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Research and Design for Special Populations

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Ethan's grandmother lives a short bike ride away, in the bungalow she had spent all her adult life. They had been packing boxes together for days. Her dementia was worsening and everyone in the family thought it best that she move into a care home before it got worse. As the transition drew nearer, Ethan naturally thought about the challenges she would face with new people and routines in an unfamiliar environment. He also wondered how she would find her way around the care home and how she would figure out how to bring the comforts of her life at home into an institutional setting. He wondered how an environmental psychologist might sensitively research building design for the special group of individuals living in the care home. What would a research project be like with participants in a therapeutic setting who sometimes do not fully grasp where they are, or have a wide variety of physical problems? More than when he was an undergraduate, Ethan began to appreciate the practical and ethical difficulties in conducting environment-behavior research among persons living with cognitive or physical deficits. He planned to pay close attention to the physical environment at the care home, once his grandmother had settled in.

Designing physical environments for persons with different mental and physical needs and abilities requires understanding both the needs and people's capacities, and how these interact with built environments. People–place research affords such understanding, enabling designers to create built settings that better meet whatever special needs users of an environment might have. However, specialized research methods are required when designing for vulnerable individuals.

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To address the difficult issues (and rewarding outcomes) surrounding designs for special populations, this chapter discusses research methods for studying the preferences, attitudes, and behaviors of persons who live with cognitive decline (e.g., dementia) and physical challenges (e.g., multiple sclerosis).

Dementia and Environmental Design

The likelihood of developing **dementia** increases linearly with age. In 2011, the oldest baby boomers turned 65. This is one indication that the need for environment-behavior research that serves older people with cognitive challenges will increase. Such research is essential to ensure that residential and therapeutic settings are accessible, comfortable, safe, and support as full and rewarding a life as possible for persons who live with cognitive decline such as dementia.

To select the most effective research methods for this purpose requires understanding the nature of cognitive decline and its implications for design. The term "dementia" means cognitive decline. Alzheimer's disease includes a group of dementia causes that are linked by a common brain pathology characterized by fibrillary plaques and neuronal tangles.

Linked to reduced function in the brain's frontal lobe, people who live with dementia typically find it increasingly challenging to negotiate new physical settings by themselves. This brain region supports executive function, the ability to make sense of and organize complex processes, in this particular case, complexity in the physical environment. Executive function is the ability to mentally combine separate elements into a whole, to organize steps in a process into a coherent sequence, and to make sense of seemingly random events, such as the many steps required to make a cup of tea or brush one's teeth. Think about how many there are and you will understand how essential executive function is for everyday life.

Persons with dementia, faced with a high degree of complexity without assistance of others, often exhibit secondary symptoms, such as apathy, anxiety, agitation, or aggression – the four "A's" of Alzheimer's. These behaviors are not directly caused by changes to the brain, but result from the fact that the person cannot easily accomplish what she or he wants. Environments that are difficult to navigate often cause these secondary symptoms because people become frustrated; environments that indicate the intended use of a space with no ambiguity can reduce these reactions. This clearly highlights the importance of appropriate building design for people with dementia.

Another consideration when designing for people with dementia is that many have difficulty navigating a building from entry to destination or remembering where places in the building are, even when the place would be very familiar to the ordinary person after a few visits. Ordinarily, **cognitive mapping** enables us to figure out, and then remember, landmarks and paths connecting the places we travel to and from. Cognitive mapping – related both to short-term memory and executive function – often is significantly impaired for those living with dementia. Successful cognitive mapping employs physical and symbolic landmarks as navigational guides. Therefore, the more a physical environment can provide such landmarks as cues to where a person has been, is, and is going to, the longer they will be able to function independently in a setting.

Another manifestation of dementia of the Alzheimer's type is reduced impulse control, which rests in three parts of the brain: the hippocampus (helps with the allocation, storing, and recall of memories), the orbitofrontal cortex (decision making), and the thalamus (sensory perception and motor function regulation). Persons with impaired impulse control due to impacts on these brain areas, who find themselves in an emotional situation, are likely to express strong feelings of attraction, anger, fear, or joy. While others with greater impulse control might feel these emotions, they pay more attention to consideration of politeness, appropriateness, and how others will be affected by their behavior. Persons with Alzheimer's with impaired impulse control are likely to say what they feel without reservation. Over time, as impulse control structures in the brain are progressively damaged during the process of dementia, people may increasingly "act out" when confronting frustrating environmental elements. For example, if such a person encounters a door they expect to be open but is locked instead, he or she might strike the door or shout out.

Research methods: General considerations

Conducting environmental design research on perceptions, behaviors, and attitudes of those with cognitive deficits can be a challenge if the researcher merely employs standard methods he or she might employ in others situations or even methods appropriate to other special needs groups. Each such group is different, with its own specifications, limitations, and idiosyncrasies. Nevertheless, most environment-behavior research studies share the broad goal of maximizing the fit between people and their environments. These studies often examine whether a physical setting matches what people intend to do in it and whether the setting is supportive, comfortable, and safe. In addition, as mentioned earlier, for special populations, environment–behavior mismatches can have significant negative consequences, meaning the contribution of design and the built environment to their well-being is that much more important.

Environment-behavior research methods used to study the needs of those with cognitive decline living at home should consider at least two things. First, those who still live at home are more likely to be at an earlier stage of dementia than those who reside in an assisted living facility. Thus, they will generally be more able to answer questions directly and be more familiar with their immediate surroundings. Second, a spouse or child living with a study participant at home is likely to be able to contribute knowledge about a participant's needs and preferences whereas, in an assisted living facility, professional caregivers are more likely to know the person only in the context of that setting. Depending on the effort made to share a resident's lifestyle experience and history, assisted living personnel may be more or less knowledgeable about those aspects of a participant's life.

