ARCHITECTURAL RESEARCH, Vol.23, No.2(June 2021). pp.19-28 pISSN 1229-6163 eISSN 2383-5575

Effects of Physical Environment on Quality of Life among Residents with Dementia in Long-Term Care Facilities in Canada and Sweden:

A longitudinal study in a large-scale institutional setting versus a small-scale homelike setting

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https://doi.org/10.5659/AIKAR.2021.23.2.19

Abstract Reduction in competence makes older adults with dementia more sensitive to the influence of the physical environment. The aim of the longitudinal study was to examine whether residents with dementia in long-term facilities with variability in physical environmental characteristics in Vancouver (N= 11), Canada and Stockholm (N=13), Sweden had a difference in their quality of life (QoL). QoL was assessed using Dementia Care Mapping tool three times over one year for the reliability of data. The results of the study demonstrated that the residents with dementia living in a homelike and positive stimulating setting showed less withdrawn behaviors and a higher level of well-being compared to those in a large-scale institutional setting. This study also found that the residents living in a large-scale institutional environment spent more monotonous times than the other groups, which may be to provision of fewer structured activity programs or less social interaction with neighbors or staff members. Residents living in a large-scale institutional setting in Canada showed so far as five times more agitated/ distressed behaviors and twice more withdrawal compared to the ones living in a small-scale homelike setting in Sweden. The study supports that the large-scale institutional environment was considerably associated with levels of lower quality of life among the residents with dementia.

Keywords: physical environment, residents with dementia, long-term care facility, quality of life, Canada, Sweden

1. INTRODUTION

Population ageing is one of the four "mega-trends"- population growth, population ageing, urbanization, and international imigration (United Nations, 2020). The United Nations estimates that globally, the number of persons aged 80 and over will triple by 2050. Exponential growth is forecasted for dementia prevalence as dementia is an epidemic in the oldest old (Corrade et al., 2010). Currently, 50 million people living with dementia worldwide and it is projected to increase to 152 million by 2050 (Alzheimer's Disease International, 2018). As cognitive, functional, and behavioral abilities decline among older adults with dementia as the disease progresses, responsive care and support are needed from informal carers, healthcare professionals and the living environments to support quality of life. According to the OECD report (2018), close to 70% of nursing home residents have some form of cognitive impairment, yet traditional models of long-term facilities may not be suitable for older adults with dementia. The report also emphasized that long-term care facilities must be equipped to provide high-quality, person-centred support for older adults with dementia.

The physical environment is emerging as an important determinant of quality of life for older adults with dementia (Sloane et al., 2002). The supportive and therapeutic role of the built environment for people with dementia can be understood by the ecological theory of aging (Lawton & Nahemow, 1973). It proposes that an individual with a particular set of health

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This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education, Science and Technology, Seoul, South Korea (NRF-2016R1D1A1B03931693).

status, functioning level and cognitive capacity interacts with the environmental press of a given setting resulting in adaptive or maladaptive behaviors. To function at the highest level possible, a person's ability must match demands placed on it by the environment. With a high degree of physical and cognitive competence, a person will negotiate the environmental demands to function successfully in a particular setting. However, as competence declines in dementia the extent of maladaptive behavior and its negative effects will increase. In other words, reduction in competence makes people with dementia more sensitive to the influence of the environment (Brawley, 2005; Cutler, 2007; Davis et al., 2009; Hall & Buckwalter, 1987; Kovach, 2006; Lee et al, 2007). It is increasingly recognized that the environment, both interpersonal and physical, plays an important role in fostering or impeding how well persons with dementia retain existing capabilities and functioning (O'Connor et al., 2007). There is substantial evidence that supportive physical environment can serve as an effective therapeutic resource to improve quality of life among residents with dementia in long-term care settings (Campo & Chaudhury, 2012; Chaudhury et al., 2018; Chenoweth et al., 2014; Fleming & Purandare, 2010; Harrison et al., 2017; Lee et al., 2016a, b; Marquardt et al., 2014; Pollock & Fuggle, 2013; Rahman, 2017; Soril et al., 2014; Verbeek et al., 2014; Zimmerman & Anderson, 2013). Small-scale living is a form of physical environmental context for older adults with dementia, intended to provide a more responsive and person-centred environmental support in long-term care settings (Ausserhofer et al., 2016; Day et al., 2000; Husberg, 2007; Joseph et al., 2016; Kane et al., 2007; Kok et al., 2018; Verbeek, 2012; Vermeerbergen, 2017). Meanwhile, other studies (de Rooij et al., 2012; Verbeek et al., 2010; Zeisel et al., 2003) identified that small-scale settings compared to traditional settings showed no beneficial effects on certain domains of quality of life. More research and evidence-based knowledge are needed to understand the impact of environmental design on quality of life among people with dementia.

Canada and Sweden have a public health care system and have had long-term care facilities for over a century. Both countries also have been facing similar issues on supporting for aged care system due to the rapid increase in the number of their older adults. While the proportion of the population living in long-term care facilities has not changed significantly over the last century, the numbers living in the facilities have grown enormously (Armstrong et al., 2009). The age and gender type in residential care in the Scandinavian countries including Sweden is similar to the Canadian one (Ibid). These situations faced by both countries provide a useful point of a comparative study on quality of life of residents living in long-term care facilities.

This longitudinal observational study aims to expand knowledge on residents' quality of life by comparing dementia care facilities in two countries.

2. METHOD

This longitudinal study was conducted in Vancouver, Canada, and Stockholm, Sweden. Due to the different research programs and longitudinal study design, we could not investigate the two countries in the same year. To avoid the effect of the time difference, the observation was conducted three times over one year in the same seasons at the same time intervals. We used a mixed-sampling strategy, i.e., random and purposive sampling.

Settings

To achieve the purpose of the study, the following process of selecting facilities in Vancouver was carried out: i) among the 56 residential care facilities in Vancouver Costal Health Authority, 11 dementia care facilities, equivalent to 20%, were selected randomly, ii) through site visits by the primary researcher and an assistant researcher, the care facilities were classified as a traditional setting and a small-scale setting based on distinct physical characteristics, which are mainly mentioned as discriminators, e.g., in references (Calkins, 2009; Day, Carreon & Stump, 2000; Verbeek, 2011). The main physical characteristics used during this phase were the number of residents in a unit (30 or more beds in a unit as a larger unit), length of corridor or hallway (>15 meters as a long corridor), and building layout, i.e., single- or double-loaded floor plan[1]. Two dementia care facilities (Richmond Manor and Maple Manor) were selected for the study. Richmond Manor has 12 residents with dementia in a unit, a relatively short corridor (14.4m), and single-loaded floor plan. Maple Manor has 30 residents with dementia, a long corridor (41.3m), and double-loaded floor plan.

