

# Unlimited Surrounding: A Scoping Review on the Impact of the Built Environment on Health, Behavior, and Quality of Life of Individuals With Intellectual Disabilities in Long-Term Care

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## Abstract

**Objectives:** To identify available literature on the impact of built environments on health, behavior, and quality of life of individuals with intellectual disabilities in long-term care. Additionally, we aimed to map the available literature, (re)frame the overall research situation in this area, and formulate recommendations. **Background:** Long-term care facilities in the Netherlands are planned without using knowledge from research regarding evidence-based design because it is unclear what evidence is available about the impact of long-term care built environments on individuals with intellectual disabilities receiving 24/7 care. **Methods:** Twelve scientific databases were searched for keyword combinations. After systematically screening 3,095 documents, 276 were included in the analysis. **Results:** There is an underrepresentation of research and publications in intellectual disabilities, compared to other user groups living in long-term care facilities. A total of 26 design components were found in all groups; as for intellectual disabilities, research was available on only seven of them. Community care, home-likeness, and variety seem to have a positive effect on health, behavior, and quality of life. There are conflicting results regarding the effects of house size. **Conclusions:** Although individuals with intellectual disabilities live in long-term care facilities, sometimes for life, little research has been conducted on the impact of the built environment on them. In the future, more empirical research should be conducted, addressing all aspects of quality of life and specific design components,

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with hypotheses based on needs assessments and the use of good research designs. This requires an investment of time and funding.

### Keywords

architecture, evidence-based design, quality of life, health, behavior, architectural psychology, disorder, intellectual disabilities, long-term care

## Introduction

Research on environmental and architectural psychology has demonstrated that various environmental aspects can influence both mood (Knez, 2001; Vollmer, 2017; Vollmer & Koppen, 2021; Weiss & Lonnquist, 2000) and behavior (Fleming et al., 2003; Gifford, 1988; Wirtz & Mattila, 2001; Zeisel et al., 1994; Zeisel et al., 2003). The physical environment appears to be an important determinant of how people feel and act. The effect of the physical or built environment may be of particular importance in long-term care facilities for individuals with intellectual disabilities, who require 24/7 care, as they have specific vulnerabilities. For example, they are more vulnerable to stress and use less effective coping strategies (Janssen et al., 2002). First, it makes them more dependent on their surroundings, including the built environment. Second, they reside there for a long period, sometimes even for life, as opposed to, for example, short-term stays in hospitals. Finally, individuals with intellectual disabilities and 24/7 care have a limited ability to adapt to certain situations, deal with challenging circumstances, or avoid stressful conditions (Mourits, 2011). Mourits (2011) points out that the environment could compensate for the limitations that individuals experience by adapting it to their special needs, and thus, reduce negative feelings and increase quality of life.

Sustaining quality of life is a challenge in itself, as admission to a long-term care facility is a major life event with a significant impact on the psychological well-being of people. Most individuals, even those with congenital disabilities, do not want to leave their homes (Gillsjö et al., 2011), and therefore, experience a reduction in quality of life when they have to live in long-term care facilities. However, due to their combined home

and care functions, these facilities are institutional on the one hand and home on the other (Eijkelenboom et al., 2017). It means that the impact of the built environment on the quality of life of individuals with intellectual disabilities depends on its capability to shape this dual nature: a professional, user-specific care facility that is a safe and agreeable workplace for care providers and, simultaneously, a safe, livable, and stimulating home for clients.

### Significance and Aim

Despite the importance, it is unclear what evidence is available about the impact of long-term care environments on individuals with intellectual disabilities receiving 24/7 care. Two previous reviews on intellectual disabilities provide information on service models and living arrangements, but information on specific design components that were associated to health-related outcomes is limited (Bertelli et al., 2013; Felce & Emerson, 2001). Therefore, a scoping review was conducted to systematically map the available literature, (re)frame the overall research situation in this area, and formulate recommendations for further research.

*Despite the importance, it is unclear what evidence is available about the impact of long-term care environments on individuals with intellectual disabilities receiving 24/7 care.*

### Conceptual Framework Guiding the Study

This review, which is part of a research program of the Dutch government, is the first step toward a more user-centered approach to designing

long-term care facilities in the Netherlands, with a specific interest in facilities for individuals with intellectual disabilities. In this article, we present the review process, the general results, and the specific associations between design components and effects on individuals with intellectual disabilities.

## Method

### *Definitions and Eligibility Criteria*

This scoping review included documents in Dutch or English and published between 1980 and 2020. The International Classification of Functions, Disabilities and Health, published by the World Health Organization in 1980, is a classification system that describes human functioning in light of an interaction between a disorder or disease on the one hand, and external (contextual) and personal factors on the other, thus leading to unambiguous definitions of the population. The following document types were included: reviews (literature reviews, systematic reviews, meta-analyses); peer-reviewed original research (quantitative and qualitative research studies), provided they concerned at least three cases ( $n = 3$ ); dissertations; descriptive documents (nonresearch-based publications, such as reports, narrative analyses, policy documents, practical descriptions, expert opinions, and theories), and books and chapters. Documents were excluded if they did not clearly define the population.