Because one of the most important problems that persons with dementia encounter in the built environment is finding their way around, we focus on that next.

Methods for studying wayfinding strategies for people with dementia

Wayfinding is the mental and physical act of navigating through an environment. For most of us, finding our way around a place is an unconscious process involving procedural memory and learning. The same is true for those with dementia: the more

self-evident a pathway is and the more cues along the path are multi-sensory, the easier wayfinding will be. Because those with dementia often have difficulty generating cognitive maps to follow, as discussed earlier, they often appear to "wander" aimlessly, although they themselves feel they have a purpose and destination.

Behavioral research can help discover the ways in which those with memory and cognitive impairments find their way; this knowledge can in turn be used to design environments that assist people to find their way rather than to wander. As discussed elsewhere in this book (see Chapters 2 and 9), observational methods employed to study non-specialized populations can also be appropriate for use with special populations.

A study conducted by one of this chapter's authors and his colleagues can serve as a practical example of this kind of observational method (Zeisel et al., 2003). The researchers followed and observed with a behavioral checklist persons with Alzheimer's disease who walked past a certain point in a special care unit at a randomly selected time every hour. The researchers then identified each item in the environment a person looked at (e.g., painting or photograph), stopped in front of (e.g., a table or window) or passed through, (e.g., doorway), and where the participant ended up.

To collect data for this study, the researchers used a "post-it note" method of environmental tagging. Just below the ceiling, where people do not usually look (approximately 8 feet up a wall), they stuck a yellow post-it note with a large black number representing whatever object was directly below. As someone with Alzheimer's walked by the object, raised their eyes to look at it, walked through it, or stopped in front of it, the object's number was recorded, as well as how much time the person was engaged in the particular behavior.

A special pen was used to swipe a barcode on a plasticized code sheet on which every post-it note number and each behavior was listed in advance. When a researcher observed a behavior and swiped the appropriate barcode associated with that object, an automatic timer started. The timer stopped when the barcode was swiped again, thereby recording not only which object was part of the person's natural wayfinding, but also how long the behavior lasted.

Passini et al. (1998) employed another research method used in studying wayfinding for people with dementia. Researchers followed and observed patients as they walked through a hospital. They recorded and described "on-the-spot" where participants lost their way, often where signs stated too much information (e.g., a sign indicating where the dining room was, along with the entire lunch menu and times when the dining room was open).

One critique of this method for observing wayfinding behavior is that, depending on the physical characteristics of the setting and the role the observer takes, it can be quite intrusive, influencing the data. If they become aware they are being followed and observed, participants may alter their behavior. Employing this research approach requires that investigators select an unobtrusive role (e.g., wearing a white coat in a hospital), and position themselves appropriately.

Methods for studying environmental familiarity for people with dementia

Researchers may elect to employ other approaches to study how familiarity of a setting influences the way people think, feel, and behave. Three methods are readily available for this. The first is to simply ask the person what she or he perceives and

experiences in familiar versus strange settings. The second is to systematically observe details about the physical space inhabited by persons with dementia. The third is to observe behavior in the environments occupied by people living with dementia.

When simply asking persons with dementia about environmental attributes they think are familiar, one effective method is the sorting task. Sorting is a hard-wired skill in all humans and therefore is less affected by dementia (Zeisel, 2009). Asking participants to sort visually instead of using only words optimizes the quality of sorting task data. For example, a researcher might prepare a set of cards with drawings or photos of various objects and places and ask the person to sort them into two boxes, one labeled "familiar" and the other "unfamiliar." A pre-test to establish word meanings can be useful in selecting which pair of words works best. For example, the boxes might be labeled "relaxes me" and "makes me nervous" rather than "familiar" and "unfamiliar," which can be too abstract a concept for some people with dementia.

Another strategy for using the sorting method is to slowly go through a deck of cards with each person, showing the cards one at a time and asking whether the image on the card is familiar or unfamiliar, then encouraging the person to independently place the card in the appropriate box. Before starting this process, a pilot phase is essential in which the researcher demonstrates the correct behavior using cards that will not be included in the main part of the study, so the person clearly understands the task.

The second method often used to learn how those with dementia conceptualize familiarity is to observe and record the physical environments they inhabit. This method requires the researcher to list and categorize each object these persons choose to keep in spaces they spend considerable amounts of time (e.g., sitting room, bedroom, and so on). One challenge with this method is the difficulty in determining whether people placed an object in a particular spot because its familiarity made them feel relaxed, or whether someone else – a caring spouse or adult child, for instance – put the object in a certain place because he or she thought it would be functional or calming for the participant. Obviously, one way to overcome this challenge is to interview caregivers about this.

The third method involves systematically observing the behavior of persons with dementia to glean information about familiar objects and spaces. This method requires an analytic leap on the part of the researcher, who must decide whether an observed behavior reflects a participant's response to familiarity, or to a lack of familiarity, of an object or setting. For example, a researcher may define behaviors such as lower agitation, aggression, and apathy as positive responses to familiar objects and surroundings when they are actually defensive responses to an unfamiliar setting. One way to ensure that such observations are valid is to ask the person to talk about the objects in their personal space after observations have been recorded.

Case Study: A Multiple Sclerosis Center Program and Post-Occupancy Evaluation

This case study describes the **programming** and **post-occupancy evaluation** (see earlier chapters) of a building designed to provide an envelope for three groups of people who deal with **multiple sclerosis (MS)**: those afflicted with the disease; staff members who help them; and friends and family who visit. Under one roof, it houses spaces for

physiotherapy, social interaction, teaching and learning, administration, storage, leisure (crafts and exercises), and counseling. The design had to recognize that users would be engaged in many diverse activities. The goal was to create a facility that successfully combined a clinic, an office, and a home away from home.