The process of choosing the dementia care units in Stockholm was not the same as in Vancouver. In Stockholm, building layout with double-loaded floor plan is uncommon and the majority of the units are small (8 - 10 residents). To select representative care homes for the study in Stockholm, the following process was carried out: i) one municipality was selected randomly in Stockholm county, ii) in the municipality, 10 facilities among 16 facilities with dementia care units were selected randomly, iii) two researchers evaluated them with site visits to ensure reliability. Two facilities (Haga Garden and Edsberg Garden) were selected with the highest variation in the physical environment features from a homelike or institutional setting. Haga Garden and Edsberg Garden have 8 and 10 residents with dementia in a unit respectively and both of them have single-loaded floor plan.

The names of all care facilities in the study document were changed to pseudonyms to provide anonymity and confidentiality.

1 Single-loaded plan refers to corridor or hallways that have resident rooms on its one side, contrasted with double-loaded plan where rooms are on its both sides.

Study Samples

The general manager or/and a care director was asked to identify residents who met eligibility criteria: aged 60 and older, in the early-mid stage of Alzheimer's disease or related dementia, and able to ambulate with or without an assistive device. Residents who were bed-ridden or staying in their private rooms during the daytime were excluded because we were interested in observing how residents move and use the environment in the care setting. In each facility, a general manager contacted their family members and assisted in obtaining consent from their family members. Twenty residents in Vancouver and 21 residents in Stockholm met the study criteria. During the observation period, a total of 17 residents passed away or moved to other locations. The final data analyses involved 24 residents with dementia: 11 from Vancouver and 13 from Stockholm.

Measurement

1) Physical environmental assessments

Physical environmental assessments were performed at each selected dementia care unit in Vancouver and Stockholm using standardized environmental assessment tool: Therapeutic Environment Screening Survey for Nursing Homes (TESS-NH) (Sloane et al., 2002). TESS-NH contains 84 discrete items and one overall item that cover six domains with 13 sub-domains. These domains include: (1) privacy/ control/autonomy: unit autonomy, access to outdoors and privacy; (2) safety/security/ health: exit control, maintenance, cleanliness and safety; (3) stimulation: lighting, visual/tactile stimulation and noise; (4) socialization: space and seating; (5) personalization/ familiarity: familiarity and homelikeness; (6) orientation: orientation and cueing. Defining specific physical features were primarily rated on a scale from 0 (distinctly unpleasant attribute) to 3 (more favorable attribute).

2) Quality of life assessment

Quality of life of the residents with dementia was measured with Dementia Care Mapping (DCM) (University of Bradford, 2010) tool. DCM is a technique and observational framework devised to systematically record and investigate quality of life from the perspective of the older adults with dementia. The tool is the intensive in-depth, real time observations over a number of hours of residents living in dementia care units (Brooker & Surr, 2010). DCM data obtained through direct observation is also a useful instrument to evaluate the level of well- or ill-being that individual residents experience. During a DCM observation, two kind of codes are used to take notes on what is taken place to each resident; Behavioral Category Codes (BCCs) and Mood and Engagement (ME) value. BCCs specify one of 23 category codes of resident's behaviors (Table 1). ME value, which shows how engaged the resident is and whether their mood is positive or negative, provides an index of relative well-being for an observation time for a resident or a group. The qualified mapper, a primary investigator in the study, observed unobtrusively the selected older adults with dementia continuously for 5-minute time frames during daytime in the primary public areas, e.g. living room, dining room or courtyard. The subjects' behaviors were recorded according to 23 BCCs. Using the individual/ group behavior profiles a mapper can assess on its level the potential for positive engagement in an environment by looking at the percentage of time spent in high potential categories (University of Bradford, 2010).

Table 1. Behavior Category Codes (BCCs)

Behavior Category Codes	General Description of Category
A. Articulation	Interaction with others
B. Borderline	Being engaged but passively (watching)
C. Cool	Being disengaged, withdrawn
D. Doing for self	Self-care
E. Expressive	Expressive or creative activities
F. Food	Eating/ drinking
G. Going back	Reminiscence and life review
I. Intellectual	Prioritizing the use of intellectual abilities
J. Joints	Exercise or physical sport
K. Come and go	Walking, standing or moving activities
L. Leisure	Leisure, fun and recreational activities
N. Nod	Sleeping, dozing
O. Objects	Displaying attachment to or relating to inanimate objects
P. Physical	Receiving practical, physical or personal care
R. Religion	Engaging in a religious activity
S. Sexual expression	Sexual expression
T. Timalation	Direct engagement of the senses
U. Unresponded to	Attempting to communicate without receiving a response
V. Vocational	Work or work-like activity
W. Withstanding	Repetitive self-stimulation of a sustained nature
X. X-cretion	Episodes related to excretion
Y. Yourself	Interaction in the absence of any observable other
Z. Zero option	Fits none of existing categories

In each time frame, the mapper assessed the subjects' mood and engagement (ME) values in context of the BCCs that they accompanied (i.e., A / -1 when appearing restless and bored during a conversation). ME values for each BCCs are expressed on a 6-level scale (i.e., +5, +3, +1, -1, -3, -5), ranging from 'extreme positive state or deeply engaged' to 'extreme negative state'. Observations in Vancouver and in Stockholm were performed by the same mapper to reduce the variability of the

assessment. Each of the residents was observed on a weekday, typically between 9:30 and 16:00. In order to obtain at least 4 hours of non-missing observations per resident, observations were conducted over 2 or 3 days at each unit. This was because residents stayed their private room that could not be observed or the mapper occasionally took breaks.

To get the reliability of data, observations implemented at three times over a period of one year at each facility. The mapper tracked up to four residents simultaneously in the public areas. The interpreted data from the ME values and BCCs is taken as an index of well- or ill-being (WIB) for a specific time period for residents.