The intervention must focus on the built environment, which has been defined as “the human-made space in which people live, work, and recreate on a day-to-day basis. It includes the buildings and spaces we create or modify” (Roof & Oleru, 2008, p. 24). It involves building design, interior and outdoor spaces, decoration, and the use of art.

Regarding context, the included population lives in “long-term care facilities” (permanent accommodation of “care” institutions), excluding those residing in temporary accommodation, for example, for treatment, or private homes. The Dutch healthcare system is divided into two sectors: “cure” and “care.” The cure sector comprises hospitals and general practitioners; for example, it provides medical treatment, the goal is healing/

recovery, and it is generally temporary and short-term. The care sector consists of residential long-term facilities for group housing and 24/7 care, such as institutional facilities, nursing homes, or (community-based) residential settings; for example, it aims to minimize the disadvantages of disease, disorder, and impairment (Raad voor Volksgezondheid en Zorg, 2001). The sectors have different insurance, referral procedures, laws, and funding streams. The question this review aims to answer was posed (and funded) from within the Dutch “care” sector; therefore, we focused on long-term care facilities. According to the Dutch Long-Term Care Act, we speak of long-term care when individuals, due to an illness or impairment, have a continued need for permanent supervision or 24-h care in the vicinity (Centrum Indicatiestelling Zorg, 2019). A continued need means that this need will not pass; functioning may improve, but even if it does, the limitations remain such that permanent supervision or 24-h care in the vicinity remains necessary.

In the first step of the scoping review process, the population included individuals with various disabilities. The term “disabilities” refers to people who are limited in their ability to function (disability) and/or experience a handicap when participating in social life due to illness or impairment (World Health Organization, 1980). Dutch long-term care legislation defines the basic category for access to long-term care using internationally recognized classification tools, such as the International Classification of Diseases and Related Health Problems by the World Health Organization and the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013). This legislation distinguishes between six categories (Centrum Indicatiestelling Zorg, 2019): (1) somatic disorders or disabilities (a current physical illness or condition); (2) physical disabilities (disorders of the nervous system and/or musculoskeletal system); (3) psychogeriatric disorders or disabilities (psychogeriatric problems and neurocognitive disorders with decline, such as dementia); (4) mental disorders (syndromes characterized by symptoms in the areas of cognitive functions, emotion regulation, or a person’s behavior); (5) intellectual disabilities (limitations in both

intellectual and adaptive functioning in the conceptual, social, and practical domains, beginning during the developmental period); and (6) sensory impairments (visual impairments, auditory communicative disabilities, or severe speech or language disorders). The categories each have their own care circuits, with their own nature of care provided, associated distinct professional groups, and different need-specific living environments. Therefore, this classification was used in the present study. This first step was necessary to map the context of literature in the field of long-term care facilities and relate it to our specific group of interest: individuals with intellectual disabilities. In a second step of the review process, we filtered the documents and focused only on this group.

### Information Sources

To identify potentially relevant documents, the following bibliographic databases were searched from 1980 to March 2020: PubMed/MEDLINE, EMBASE (OVID), Web of Science, COCHRANE Library (CENTRAL), Emcare (OVID), PsychINFO (EBSCO), PsychARTICLES (EBSCO), and Academic Search Premier (EBSCO). In order to identify additional potentially relevant material, a call was made in the newsletter of the Dutch Association of Disability Care (VGN), and the suggestions from colleagues and students were checked manually. A number of databases for gray literature (GLIN and WorldCAT) and Dutch publications (NAZ and INVERT) were also searched.

### Search Strategy

A structured search strategy was established for each database to retrieve all relevant documents related to the research question. We used (synonyms of) concepts: built environment (intervention), individuals with disabilities (population), and long-term care (context). The thesaurus, medical subject headings, and truncated terms were used where appropriate. The concept of health/behavior/quality of life (outcome) was not included as a selection criterion in the search strategy, as it could cause a narrowing of the results. Data extraction describes and clusters all