Multiple sclerosis is a debilitating and poorly understood disease that affects thousands of people around the world in a broad variety of ways. The condition often leads to reductions in muscle function that confine its victims to wheelchairs. MS is not steadily progressive, but rather follows unpredictable cycles. In many cases, the severity of MS changes spontaneously and individuals often recover for a time, which can improve their mobility and other abilities.

MS poses special challenges when designing whole buildings for those with the condition. First, individuals with MS are often diagnosed in their 20s but usually live a near-normal lifespan, so MS facilities must be planned for all adult age groups. Second, MS affects a variety of physiological systems, from vision to fine motor coordination, overall strength, and bladder control. These effects can vary in any individual both in terms of severity and the physiological system affected. Third, at any given time, people with no visible disability, others with a wide range of disabilities, as well as staff who do not have MS use the same building.

The story

One spring day, the executive director of the local Multiple Sclerosis Society phoned to ask another one of the chapter's authors to give a talk to the Society's board of directors. He was told the Society was facing a number of design challenges with the buildings they occupied. The Society was housed in three separate buildings in three different neighborhoods. One held its administrative offices, another the physiotherapy clinic, and a third its storage facilities (see Figures 18.1 and 18.3 for facades and Figure 18.2 for the interior retail area of the electronics building). Transportation and communication between the buildings were difficult and the environments of the offices and clinic were clearly inadequate.

The researcher outlined to the board the social design process by which a building could be created that incorporates the needs and preferences of building users, and

Figure 18.1 The building exterior before the renovation.

Figure 18.2 The retail area before the renovation.

Figure 18.3 The warehouse before the renovation.

illustrated the process with examples. A few days later, the chair of the board called to negotiate a contract for programming the renovation of a retail electronics building the Society was already in the process of acquiring.

The board chair's call was welcome first because the opportunity to help design a building for a group of people with special needs was more of a challenge and thus more interesting than designing a building for a group of able-bodied persons. This project called for clear design recommendations for a group with uncommon requirements, which was a pleasant challenge.

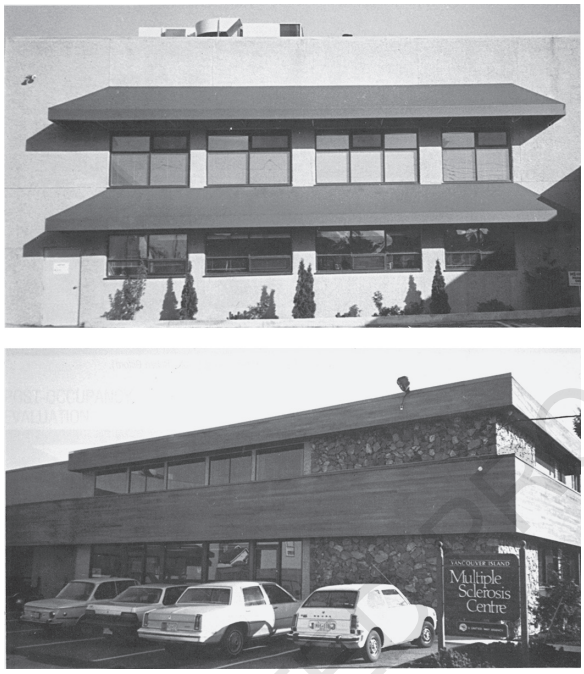

Figure 18.4 The building exterior after the renovation.

The second reason the call was welcome was that the researcher experienced positive acceptance of the process by the board chair and his team. During the question and discussion period after the invited talk, the chair, feeling that it was his duty to take charge of the situation, rolled out a large sketchpad on a movable stand. He began offering potential design solutions to problems he thought the Society would face in the renovation. He seemed unaware that the research and design process would lead to firm design recommendations, and these speculations were too early and presumptuous.

Eventually, the executive director courageously interrupted the chair and said, "Isn't the purpose of this meeting to listen to our speaker's views on the process by which the design decisions might be made, rather than to make the decisions right now?" The talk had emphasized that the most fruitful design discussions needed to reflect the views of individuals who use the building every day – in this case MS patients, their families, staff members, and volunteers. As the project progressed, the chair enthusiastically adopted the idea that building users must be consulted in the design process.

The old and new premises

The Society's existing premises included a clinic in a local building shared with several other social service organizations, a storefront suite of offices about half a mile away, and rented storage space in a building a couple of miles from both the clinic and the offices.

The new building acquired by the Society was an L-shaped structure with two stories on the longer side and a single story warehouse on the shorter side. In moving

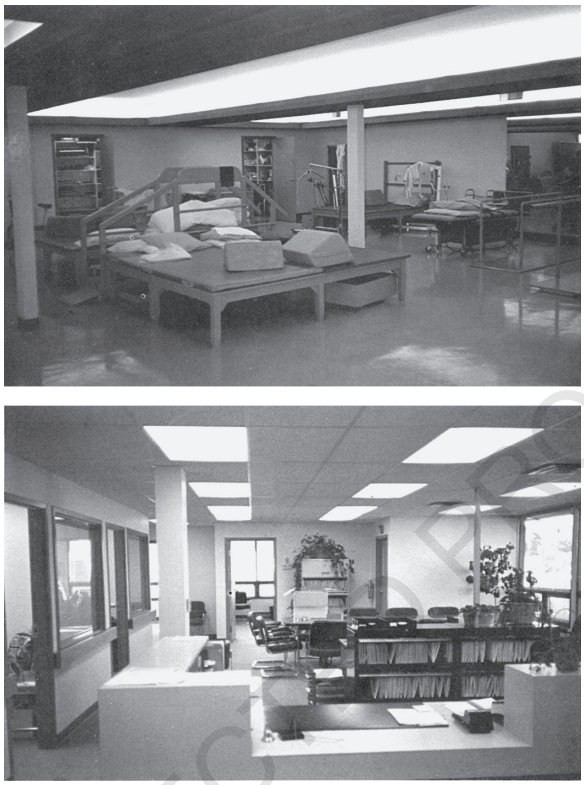

Figure 18.5 The physiotherapy and offices after the renovation.