Data collection and analysis

The unobtrusive observations were held in Canada from January to February in 1st phase, June–July in 2nd phase, and November in 3rd phase in 2013. In Sweden they were held from October to November in 1st phase, January– February in 2nd phase, and June-July in 3rd phase in 2016. Data were coded and analyzed using Microsoft Excel (2010 version) and SPSS version 28.0. Descriptive statistics including frequency and percentage were applied using Excel program. The analysis of variance (ANOVA) test was used to compare the study groups' environmental assessment in SPSS with a level of significance of $p< 0.05$. As an auxiliary analysis, Post hoc analysis using the Bonferroni post hoc criterion was performed to identify the differences in means between each group.

DCM data obtained through systematic recording were analyzed using an analysis method developed by the Dementia Group of the University of Bradford (Brooker & Surr, 2010; University of Bradford, 2010). According to the analysis method for assessing quality of life of participants, DCM data were analyzed using five different analyzing types as follows;

i) High potential engagement: levels of the potential for positive engagement in an environment regarded as one of the key factors to quality of life in dementia was measured by the percentage of time spent in codes such as A (interaction), D (self-care), E (creative activities), F (eating/drinking), G (reminiscence), I (intellectual abilities), J (exercise), K (walking/standing), L (leisure), O (displaying attachment to objects), P (receiving personal care), R (religious activity), T (engagement of the sense), V (work-like activity), and Y (interaction in the absence of any other).

ii) Diversity of occupation: as an indicator of the quality of care, the diversity of occupation was assessed by the number of high potential categories excluding 'eating' (code F), 'personal care' (code P), and 'excretion' (code X).

iii) Agitation/ distress: levels of agitation and distress were measured in terms of the amount of times spent in 'communication without receiving a response' (code U), and 'walking whilst being in a negative mood' (code K with negative ME value), 'repetitive self-stimulation whilst being in negative mood' (code W with negative ME value), and 'interaction with absence of others whilst being in negative mood' (code Y with negative ME value).

iv) Withdrawal: when in withdrawn behaviors, a resident is not showing any signs of engagement with oneself or the world surrounding oneself. Withdrawal was evaluated in the amount of time spent in 'being disengaged' (code C) and 'dozing' (code N).

v) Well- or ill-being (WIB): WIB brings an index of whether the preponderance of time was spent in posivive or negative mood and engagement (University of Bradford, 2010).

DCM data were also analyzed using T-test in SPSS to determine whether there were significant differences on the domains of QoL.

Ethical considerations

Ethical approval and permission to conduct the study were obtained from the Office of Research Ethics at Simon Fraser University, Vancouver, Canada and the Centrala etikprövningsnämnden (Central Ethical Examination Board) in Stockholm, Sweden.

The participating residents' families received a consent form, which contained the study objective, detailed observation process, and the confidentiality of residents' identity. The consent forms with the participating residents' family signature were gathered by the primary investigator through the managers.

3. RESULTS

General characteristics of the residents

An overview of the general characteristics of the residents in Vancouver and Stockholm is presented in Table 2. More participants in all four groups were female, with an average age ranging from 77.6 to 86.2 years. The means of stay length of residents who participated in the study ranged from 19.5 to 40.7 months. The average activities of daily living (ADL) ranged from 22.9 to 63.0 scores. Overall the participants in Vancouver were shorter in the stay length in the facilities and higher in ADL compared to ones in Stockholm.

Table 2. General characteristics of the residents and the dementia care settings

	Vancouver		Stockholm	
	Richmond Manor (n = 6)	Maple Manor (n = 5)	Haga Garden (n = 6)	Edsberg Garden (n = 7)
Age (years)				
Mean (SD)	83.8 (9.4)	77.6(9.8)	86.2(8.4)	82.3(5.5)
Range	73 – 95	62 – 88	72 – 96	72 - 89
Gender				
Male f (%)	3 (50.0)	2 (40.0)	0 (0.0)	2 (28.6)
Female f (%)	3 (50.0)	3 (60.0)	6(100.0)	5 (71.4)
Marital Status				
Married f(%)	1 (16.7)	1 (20.0)	0 (0.0)	4 (57.1)
Widowed f (%)	4 (66.6)	3 (60.0)	6 (100.0)	3 (42.9)
Others f (%)	1 (16.7)	1 (20.0)	0 (00.0)	0 (0.0)
Stay length (months)				
Mean(SD)	19.5 (18.3)	22.0(5.7)	40.7(16.3)	24.4 (14.7)
Range	2 – 54	15 - 28	17- 66	10 - 51
ADL*				
Mean(SD)	63.0 (35.6)	60.2 (31.3)	39.2(35.4)	22.9(22.1)
Range	10 - 94	17 - 98	0 - 78	2 - 61

* Activities of Daily Living

Physical environment assessment

Table 3 shows general features and results of F-test analysis on the physical environmental assessment of the four facilities in Vancouver and Stockholm. Richmond Manor selected in Vancouver is a purpose-built dementia care facility, with 12 older adults with dementia on each unit and all single bedrooms. The number of staff working in the daytime was 1.5 nurses and two care aids, thus the ratio of staff to residents is 1:3.4. Maple Manor selected in Vancouver is an institutional care setting, with 30 older adults with dementia on each unit, mixed single/semi-private bedrooms, and a double-loaded floor plan. One nurse and four care aides took care of 30 older adults with dementia during the daytimes, that is, the staff ratio is 1:6. Haga Garden located in Stockholm, has eight older adults with dementia on each unit with all single bedrooms. For the residents, there were one registered nurse and two assisted nurses who worked during the daytimes. The ratio of staff to residents is 1:2.7. Edsberg Garden consists of two units with 10 older adults with dementia on each unit on the 4th floor. Bedrooms are all single-occupancy, with 0.5 nurse and two assisted nurses taking care of residents during the daytimes. The ratio of staff to residents is 1:4.

The means and F-tests of statistical significance on the physical environmental assessment of the four dementia care facilities are shown in the lower part of Table 3. There were significant differences in the stimulation ($F3, 76 = 5.03$, $p < 0.01$) and personalization/familiarity/homelikeness ($F3,20=4.46$, $p<0.05$), while the domains of privacy/control/autonomy, safety/security, socialization, and orientation revealed no significant differences between the care facilities. Post hoc analyses using the Bonferroni post hoc criterion indicated that the domains of stimulation and personalization/ familiarity/ homelikeness were significantly higher in Edsberg Garden (M= 1.85, SD= 0.67/ M= 2.50, SD= 1.22 respectively) than in Maple Manor (M=0.95, SD=0.86/ M=0.50, SD=0.84 respectively). The results indicate that Edsberg Garden provided significantly more caring physical environmental features in quality of lighting, visual/ tactile/acoustic stimuli and more personalized and home-like atmosphere to the residents with dementia compared to those of Maple Manor.

