features. For example, a secured outdoor space was designed specifically to allow independent access to fresh air for residents, but staff were initially reluctant to promote use of this space given their worries that residents shouldn't be outdoors unaccompanied. For administrators, a lot of staff education time was required to allow residents to access this outdoor space. In another example, the entryways to residents' rooms were designed to allow family to decorate these areas in ways that would serve to delineate the personality of the resident who lived there, but few of these doorways were decorated at the time of our walk-through many months after the data collection period. This raises important questions about why families are not availing themselves or being encouraged to take up this opportunity to help to establish a more personal space for residents.

The nursing station is a very prominent feature in the new unit, immediately viewable once one enters through the camouflaged security doors. Surprisingly, the behavior mapping revealed less congregation around the nursing station in the new unit despite its prominent location and high visibility. Future studies may benefit from interviewing the staff about how they feel residents experience the environment and also how they themselves experience this environment as a workplace.[21,22]

As researchers, we found that the observational data we had access to were limited in terms of helping us to understand the motivations of individual residents and to directly interpret the influence of the environment on patients personally, given the lack of the voices of residents in these studies.[28] Thus, as researchers we would recommend that more entry level data should be collected or provided to staff initially, as well as collected throughout their illness and care trajectories to help staff to better understand and care for the persons living with dementia in these units. This is consistent with a person-centered care philosophy aimed at promoting quality of life and respecting the self-hood and identity of individuals[30,31]

For example, in other research, spatial memory and topographical disorientation have been examined, the latter as a specific syndrome brought about by a range of brain disorders such as stroke, dementia, and trauma, in which the spatial navigational ability of individuals is impaired in selective ways in real-world environments.[32,33] In this latter study, data were collected from residents with dementia and their caregivers to better understand the navigational ability of residents (with dementia).[33] Taken together, these results suggest that exploring other avenues for gathering information (from residents themselves and caregivers and staff persons) have merit in the provision of care, promoting a greater awareness of the complexity of individuals, and ideally fostering a stronger sense of belonging and environment fit.

Further, researchers are increasingly interested in understanding environmental and sensory stimuli that individuals with dementia respond well to in the acute care setting. In her recent book, Chow encourages clinicians and others to make fearless and honest appraisals of what residents do, urging them to look deeper to consider the triggers behind their behaviors that reflect the only way they have to notify family and caregivers that some of their needs are not being met.[34]

## Conclusion

Dementia is an umbrella term that represents a range of very complex mental and neurological processes affecting a substantial proportion of older adults today and a growing proportion of older persons in future. Providing adequate care for individuals living with dementia is one of our society's biggest challenges and responsibilities. Additional studies that explore how individuals with dementia experience various care settings have value for persons with dementia as well as their family members, and other vulnerable older adults in different institutional environments. Although painting a small portrait with a limited palette of data, this microscale, qualitative observational study underscores the importance of further work with residents, staff, administrators, and researchers from multidisciplinary perspectives such as social gerontology, architecture, social work, occupational and physiotherapy, human geography, planning, and health policy. At the end of the day, it is incumbent on all of us to work to connect the dots to help configure environments that support a sense of home and belonging and that promote a higher quality of care and quality of life for vulnerable older adults wherever they reside.

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