Figure 18.6 The atrium after the renovation.

from three spaces to one much larger building, the Society was integrating its operations into a single building triple its present size.

The design cycle

The **design cycle** employed in the project, including detailed programming and a post-occupancy evaluation, has been described earlier in this book. In this chapter, we focus on methods used when the clients have special needs. Even if architects try to imagine how building users might function in a new space, they will have very different life experiences and perspectives from those who use the building.

Setting out

The preliminary discussions the researchers held with staff and patients indicated three overriding themes. First, there was near total consensus that the new building must be made as accessible as possible to individuals with MS who walk with difficulty or use wheelchairs. There is a great difference, the future users stressed, between saying that a building should be accessible and creating one that is actually accessible. Respondents stressed that many buildings that were supposedly accessible, were not accessible for many of those for whom it was designed. Accessibility remains an empty concept if it is not specifically defined for each type of disability, each type of activity, and each type of setting. Recommendations were requested to be based on specific definitions of disability rather than generic ones.

A second theme and goal that emerged was the significance of creating a setting that draws people together and welcomes them to a homelike place. Every effort, they emphasized, should be made to avoid institutional characteristics. A third theme the users raised was the necessity to upgrade the decor and equipment in the office and clinic areas to be more modern and professional. More specifically, this meant brightening the space by painting it, acquiring new and more functional chairs and filing cabinets, removing unrelated equipment and clutter, and rearranging the space to better reflect the flow of activities.

Charting a course

The team set about creating a list of building "domains" – that is, facets of the structure that deserved attention in the programming process. "Domain" means not only the usual functional areas of the facility (e.g., lounge, kitchen), but also design elements (e.g., lighting, ventilation) and miscellaneous design concerns (e.g., flexibility of arrangements, the approach to the building). Twenty-three domains were identified which will be described later.

The two primary methods of gathering data for the program were interviews and observations. Interviews were selected in favor of questionnaires, although questionnaires would have been more economical, because many of the respondents had difficulty writing which questionnaires would require, while interviewing left the recording of the structured dialogue to researchers.

Observation was also selected as a method to overcome the fact building users (able-bodied as well as others) are sometimes "out of touch" with their own behavior (see also Chapter 2), making self-report unreliable. When we are involved in an

activity, we often unconsciously and automatically overcome and thus pay little attention to mild or moderate obstacles in the physical setting. Watching and recording how individuals actually interact with their surroundings can therefore be a valuable supplement to interviews. Observations of staff and client use of the old clinic and offices were structured to attend to all 23 domains.

Interviews

Everyone connected with the MS Society was invited to be interviewed, either through a personal invitation or through notices in the Society newsletter. While a few individual interviews were conducted, including patients, office staff, physiotherapy clinic staff, volunteers who helped in the office and clinic, the board of directors, and several groups of persons with MS from other districts, family members, and friends. Over 20 formal interviews of groups ranging in size from 1 to 25 people were conducted lasting from 1 to 3 hours. Over 80 individuals participated in interviews.

Each interview was structured to cover the 23 domains and ended with a question about whether anything pertaining to the design of the new building had been missed. Thus, the interviews were both structured, so that everyone was queried about every major domain, and unstructured, in that comments were solicited on topics important to the respondent that were omitted from the basic interview. As expected, the interviews produced a very large mass of information that had to be sorted, compared, reconciled, and integrated.

Observations

Behavioral observations of the clinic and the offices supplemented the interviews and uncovered numerous behavior patterns that no one thought to mention in the interviews. Observations also identified behavior patterns that were different from the impression given in the interviews, as well as behavior patterns that confirmed interview responses. Many hours were spent observing the workings of the office and clinic to identify typical activity patterns.

During the data collection phase, several interim meetings with board members and the executive director were held to report preliminary findings. Often, a trend in preference or behavior that we spotted was confirmed or further explained by Society officials.

Goals and recommendations

Over 150 recommendations were made. With the executive director, the architect, and the board, the researchers had to decide which would actually be beneficial, which were feasible given financial and design constraints (e.g., the shell of the building could not be substantially altered), and which the data showed would be welcomed by different individuals sharing the same part of the building. For each domain, an overall goal and a set of specific recommendations that would facilitate that goal were prepared.

Many specific recommendations were of concern only in this particular building, so not all are listed. The interested reader may, however, see brief versions of the recommendation in Tables 18.1 to 18.4. While specific design solutions must be found within the constraints of each project, the tables of domains and goals may

Table 18.1 Priority 4 (Highest) Program Recommendations.

Adopted	*Partially adopted*	*Not adopted*	*No longer a concern*
More, accessible washrooms Separate reception area Private counseling room Automatic opening door Reception desk and waiting area Telephone in reception Parking visible tram reception Coatracks in foyer Noninstitutional foyer Remove boards on windows Building mostly nonsmoking Smoking room Expand clinic by 3,000 sq. ft. Open-space clinic Staff lunchroom Direct passage to clinic/office New telephone system Wire for more phones Mirrors in clinic Screen clinic from parking Accessible clinic coat rack Review tire alarms Fire Department Examination	Smooth floors and sills* Two accessible washrooms* Clinic shielded from foyer Coatracks in all main rooms	Door with mail slot Nonisolated receptionist* Enclosed foyer Handrails in all halls	Bell, for receptionist Offices in showroom space Centrally located elevator*

* Item recommended in the POE study for adoption or completion when funds become available.

Table 18.2 Priority 3 Program Recommendation.