Dementia care mapping for residents with dementia

The distribution of the behavior category profiles and Mood/ Engagement values across the three observation time lines (T1 -T3) for the residents in the study groups is shown in Table 4. Among the behavior categories, 'A: interaction with others', 'B: passively watching', and 'F: eating and drinking' were generally shown higher in the study groups. Notably in Maple Manor, a traditional care unit, the more frequently observed behaviors were 'B: passively watching' (26.5%), 'N: dozing' (15.3%), and 'C: being disengaged' (11.5%) during the observation times. Behavior category 'G: reminiscence and life review' was not observed among all the groups for the observation period. When comparing the residents in Stockholm to Vancouver counterparts, the behavior category 'T: direct engagement of the senses' and 'Y: engagement in interaction in the absence of other' were only observed among the residents of Stockholm. Residents in Stockholm were often observed in enjoying the sunshine, included in the code T, on the balcony or in the

Table 3. General features and results of F-test analysis on physical environmental assessment

	Vancouver		**Stockholm**		
	Richmond Manor	**Maple anor**	**Haga Garden**	**Edsberg Garden**	
Dementia Care Unit Features					
Type of unit	Segregated with other units	Segregated with other units	Segregated with other units	Segregated with other units	
Bedroom type	Single bedrooms	Mixed single and semiprivate bedrooms	Single bedrooms	Single bedrooms	
Number of residents in a unit	12	30	8	10	
Staff ratio (daytime)	1:3.4 (1.5 nurses, 2 care aids)	1:6 (1 nurse, 4 care aids)	1:2.7 (1 registered/ 2 assisted nurses)	1:4 (0.5 registered/ 2 assisted nurses)	
TESS-NH	mean (SD)	mean (SD)	mean (SD)	mean (SD)	F value(df)
Privacy/control/autonomy	2.21 (2.26)	1.43 (1.16)	1.79 (2.33)	2.04 (2.24)	N.S.
Safety/security	1.70 (0.70)	1.30 (0.63)	1.48 (0.73)	1.70 (0.70)	N.S.
Stimulation	1.50 (0.67)	**0.95 (0.86)**	1.45 (0.76)	**1.85 (0.67)**	**F(3,76)= 5.03****
Socialization	1.25 (1.09)	0.75 (1.30)	1.00 (0.92)	1.25 (1.26)	N.S.
Personalization/homelikeness	1.83 (0.75)	**0.50 (0.84)**	2.17 (1.17)	**2.50 (1.22)**	**F(3,20) = 4.46***
Orientation	0.54 (0.52)	0.38 (0.51)	0.46 (0.52)	0.31 (0.48)	N.S.

* $p < 0.05$ ** $p < 0.01$ _____: significant differences between groups after using Bonferroni post hoc analyses
N.S.: not significant df: degrees of freedom

garden. Meanwhile, the behavior category 'W: repetitive self-stimulation' was only observed in the residents of Vancouver.

To test the significant differences between Maple Manor and Edsberg Garden, which showed significant differences in the physical environment assessment, t-test analysis was conducted on domains of QoL: potential positive engagement, level of agitation/distress, withdrawn behavior, and well- or ill being (Table 5).

1) Potential positive engagement

Positive engagement is one of the important indicators to quality of life in dementia. The levels of the potential for positive engagement in an environment was measured by the percentage of time spent in codes A, D, E, F, G, I, J, K, L, O, P, R, S, T, V and Y. The average percentage of potential positive engagement was 59.9% in Richmond Manor, 43.1% in Maple Manor, 67.5% in Haga Garden, and 73.6% in Edsberg Garden.

The result of t-test to examine the difference between Maple Manor and Edsberg Garden revealed no significant difference.

2) Diversity of occupation

The diversity of occupation was assessed by the number of high potential categories with a greater diversity proposing better quality care excluding 'F: eating', 'P: personal care', and 'X: excretion'. The number of high potential categories with a positive ME value for 2% or more of the time was 5 behavior categories (A: interaction with others/ D: self-care/ E: creative activities/ K: walking & standing/ L:leisure) in Richmond Manor, 2 (A: interaction with others/ K: walking & standing) in Maple Manor, 5 (A: interaction with others/ K: walking & standing/ L: leisure/ T: engagement of the sense/ V: work-like activity) in Haga Garden, and 5 (A: interaction with others/ J: exercise/ K:walking & standing/ L:leisure/ Y:interaction in the absence of any other) in Edsberg Garden. The data showed that the residents in Maple Manor spent their time doing relatively monotonous activities during the observation period. The other three care homes provided 5 different high potential categories, where three of them, 'A: interaction with others', 'K: walking', and 'L: leisure' were in common.

3) Level of agitation/distress

Levels of agitation or distress were measured in terms of the amount of times spent in 'U: communication without receiving a response', and '-K: walking' (negative ME value), '-W: repetitive self-stimulation' (negative ME value), and '-Y: interaction with absence of others' (negative ME value). The average time to spend in behaviors related to agitation or distress was 0.4% in Richmond Manor, 1.0% in Maple Manor, 0.2% in Haga Garden, and 0.4% in Edsberg Garden. There was no statistically significant difference between Maple Manor and Edsberg Garden as a result of t-test.

4) Withdrawn behavior

The withdrawn behavior was evaluated in the amount of time spent in 'C: being disengaged' and 'N: dozing'. The average of withdrawal overall T1~T3 observation times was 17.4% in Richmond Manor, 26.8% in Maple Manor, 11.5% in Haga Garden, and 11.9% in Edsberg Garden. T-test revealed a statistically significant difference between Maple Manor (M=13.4, SD= 5.23) and Edsberg Garden (M= 5.93, SD= 4.92); $t(10)= 2.55$, $p< 0.05$ (Table 5). The result means that the residents in Maple Manor showed less any signs of engagement with themselves or the world around them, compared to the ones in Edsberg Garden.

5) Well- or ill-being (WIB)

To identify levels of the resident's WIB, their mood and engagement (ME) was measured according to each of their behavior category codes (lower part of Table 4). The residents in Maple Manor showed less than one score in WIB values throughout T1~T3 (0.76, 0.49, 0.59). ME values for all four groups did not show any scores in -5 except for the residents in Maple Manor during the duration of the observation periods.

To determine general features, ME values for each facility were divided into three groups: positive (+3. +5), neutral (+1), and negative (-1, -3, -5) values, and calculation using the average WIB scores was made as Figure 1. The residents in Richmond Manor showed the highest positive scores (13.8%), whereas the ones in Maple Manor showed the highest negative scores (17.5%) among the participating groups. The two groups in Stockholm (Haga Garden and Edsberg Garden) showed higher neutral values (90.7%, 90.4% respectively) and lower negative values (5.2%, 2.0% respectively) compared to Vancouver counterparts.

T-test was conducted to compare WIB scores in Maple Manor and Edsberg Garden. There was a significant difference between the residents in Maple Manor (M= 0.61, SD= 0.14) and the ones in Edsberg Garden (M= 1.00, SD= 0.05); $t(4)= - 4.70$, $p< 0.01$ (Table 5). The result indicates that the participants in Maple Manor spent more time to be negative mood or affect compared to the ones in Edsberg Garden.

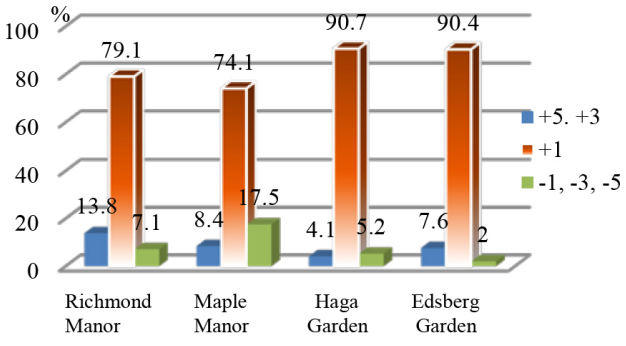

Figure 1. Average well- or ill-being scores

Table 4. Distribution of Behavior Category Profiles and Mood/Engagement Values across Three Observation Time Lines

Codes	Vancouver								Stockholm							
	Richmond Manor				Maple Manor				Haga Garden				Edsberg Garden			
	mean%	(T1	T2	T3)	mean%	(T1	T2	T3)	mean%	(T1	T2	T3)	mean%	(T1	T2	T3)
A	**21,0**[1]	(22,0	18,9	22,1)	**13,2**[2]	(20,3	10,1	9,1)	**20,2**	(25,6	16,4	18,6)	**22,1**[3]	(25,4	23,0	17,9)
B	**17,6**	(20,5	18,9	13,5)	**26,5**	(22,7	26,3	30,4)	**20,3**	(23,8	19,4	17,7)	**13,9**	(15,6	13,0	13,1)
C	**5,1**	(3,1	11,4	0,6)	**11,5**	(18,4	9,5	6,7)	**3,6**	(1,2	3,2	6,5)	**1,6**	(1,5	1,3	1,9)
D	**2,4**	(1,6	2,6	3,1)	**0,7**	(0,0	0,6	1,5)	**0,7**	(1,1	0,7	0,2)	**0,9**	(0,9	0,8	0,9)
E	**3,7**	(2,8	6,6	1,8)	**1,4**	(0,0	2,1	1,9)	**0,1**	(0,3	0,0	0,0)	**0,3**	(1,0	0,0	0,0)
F	**18,4**[4]	(19,7	14,0	21,5)	**18,7**	(22,7	18,7	14,7)	**20,0**	(16,9	23,8	19,4)	**19,8**	(19,2	18,5	21,7)
G	**0,0**	(0,0	0,0	0,0)	**0,0**	(0 ,0	0,0	0,0)	**0,0**	(0,0	0,0	0,0)	**0,0**	(0,0	0,0	0,0)
I	**1,2**	(0,0	0,0	3,7)	**0,0**	(0,0	0,0	0,0)	**0,7**	(0,0	0,7	1,5)	**1,2**	(3,4	0,3	0,0)
J	**0,0**	(0,0	0,0	0,0)	**1,2**	(0,0	3,1	0,6)	**0,2**	(0,0	0,0	0,7)	**3,1**	(1,4	3,2	4,9)
K	**6,7**	(9,8	5,3	4,9)	**6,3**[5]	(1,0	7,0	11,0)	**9,0**[6]	(12,5	6,7	7,8)	**6,8**	(7,9	8,8	3,7)
L	**4,4**	(5,9	0,4	6,7)	**1,4**	(1,4	0,3	2,4)	**7,0**	(8,4	7,0	5,6)	**4,1**	(3,1	6,0	3,3)
N	**12,3**	(7,9	13,2	16,0)	**15,3**	(10,6	19,6	15,7)	**7,9**	(1,9	8,9	12,8)	**10,3**	(11,4	11,3	8,2)
O	**0,5**	(0,4	0,4	0,6)	**1,2**	(0,5	0,6	2,6)	**1,1**	(0,3	0,5	2,4)	**1,8**	(2,3	1,2	1,9)
P	**1,3**	(0,0	2,2	1,8)	**1,4**	(1,0	1,2	1,9)	**5,7**	(4,3	7,2	5,6)	**5,9**	(3,6	6,3	7,7)
R	**0,3**	(0,0	0,9	0,0)	**0,0**	(0,0	0,0	0,0)	**0,0**	(0,0	0,0	0,0)	**0,0**	(0,0	0,0	0,0)
T	**0,0**	(0,0	0,0	0,0)	**0,0**	(0,0	0,0	0,0)	**0,1**	(0,1	0,0	0,2)	**1,4**	(0,6	0,0	3,5)
U	**0,4**	(0,4	0,9	0,0)	**0,4**	(0,0	0,0	1,3)	**0,2**	(0,5	0,1	0,0)	**0,4**	(0,4	0,5	0,5)
V	**1,2**	(2,0	0,9	0,6)	**0,4**	(0,5	0,6	0,2)	**0,3**	(0,8	0,0	0,0)	**1,5**	(0,1	2,2	2,1)
W	**3,2**	(3,5	3,1	3,1)	**0,3**	(1,0	0,0	0,0)	**0,0**	(0,1	0,0	0,0)	**0,0**	(0,0	0,0	0,0)
X	**0,3**	(0,4	0,4	0,0)	**0,1**	(0,0	0,3	0,0)	**0,2**	(0,1	0,5	0,0)	**0,0**	(0,0	0,0	0,0)
Y	**0,0**	(0,0	0,0	0,0)	**0,0**	(0,0	0,0	0,0)	**2,4**	(2,1	4,0	1,0)	**4,9**	(2,1	3,7	8,9)
Total	**100,0**	(100,0	100,0	100,0)	**100,0**	(100,0	100,0	100,0)	**100,0**	(100,0	100,0	100,0)	**100,0**	(100,0	100,0	100,0)