Adopted	*Partially adopted*	*Not adopted*	*No longer a concern*
Social lounge Equipment repair area More, closed office space More storage space Kitchen Handy DART parking spots Well-lit parking Improve landscaping Increased natural light Full-spectrum and indirect light Rheostat controls Incandescent lighting in lounge Smooth flooring Shelves for ultrasound Equipment and sink Plants in main rooms Lockable clinic Locking storage and offices	Ramped curbs Illuminated durable sign Accessible and flexible clinic tables Separate craft and physiotherapy storage* Easy-opening doors* Accessible and non central smoking room*	Separate handicraft area* Street signs Entry overhang Grid system for clinic equipment Resting bed Separate painting and physiotherapy*	Elevator for two wheelchairs* Diffusers on clinic lamps Ceiling fans Upstairs office space* Inventory control

* Item recommended in the POE study for adoption or completion when funds become available.

Table 18.3 Priority 2 & 1 Program Recommendations.

Adopted	*Partially adopted*	*Not adopted*	*No longer a concern*
Educational space Blackboard More electrical outlets	Wider parking spots Disability parking signs Electrical outlets higher than usual Light and heat controls lower than usual	Two meeting rooms* Games and exercise space Hydrotherapy pool Fireplace Overnight accommodation* Eight ambulatory parking spots No concrete parking barriers Repave parking lot Snow grating Double glazed windows Cafe tables for lounge	Tuck and/or gift shop Hot-water heating

*Item recommended in the POE study for adoption or completion when funds become available.

alert designers and facility managers to important considerations in the design of any building for the disabled.

The 23 domains are presented here in the order that a typical user or visitor might experience them in the process of finding the place, entering, engaging in various activities, and leaving:

- **Approaching the building.** The building is in an odd corner of town, not on a main street. GOAL: The building must be easy for visitors and new members to find. Signage must begin at nearby main streets.
- **Parking.** The current parking lot contains 20 spaces. The width of these is normal to slightly narrow for retail parking. The lot is flat and paved asphalt. At busy times the parking lot may not hold all the vehicles of those using the building. GOAL: Parking must be close and plentiful, and arranged so that patients, staff, volunteers, and visitors (in that order) have easy access to the main entrance.
- **Building exterior.** Part of the building is clad in wood and stone, and the rest is clad in stucco. The small boulevard area is an untended jumble of shrubs and weeds. GOAL: The outside of the building must be attractive and non-institutional in appearance.
- **Entry.** Three small glass doors currently serve as entries to the retail part of the building. One small wooden door and a large vertically-opening metal door serve as entries to the warehouse area. GOAL: Provide maximum accessibility to the building with minimum exposure to the elements. Smooth and sheltered passage from vehicles to the interior is desirable.
- **Foyer.** The present building has no real foyer. GOAL: Provide an area inside the entrance for orientation, information, and waiting for transportation.

Table 18.4 Program Recommendations Not Given a Priority.

Adopted	*Partially adopted*	*Not adopted*	*No longer a concern*
Break up "warehouse" look	Textured and lower lounge ceiling	Umbrella rack in foyer	Staff parking in nearby offsite lot
Operable windows	Stackable clinic chairs	Art on clinic ceiling	Parking on road
Heat pump	Full-size kitchen	"You-Are-Here-Map"	Two-hour street parking
Locally controlled heating	Accessible washrooms*	Door handle near hinges*	Parking-lot sign
Ventilate to ASHRAE standards	"Occupied" washroom signs*	Shallow sink	Clinic staff door
Avoid dry air	Adequate space below sinks*	Single control taps	Assessment area by reception
Quiet HVAC system	Side toilet paper*	Zero-gap toilets	Office partitions
Carpeted office	Easy-reach soap dispenser*	Wall-hung toilets	Office carpet
Desk for clinic	Plants in every room	Various-height toilets*	Noninstitutional maps
Desk chairs for office	Smooth floors and sills*	Side toilet handle	Fund-raisers' plaques
Clinic color—not white or green	Doors with lever-type handles	Off-track washrooms	Marked volunteer area
Kitchen equipment	Clinic sound absorbers*	Bell in washrooms*	Emulate good local signs
Retain and upgrade washrooms	Art in major areas	"Century" tub	New kitchen cups
Wide washroom doors	TV, stereo, and cable	Sound system	Social lounge kitchen
Lever-type door handles		Mat fixed to bed	Smooth tile flooring
Smooth flooring		Wheelchair scale	Upstairs shower
No privacy screens		Longer parallel bars	Educational washroom
Storage cabinets		Recreational equipment	One computer
Towel dispenser			Office display space
Adequate floorspace			Two-wheelchair elevator*
Wheelchair-height counters			Stair use restrictions
Adequate hallway widths			Elevator*
Washer and dryer			Adequate burglar alarm

(*continued*)

Table 18.4 (continued)

Adopted	*Partially adopted*	*Not adopted*	*No longer a concern*
Adequate phones			
Photocopy machine			
Quiet typewriters			
Janitorial equipment			
VCR			
Nonsmoking zone			
Preserve natural light			
Private ultrasound area			
Soundproof meeting rooms			
Review keying and control			

*Item recommended in the POE study tor adoption or completion when funds become available.