Mood & Engagement Values[7]	Vancouver						Stockholm					
	Richmond Manor			Maple Manor			Haga Garden			Edsberg Garden		
	T1 f (%)	T2 f (%)	T3 f (%)	T1 f (%)	T2 f (%)	T3 f (%)	T1 f (%)	T2 f (%)	T3 f (%)	T1 f (%)	T2 f (%)	T3 f (%)
+5	7 (3.0)	0 (0.0)	0 (0.0)	1 (0.5)	0 (0.0)	0 (0.0)	10 (1.5)	0 (0.0)	0 (0.0)	8 (1.1)	1 (0.2)	0 (0.0)
+3	49 (20.9)	20 (10.1)	10 (7.3)	33 (17.8)	6 (2.3)	18 4.6)	41 (6.3)	7 (1.9)	9 (2.5)	61 8.6)	41 (7.7)	20 (5.1)
+1	168 (71.8)	147 (74.2)	125 (91.2)	107 (57.8)	217 (82.5)	320 (81.8)	590 (90.2)	341 (93.4)	320 (88.6)	624 (88.4)	480 (90.4)	363 (92.4)
-1	10 (4.3)	31 (15.7)	2 (1.46)	40 (21.6)	35(13.3)	37 (9.5)	12 (1.8)	16 (4.4)	32 (8.9)	13 (1.8)	9 (1.7)	10(2.5)
-3	0 (0.0)	0 (0.0)	0 (0.0)	3 (1.6)	5 (1.9)	8 (2.1)	1 (0.2)	1 (0.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
-5	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)	0 (0.0)	8 (2.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
GroupWIB score[8]	1.34	0.78	0.94	0.76	0.49	0.59	1.14	0.94	0.87	1.05	1.00	0.96

1- 3. Percentage of code A with negative ME value = 1.2%, 2.8%, 0.2% included respectively
4. Percentage of code F with negative ME value = 0.5% included
5. Percentage of code K with negative ME value = 0.6% included
6. Percentage of code K with negative ME value = 0.04% included
7. +5: very happy/ very absorbed +3: content, happy/concentrating but distractible
+1: neutral/ intermittent engagement
-1: small signs of negative mood/ withdrawal -3: considerable signs of negative mood
-5: very distressed
8. Group WIB score = $\frac{\text{sum of relevant ME values for all participants}}{\text{total number of time frames for all participants}}$

Table 5. Results of T-test Analysis on Domains of QoL

	Maple Manor	Edsberg arden	t(df)-value
	mean (SD)	mean (SD)	
Positive Engagement	2.83 (6.04)	4.92 (6.89)	N.S.
Agitation	0.31 (0.54)	0.23 (0.26)	N.S
Withdrawn Behavior	13.4 (5.23)	5.93 (4.92)	t(10) = 2.55*
WIB	0.61 (0.14)	1.00 (0.05)	t(4) = - 4.70**

df: degrees of freedom N.S.: not significant * $p < 0.05$ ** $p < 0.01$

4. DISCUSSION

This is the first longitudinal study to directly investigate whether residents with dementia in long-term facilities with variability in physical environmental characteristics in Vancouver, Canada and Stockholm, Sweden had a difference in their quality of life. QoL was assessed using DCM tools three times over one year for the reliability of data. The results of the study demonstrated that the residents with dementia living in a homelike and positive stimulating setting showed less withdrawn behaviors and a higher level of well-being compared to those in a large-scale institutional setting. The findings are consistent with previous studies that demonstrated the positive effects of physical environmental characteristics, such as small-scale homelike settings and appropriate stimuli on social engagement/involvement (Verbeek et al., 2014; Lee et al., 2016a,b; de Rooij et al., 2012; Verbeek et al., 2012; Garre-Olme et al., 2012; Smit et al., 2012). In particular, some studies have shown that a well-planned physical environment for adults with dementia improves their ADL function (Reimer et al., 2004) and facilitates social interaction and staff's care practice (Hung & Chaudhury, 2011).

This study also found that the residents in Maple Manor with a large-scale institutional environment spent more monotonous times than the other three groups, which may be to provision of fewer structured activity programs or less social interaction with neighbors or staff members. When comparing the frequency of agitated behavior, they showed so far as five times more agitated/distressed behaviors and twice more withdrawal during the daytimes compared to the ones in Haga Garden, a small-scale homelike setting. Considering their general characteristics such as age and ADL, the residents in Maple Manor could be expected to be more active and positive behaviors as they are the youngest and more competent group among the study groups. However, according to the findings, despite being younger and more competent residents, they showed more negative behaviors and lower level of well-being among the other cohorts of participating facilities. Maple Manor assessed the lowest positive stimulating and homelike environment among the four homes between the two countries. Based on these findings, the study supports that the large-scale institutional environment was considerably associated with levels of lower quality of life among the residents with dementia.

According to the well- or ill-being (WIB) data, the residents in Sweden spent more time in neutral mood/engagement than the ones in Canada. Meanwhile, the residents in Canada with a small-scale homelike environment (Richmond Manor) received the highest WIB scores, whereas the other ones in Canada with a large-scale institutional setting (Maple Manor) obtained the lowest WIB scores. These findings may be due to different cultures or national traits between two countries, but the most important thing to note in the findings is that the quality of life of older adults with dementia is highly like to be associated with their surrounding environment. The proximate environment could directly and indirectly affect the ameliorating or deteriorating quality of life of residents with dementia who seem to be more vulnerable to the environmental circumstances. A recent study on the physical environment from the perspective of the staff (Lee et al., 2021) suggested the supportive environment qualities to improve the quality of life of residents with dementia: small-scale units, spatial arrangement without a long and dead-end corridor, and optimal level of stimulation to avoid boredom and helplessness. Furthermore, this study insisted that these environmental features are associated with providing responsive care and meaningful activities. The study of Verbeek et al. (2012) found that the residents in the small-scale homelike facilities in the Netherlands received higher levels of personal attention; staff showed more empathy and were willing to spend time with families. Future research should further examine the complexity of how the physical environment and socio-cultural factors may interact in affecting the staff's attitude, work behavior and relationship with residents with dementia.

The limitation of the study is that a limited number of participants in the observation were involved and they do not represent the overall population of older adults with dementia. In particular, a small number of facilities in the study have limitations to exemplify each city or country and thus have limitations in generalizing the results of the study. Despite the limitations of this study, however, the advantage of the study is that in-depth and longitudinal data were used to identify quality of life of residents with dementia. Furthermore, this rich data obtained from the DCM tool could use to improve care practice development.

5. CONCLUSION

The results of this study suggest that residents in a small-scale homelike setting with positive stimuli had a higher quality of life compared to a large-scale institutional setting, measured by Dementia Care Mapping tool at three times over one year in two countries, Canada and Sweden. The observational data also indicated that the residents in the large-scale institutional environment spent their time doing relatively monotonous

activities. Research is needed to investigate the complexity and specific aspects of how the physical environment and socio-cultural factors may influence staff practice and residents' quality of life.

REFERENCES

Alzheimer's Disease International.(2018). World Alzheimer Report 2018: *The state of the art of dementia research: New frontiers.* https://www.alz.co.uk/research/ WorldAlzheimerReport2018.pdf?2

Armstrong, P., Banerjee, A., Szebehely, M., Armstrong, H., Daly, T., & Lafrance, S. (2009). *They Deserve Better: The Long-Term Care Experience in Canada and Scandinavia.* Ottawa: Canadian Centre for Policy Alternatives.

Ausserhofer, D., Deschodt, M., Geest, S.D., van Achterberg, T., Meyer, G., & et al. (2016). "There's no place like home": A scoping review on the impact of homelike residential care models on resident-, family-, and staff-related outcomes. *Journal of the American Medical Directors Association,* 17(8), 685-693.

Brawley, E.C. (2005). *Design Innovations for Aging and Alzheimer's: Creating Caring Environments.* Hoboken, NJ: John Wiley & Sons.

Brooker, D., & Surr, C. (2010). *Dementia are mapping: Principles and practice.* Bradford, UK: University of Bradford.

Calkins, M.P. (2009). Evidence-based long term care design. *Neuro Rehabilitation,* 25,145-154

Campo, M., & Chaudhury, H. (2012). Informal social interaction among residents with dementia in special care units: Exploring the role of the physical and social environments. *Dementia,* 11(3), 401-423. https//doi-org.focus.lib.kth.se/10.1177/ 1471301211421189

Chaudhury, H., Cooke, H., Cowie, H., & Razaghi, L. (2018). The influence of the physical environment on residents with dementia in long-term care settings: review of the empirical literature. The Gerontologist, 58(5), e325–e337. https://doi.org/10.1093/geront/ gnw259

Chenoweth, L., Forbes, I., Fleming, R., & et al. (2014). PerCEN: a cluster randomized controlled trial of person-centered residential care and environment for people with dementia. *International Psychogeriatrics,* 26(7), 1147-1160.

Corrada, M.M., Brookmeyer, R., Paganini-Hill, A., Berlau, D., & Kawas, C.H. (2010). Dementia incidence continues to increase with age in the oldest old: the 90+ study. *Ann Neurol,* 67(1), 114–121.

Cutler, L.J. (2007). Physical environments of assisted living: Research needs and challenges. *The Gerontologist,* 47(3), 68-82.

Davis, S., Byers, S., Nay, R., & Koch, S. (2009). Guiding design of dementiafriendly environments inresidential care settings: Considering the living experiences. *Dementia*, 8(2), 185-203. http://www.sagepub.co.uk/ journalspermissions.nav

Day, K., Carreon, D., & Stump, C. (2000). The therapeutic design of environments for people with dementia: A review of the empirical research. *The Gerontologist,* 40(4), 397-416.

de Rooij, A.H.P.M., Luijkx, K.G., Schaafsma, J., Declercq, A.G., Emmerink, P.M.J., & Schols, J.M.G.A. (2012). Quality of life of residents with dementia in traditional versus small-scale long-term care settings: A quasi-experimental study. *International Journal of Nursing Studies,* 49(8), 931-940.

Fleming, R., & Purandare, N. (2010). Long-term care for people with dementia: environmental design guidelines. *International Psychogeriatrics,* 22(7), 1084-1096.

Garre-Olme, J., Lopez-Pousa, S., Turon-Estrade, A., Juvinya, D., Ballester, D., & Vilalta-Franch, J. (2012). Environmental determinants of quality of life in nursing home residents with severe dementia. *The Ameriacan Geriatrics Society,* 60(7), 1230-1236.

Hall, G.R., & Buckwalter, K.C. (1987). Progressively lowered stress threshold: A conceptual model for care of adults with Alzheimer's disease. *Archives of Psychiatric Nursing,* 1(6), 399-406.

Harrison, S.L., Dyer, S.M,, Laver, K.E., Milte, R.K., Fleming, R., & Crotty, M. (2017). Physical environmental designs in residential care to improve quality of life of older people. *Cochrane Database of Systematic Reviews,* 12(CD012), 1-14. https://DOI: 10.1002/14651858.CD012892

Hung, L., & Chaudhury, H. (2010). Exploring personhood in dining experiences of residents with dementia in long-term care facilities. *Journal of Aging Studies*, 25(1), 1-12. https://doi.org/10.1016/j.jaging.2010.08.007

Husberg, L., & Ovesen, L. (2007). *Gammal och Fri* (Old and Free). Ängsblomman:Sweden.

Jones, G.M.M., & van der Eerden, W.J. (2008). Designing care environments for persons with Alzheimer's disease: visuoperceptual considerations. *Reviews in Clinical Gerontology,* 18(1), 13-37. https://doi.org/10.1017/ S0959259808002645

Joseph, A., Choi, Y., & Quan, X. (2016). Impact of the physical environment of residential health, care, and support facilities (RHCSF) on staff and residents: A systematic review of the literature. *Environment and Behavior.* 48(10),1203-1241.

Kane, R.A., Lum, T.Y., Culter, L.J., Degenholtz, H.B., & Yu, T. (2007). Resident outcomes in small-house nursing homes: A longitudinal evaluation of the initial green house program. *Journal of the American Geriatrics Society,* 55(6), 832-839.

Kok, J.S., Nielen, M.M.A., & Scherder, E.J.A. (2018). Quality of life in small-scaled homelike nursing homes: an 8-month controlled trial. *Health and Quality of Life Outcomes,* 16(38), 2-8.