- **Lighting.** The building currently is lit with banks of fluorescent ceiling fixtures. Some, but not all, MS patients report difficulties with fluorescent lighting. GOAL: Reduce irritation and headaches that might be caused by lighting. Do so without significantly increasing lighting costs.
- **Windows.** Fenestration in the electronics building was limited to the parking lot side of the building and the south side, facing the street. The latter windows are boarded up because of recurrent vandalism. Other parts of the building have no windows. Windows on the second story can be opened, but those facing the parking lot on the first floor cannot. GOAL: Provide as much natural light and individual control of ventilation as possible within current energy conservation standards.
- **Heating.** MS patients are sensitive to coolness and complain that they cannot adjust the temperature. GOAL: Provide heating that is not too drying and is subject to personal control.
- **Ventilation.** Some MS patients are particularly sensitive to air pollutants. Many are strongly opposed to smoking, but others are dedicated smokers. Some valuable volunteers are smokers and should not be driven away by a total ban on smoking. Certain stressful occasions, such as counseling for newly diagnosed patients, may make smoking an acute need even for casual smokers. Activities such as painting produce fumes that require extra ventilation. GOAL: An excellent supply of clean air is necessary and a place in the building for smokers.
- **Clinic ceilings.** Physiotherapy often requires patients to lie on their backs for up to 45 minutes. Most ceilings are dull. Some heavy clinic equipment needs to be suspended from the ceiling. GOAL: Provide visual interest (e.g., art) on the ceiling for patients who lie on their backs for long periods in the clinic. Ensure that the clinic ceiling is strong enough to support equipment.

- **Floors.** The first floor of the electronics building is covered with tiles; the second with carpeting. Underneath, it is pitted and uneven in places. GOALS: Provide maximum ease of movement for ambulatory and chair-bound patients. Reduce noise and meet the aesthetic concerns of office staff. Smooth the floor as much as possible (more so than for an able-bodied population) to avoid painful bumps for wheelchair users and unnecessary lifting of legs for those who walk with difficulty.
- **Space.** The newly developed space will triple the old space, so there should be plenty of room to design for each different activity. GOAL: Provide adequate space for all activities in the building.
- **Furniture.** Some furniture will be moved from the old buildings, but some will need to be acquired. GOAL: Specify tables, chairs, and other furnishings that are comfortable and efficient.
- **Decor.** The most common opinion expressed was that the new building avoid an institutional look. The terms "pleasant" and "homelike" were mentioned often. Naturally, a variety of opinions about specific colors that would create the desired effect were expressed. GOAL: Decorate the clinic area in warm but not garish tones and the office area to look professional.
- **Signs.** Signs may be inadequate in number or in information, they may be overdone and institutional, or they may serve as aids that help people find their way and prevent accidental intrusions (e.g., salespeople in the clinic). GOAL: Use a system of signs that informs without being overbearing.
- **Lunchroom.** The electronics building has a staff lunchroom on the second floor containing seating and basic kitchen facilities. MS office staff currently takes coffee breaks and are on call if needed during these breaks while staff on lunch breaks are supposed to be off duty. In the new location, staff may leave the building for lunch more often than they have in the past. Since the second floor as a whole is not intended at present to be developed, first-floor space for staff lunches is needed. GOAL: Provide an indoor "getaway" for staff when they choose not to leave the building for lunch.
- **Kitchen.** Current kitchen facilities are limited to the kitchenette in the lunchroom. GOAL: Provide space for basic kitchen functions in the office, clinic, social area, and future occupational therapy area.
- **Bathrooms.** The electronics building has two washrooms upstairs and one downstairs. All three are typical (not very accessible) washrooms. One upstairs washroom has a standard shower. Accessible washrooms are near the top of most MS clients' list of priorities and are essential to a successful MS facility. GOAL: Provide washrooms that are fully accessible to wheelchair and ambulatory clients located near each major center of activity.
- **Flexibility of spatial arrangements.** The increased space available in the new building should reduce the need for flexibility and a separate space therefore might be dedicated to some activities that formerly occurred in the same place. However, flexibility is still needed in some spaces. For example, the office computer needs to be easily available to multiple users. GOAL: Use separate spaces for incompatible activities but provide spatial arrangements that promote cooperation where activities should be or must be well coordinated.
- **Machines and equipment.** Some machines and equipment will be brought from the current buildings and some will have to be acquired. GOAL: Provide machines

and equipment that promote efficiency, professionalism, and pleasantness in these three settings.

- **Adjacencies.** Activities from two buildings will be combined in one new building, but the new building was not designed for physiotherapy. Careful consideration must be given to possible clashes between individuals involved in office work, physiotherapy, crafts, socializing, counseling, and meeting. Patients undergoing physiotherapy must not be exposed to the view of passersby. GOAL: Design the building so that it promotes a sense of unity in the Society as a whole, but arrange activities so that noise and visual access do not cause privacy problems.
- **Personal possessions.** Staff, clients, and visitors carry personal items into the building. GOAL: Provide space for these items that maximizes convenience of access and security.
- **Building security.** While security is important, so is homelike quality. GOAL: Provide a secure environment for all building users, but not at the expense of the homelike quality of the spaces.

Ranking and wrangling

As noted earlier, over 150 specific recommendations in 23 domains were reported to the board. While each one is important, the board felt that some recommendations were more important than others. The Society's board therefore made the final decision about the relative importance of each recommendation.

The board graded each recommendation into one of the following categories:

- Priority 4: Recommendations judged essential.
- Priority 3: Recommendations judged very desirable.
- Priorities 2 and 1: Recommendations judged desirable, but less so than the foregoing.

Generally, the board agreed with the final recommendation rankings. A few notable exceptions occurred in which the research team tried to convince the board that a particular recommendation needed a higher priority. For example, whether windows should be operable sparked debate. Some board members believed any windows that *can* be opened *will* be left open at inappropriate times (such as all night), leading to vast increases in energy costs. The research team argued that building users have an educable and responsible nature and that giving them that seemingly small sense of control is valuable. The research team won that debate, but lost others.

Design and construction

As often happens, the project became deadline-oriented. The architect, who had been selected from a short list of those with experience in designing facilities for the disabled, hurried to translate as many of the recommendations as possible into a formal design. Perhaps because of the rush, there was less communication between the research team and the architect in this period than might be desirable. Little communication took place either because the 36 pages of specific, ranked

recommendations was an entirely adequate basis for the formal design or the architect was unaccustomed to interacting with program consultants.

The post-occupancy evaluation

There were casual reports that most building users were very happy with the building. However, occupants of new buildings usually undergo a "honeymoon" period during which their satisfaction is based more on the newness of the building than on its day-to-day performance in the longer run. Therefore, the research team waited 18 months to perform a post-occupancy evaluation not influenced by the honeymoon effect.

Responsible environmental psychologists are not interested in POEs that merely make their work look good; they want to know the truth about how a building is performing. The POE often takes the form of a new set of recommendations because of: (a) slips between the program and construction; (b) program elements that were not quite functional; and (c) naturally evolving occupant needs and patterns of use. A four-part evaluation was conducted: audit, interviews, observations, and new recommendations.

Audit. No building is constructed with every recommendation fulfilled. Some recommendations fall victim to shortages of funds, some are not as urgent as others, and some conflict with other more important recommendations. We began our POE by conducting an audit. Which recommendations from the original program were incorporated into the new building, and which were not? Each recommendation was placed into one of four categories:

- Adopted (fully incorporated into the building).
- Partially adopted (done partly or in some locations only).
- Not adopted (no sign of the recommendation).
- No longer a concern (N/A) (the recommendation is now irrelevant because of other changes, or there is no evidence that anyone cares anymore).

Not all of even the highest priority recommendations were adopted. This is not particularly surprising, given the large number of recommendations that were made (and followed). An estimate of the fulfillment rate of the recommendations was made. Why bother counting them up at all? First, the board should carefully examine all the recommendations that were not fully adopted as part of the basis for planning the next round of changes to the building. All the recommendations that were not already adopted should be reconsidered. Second, a measure of the fulfillment rate might be related to the satisfaction of building users. For example, to obtain a 90% approval rate, must one fulfill 90% of all recommendations, or will 70% or less do? Next the team set out to determine how satisfied the users were.

Interviews. The goal was to discuss the new building with as many building users as possible. About 80 clients, staff, board members, and others had been interviewed in the programming phase. To interview the same number of users within the constraints of a smaller POE budget, the interview was designed to focus on the respondent's salient satisfactions and dissatisfactions, rather than systematically

covering every domain of the building. Interviews were conducted with all 9 staff members, 38 clients, 6 volunteers, 8 spouses, and 16 board members, for a total of 77 individuals.

Respondents were asked, "What do you like most about the new building?" The interviewer repeated the question once in order to elicit any further building "likes." The interviewer then asked, "What do you like least about the building?" and repeated the question as before. Next, the question was asked, "Overall, how satisfied are you with the building?" Finally, respondents were asked how often, if ever, they participate in the organized programs that occur in the afternoon and whether and how often they informally drop into the center.

The natural turnover in Society membership, combined with some differences in respondent availability and willingness to discuss the building's design, resulted in the POE interviews being divided about equally between those who were involved in the programming phase and those who were not. The most-liked features of the new building are listed in Table 18.5.

Table 18.5 Most-Liked Building Features in the POE, with Sample Comments (number of mentions follows each item)

Frequently mentioned features	*Less-often-mentioned features (under five mentions)*
Light (sunny and bright) 20*	Parking (convenient)
Spacious (openness) 20* "Gives psychological uplift"	[not mentioned by physio. or office staff]
Everything (the whole building) 16* "It's like the Ritz-Carlton compared to before"	Our own building "Equals positive in change of attitudes"
Accessibility (client friendly) 16* "Building has TOTAL accessibility"	"Even clients who don't regularly visit take pride in the facility"
[not mentioned by physio, or office staff]	One level (no stairs)
Integrated facility (proximity of staff) 15 "Not scattered, feels whole"	[only mentioned by once/week clients and board]
Atrium (and the plants) 12 "Enjoy the area, even it I don't spend much time in there"	Equipment (amount and proximity)
Layout (convenience) 11 "I know where everything is" Number of washrooms 11	Windows
[only mentioned by clients and volunteers]	Colors
Indirect lighting It "If it was bad, we'd notice"	[only mentioned by volunteers and physio. staff]
Lounge 9 "A nice place, and comfortable"	Smoke room
Library 7	[only mentioned by once/week clients and office staff]
[only mentioned by clients and volunteers]	
Sliding doors 6	
Decor and furniture (attractive) 6 "Quality of furniture gives message that clients are important"	
Kitchen 5	
Atmosphere 5	

* mentioned by more than 20 percent of respondents

The 77 respondents mentioned a total of 195 most-liked features, about 2.5 items per respondent. The features mentioned by at least 20% of those we interviewed were:

- the light, sunny, bright atmosphere;
- the openness and spaciousness;
- "everything" (the whole building); and
- accessibility.

These four features account for 72 of the 195 mentions. These features and the remaining, less-often mentioned features are listed in Table 18.5. Nearly half of the respondents (36) could not think of anything they disliked about the building. The entire group of 77 respondents mentioned a total of 71 least-liked features, about .9 items per respondent. Thus, one indication of overall satisfaction is that the average respondent ventured 2.5 times as many "most-liked" features as "least-liked" features. The two domains that received the most "least-liked" mentions were bathrooms and storage. The details of these concerns are listed in Table 18.6, along with the other "least-liked" features mentioned in the interviews.

Table 18.6 Least-Liked Building Features (number of mentions follows each item).