Kovach, C.R., Noonan, P., Schilidt, A.M,, Reynolds, S., & Wells, T. (2006). The serial trial intervention: An innovative approach to meeting needs of individuals with dementia. *Journal of Gerontological Nursing,* 32(4), 18-25.

Lawton, M.P., & Nahemow, L. (1973). Ecology and the aging process. In *The psychology of adult development and aging.*

Washington, DC: American Psychological Association, 619-674.

Lee, S.Y., Hung, L., Chaudhury, H., & Morelli, A. (2021). Staff perspectives on the role of physical environment in long-term care facilities on dementia care in Canada and Sweden. *Dementia,* 0(0), 1–15. doi: 10.1177/14713012211003994

Lee, S.Y., Chaudhury, H., & Hung, L. (2016a). Effects of physical environment on health and behaviors of residents with dementia in long-term care facilities: A longitudinal study. *Research in Gerontological Nursing,* 9(2), 81-91. doi:10.3928/19404921-20150709-01

Lee, S.Y., Chaudhury, H., & Hung, L. (2016b). Exploring staff perceptions on the role of physical environment in dementia care setting. *Dementia*, 15(4), 743–75. doi: 10.1177/1471301214536910

Lee et al. (2007). Health supportive design in elderly care homes: Swedish examples and their implication to Korean counterparts. *Architectual Research,* 9(1), 9-18.

Marquardt, M., Bueter, K., & Motzek, T. (2014). Impact of the design of the built environment on people with dementia: An evidence-based review. *Health Environments Research & Design Journal,* 8(1), 127-157.

O'Connor, D., Phinney, A., Smith, A., Small, J., Purves, B., Perry, J., Drance, E., Donnelly, M., Chaudhury, H., & Beattie, L. (2007). Personhood in dementia care: Developing a research agenda for broadening the vision. *Dementia:The International Journal of Social Research and Practice,* 6(1), 121-142.

OECD. (2018). *Care Needed: Improving the Lives of People with Dementia.* OECD Health Policy Studies. OECD Publishing: Paris. http://dx.doi.org/10.1787/ 9789264085107-en

Pollock, A., & Fuggle, L. (2013). Designing for dementia: creating a therapeutic environment. *Nursing and Residential* Care, 15(6), 438-442. https://doi.org/10.12968/nrec.2013.15.6.438

Rahman, S. (2017). Living well and promoting wellbeing. In *Enhancing Health and Wellbeing in Dementia.* Jessica Kingsley Publisher, 173-198.

Reimer, M.A., Slaughter, S., Donaldson, C., Currie, G., & Eliasziw, M. (2004). Special care facility compared with traditional environments for dementia care: A longitudinal stuyd of quality of life. *Journal of the American Geriatrics Society,* 52(7), 1085-1092.

Sloane, P.D., Mitchell, M., Weisman, G., Zimmerman, S., Foley, K., Lynn, M., & et al. (2002). The therapeutic environment screening survey for nursing homes (TESS-NH): An observational instrument for assessing the physical environment of institutional settings for persons with dementia. *Journal of Gerontology: Social Sciences,* 57B(2), S69-S78.

Smit, D., de Lange, J., Willemse, B., & Pot ,A.M. (2012). The relationship between small-scale care and activity involvement of residents with dementia. *International Psychogeriatrics* / IPA, 24(5), 722–32. doi:10.1017/S1041610211002377

Soril, L.J.J., Leggett, L.E., Lorenzetti, D.L., Silvius, J., Robertson, D., Mansell, L., Holroyd-Leduc, J., Noseworthy, T.W., & Clement, F.M. (2014). Effective use of the built environment to manage behavioural and psychological symptoms of dementia: A systematic review. *PLoS ONE*, 9(12), e115425. https://doi.org/ 10.1371/journal.pone.0115425

United Nations. (2020). *World Population Ageing* 2019. The United Nations: New York.

University of Bradford. (2010). *DCM 8 User's Manual.* University of Bradford.

Verbeek, H. (2011). Redesigning dementia care: An Evaluation of Small-Scale Homelike Care Environments. Doctoral Thesis. Universiteit Maastricht.

Verbeek, H., Zwakhalen, S.M.G., van Rossum, E., Ambergen, T., Kempen, G.I.J.M., & Hamers, J.P.H. (2014). Effects of small-scale, home-like facilities in dementia care on residents' behavior, and use of physical restraints and psychotropic drugs: A quasi-experimental study. *International Psychogeriatrics,* 26(4), 657-68. doi:10.1017/ S1041610213002512

Verbeek, H., Zwakhalen, S.M.G., van Rossum, E., Kempen, G.I.J.M., & Hamers, J.P.H. (2012). Small-scale, homelike facilities in dementia care: a process evaluation into the experiences of family caregivers and nursing staff. *International Journal of Nursing Studies,* 49(1), 21-29.

Verbeek, H., van Rossum, E., Zwakhalen, S.M.G., Ambergen, T., Kempen, G.I.J.M., & Hamers, J.P.H. (2009). The effects of small-scale, homelike facilities for older people with dementia on residents, family caregivers and staff: design of a longitudinal quasi-experimental study. *BMC Geriatrics*. 9(1):3. Doi:10.1186/1471-2318-9-3

Verbeek, H., Zwakhalen, S.M., van Rossum, E., Ambergen, T., Kempen, G.I., & Hamers, J.P. (2010). Dementia care redesigned: Effects of small-scale living facilities on residents, their family caregivers, and staff. *Journal of the American Medical Directors Association, 11,* 662-670. doi:10.1016/ j.jamda.2010.08.001

Vermeerbergen, L., van Hootegem, G., & Benders, J. (2017). A comparison of working in small-scale and large-scale nursing homes: A systematic review of quantitative and qualitative evidence. *International Journal of Nursing Studies,* 67, 59–70. http://doi.org/10.1016/j.ijnurstu.2016.11.006

Zeisel, J., Silverstein, N.M., Hyde, J., Levkoff, S., Lawton, M.P., & Holmes, W. (2003). Environmental correlates to behavioral health outcomes in Alzheimer's special care units. *The Gerontologist,* 43, 697-711. doi:10.1093/geront/43.5.697

Zimmerman, S., Anderson, W.L., Brode, S., & et al. (2013). Systematic review: Effective characteristics of nursing homes and other residential long-term care settings for people with dementia. *Journal of the American Geriatrics Society,* 61(8),1399-1409.

(Received Nov. 30, 2020/ Revised Mar. 19, 2021/Accepted Jun. 25, 2021)