Frequently mentioned features	*Less-often-mentioned concerns (under five mentions)*
Nothing (so far) 36	Temperature (clinic and assessment area too hot)
Numerous problems were cited with the bathrooms 18	Noise in clinic waiting area
Bathroom rails are shaky and some would like to have rails mounted on the walls	Front door (closes too quickly)
Some found the height of the toilet to be a problem	Smoking room (entry difficult, not used, fumes come into bathroom, no sand in ashtrays)
Bathroom doors were hard to close from the inside and the locks were difficult	Parking (not enough)
Counters were too low for some chairs to get under and not all visitors found the sinks accessible	Facade (too much cement)
People found the soap dispenser and the toilet paper hard to reach	Atmosphere (still a little too institutional)
The placement of the light switches was seen as awkward and the bathroom towels were cited as hard to use	Handrails (too few)
Storage was the next largest concern 9	Lounge (purpose mixed up, carpet hard to wheel on)
Amount of storage space	Atrium (floor sills, not used much)
Blocked access to the clinic storage	Kitchen (colors are too institutional, no space for dishwasher)
Use of the elevator shaft for storage	Clinic (pillars present obstacles, space becoming too tight, hanging lights hard to maintain)
Painting storage not being separate from the clinic (as recommended)	Office (circulation bottleneck, chair glide-pad too small)
Type and height of shelving	Second floor (not being used)

Next, respondents were asked for their overall level of satisfaction with the new building, offering the alternatives "very unsatisfied," "somewhat unsatisfied," "neutral," "somewhat satisfied," and "very satisfied." About 95% of the respondents said they were "very satisfied" and the other 5% pronounced themselves "somewhat satisfied."

The next interview question asked respondents to mention changes they would like to see in the building. A large number and varied range of suggestions were made. These were evaluated and many were incorporated into the new POE recommendations.

Observations. Interviews allow building users to report their satisfactions and their beliefs about what is right and wrong about the building. Several hours were also spent observing normal building activities in the office, clinic, and during some programs (bridge, Tai Chi, and painting). Notes on these sessions fill several pages, but two examples were that card-playing (and similar activities) could be improved by the addition of larger tables, and too much time was spent adjusting and jockeying furniture in preparation.

When the new building was being planned, some speculated that a new, larger, attractive building would draw more people. Over the first year, this speculation has been confirmed. The clinic now sees about 20% more clients than one year ago. The office staff report an increase in the number of visitors (both patients and outsiders). The number of staff hours has also increased, and a new occupational therapist has been hired.

New recommendations. The changes recommended in the POE were based on several sources: the inventory of original recommendations (i.e., those that were not adopted or not fully adopted in the construction phase); suggestions made by respondents in the POE study; and changes based on observations of the building in action.

The recommended changes fall into several distinct categories. The first category echoes a major theme from the programming phase, bathrooms. The MS Society has already begun to remedy the problems with the bathrooms, but some of the changes to be recommended have not yet been dealt with. Probably a few concentrated hours spent with clients who prefer different configurations would result in an array of bathroom plans that would meet the needs of nearly everyone and might prevent a long series of separate alterations.

The second category includes a collection of items that would improve accessibility to clients in other areas of the building. The third category includes items that would cost relatively little but would affect a fair number of clients or staff. Clearly, as usual, some features are more desirable than others. After estimating desirability quantitatively, each item's desirability was qualitatively scored according to the following formula:

$$\text{Desirability} = \left(\text{Urgency} \times \text{Number of Building Users Affected}\right) / \text{Cost}$$

The fourth category of changes related to the acquisition of an elevator and development of the upper floor. The fifth and last category of recommended changes included items that are not particularly urgent. They were suggestions for the board to consider when some of the more immediate concerns are met.

Conclusions

Almost everyone was very satisfied with the new building. The original three goals were to create an accessible building, a true center, and a professional image. The second and third of these seem clearly present. Accessibility is very adequate in most areas of the new building, but is still not ideal. Finding the perfect bathroom (or, more accurately, the perfect *array* of bathrooms for persons whose affliction affects different parts of their bodies) is an intriguing and challenging task.

The executive director of the Society and others were convinced that the programming and post-occupancy evaluation process produced a much better facility than the normal design process would have. The difference lies in many small but important design elements that even sensitive architects would not notice, mainly because they do not experience buildings the way those afflicted with multiple sclerosis experience them.

A Note on the Ethics of Researching Special Populations

Ethical considerations are paramount when studying people with differing needs, abilities, and levels. Persons with impairments may not understand the purpose of a research project or how its results will be used. For this reason, among others, researchers need to obtain signed consent not only from family members but also from participants whenever possible. During the course of the research, observers must also be aware of implied indications of consent – called "assent." If at any time participants indicate that they do not want to take part in a study, researchers must accept this inclination immediately.

Summary and Conclusion

This chapter outlines some of the ways people with special needs can be helped by environmental psychology research methods. Observational research methods, interviews, programming, and post-occupancy evaluation are among the techniques that can be used. A take-home message for conducting environment-behavior research with special populations is that someone with a mental or physical impairment is a person first, and a study participant second. Every individual has numerous capabilities that can be employed to gather useful and valid information about their attitudes, behaviors, preferences, and feelings. Researchers who do not underestimate the capacity of participants will be most likely to discover new and exciting solutions, and make important contributions to the well-being and quality of life of special populations.

Glossary

Cognitive mapping The mental representation of a place or space which allows an individual to acquire, code, store, recall, and decode information about it.

Dementia A severe loss of cognitive ability in a previously unimpaired person, beyond what might be expected from normal aging.

Design cycle The process of building design in which five phases (programming, design, construction, use, and evaluation) connect to, and build upon, each other.

Multiple sclerosis (MS) An inflammatory disease in which the insulating covers of nerve cells in the brain and spinal cord are damaged, resulting in a wide range of physical, mental, and sometimes psychiatric symptoms.

Post-occupancy evaluation (POE) The final phase of the design process, in which the strengths and weaknesses of a building's form and function are examined.

Programming A phase of the design cycle in which information about a space to be built or renovated is systematically gathered, analyzed, and summarized before the formal design and construction phases occur.

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Suggested Readings

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