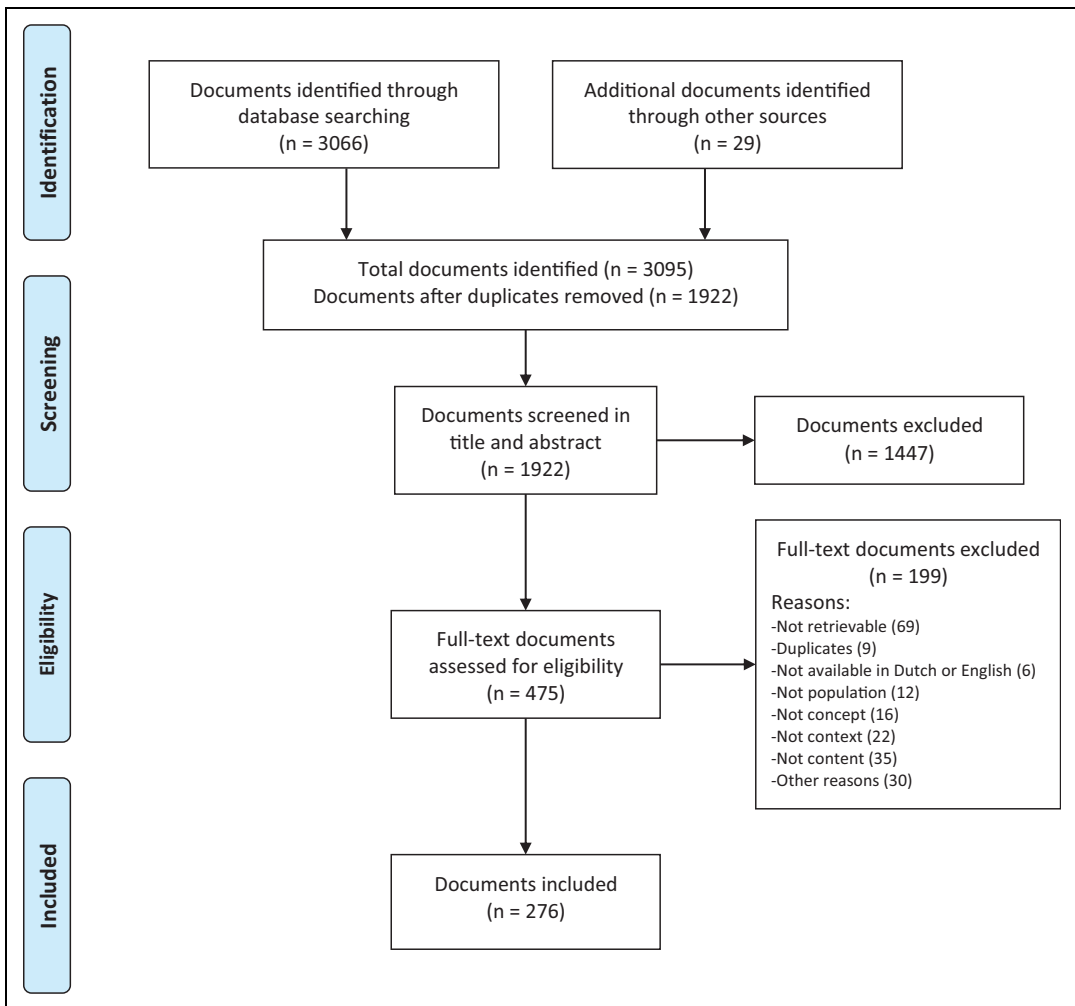
the outcome variables. Filters were used for language and date of publication: (*English[la] OR Dutch[la]*) AND (“1980/01/01”[PDAT]:”3000/12/31”[PDAT]). The final search strategy for PubMed is presented in Appendix A. The final search results were exported to EndNote, and duplicates were removed.

### Screening and Selection

After the removal of duplicates, the documents obtained were independently screened by two reviewers (J.R. and Y.D.) to select documents that met the inclusion criteria. Disagreements concerning eligibility were resolved by consensus or by arbitration through the project group. Documents that fulfilled all the inclusion criteria were processed for data extraction.

### Data Charting Process

In the first step, for all the documents included, information about document features, objective, population, context (housing type), research method, design components, and outcome variables were charted by a reviewer, using a data charting form. The data were transferred to overviews that included document types, user groups in the population, design components, and outcome variables. The design components found as described spatial interventions were clustered into six basic concepts for the purpose of organization and legibility of the results: residential concept, spatial organization, spatial character, furnishing and upholstery, climate, and specific spaces. We also defined clusters of outcome variables related to health, behavior, and quality of life. This clustering was based on the aggregation of synonyms and integration of matrices found in the reviews (Calkins, 2018; Chaudhury et al., 2018; Joseph et al., 2016; Marquardt et al., 2014), supplemented with topics from other reviews and studies. Finally, the widest possible list was maintained, with as little overlap as possible between the clusters. In the second step, we filtered for documents on individuals with intellectual disabilities. For this user group, we extracted the results from the documents and summarized the associations between design components and outcome



**Figure 1.** Search and selection results.

variables. A scoping review only clarifies the subject matter and is not primarily intended to conduct assessments of the quality of the enrolled studies (Tricco et al., 2018). We did not do any quality assessments of the studies, weigh the effects, or perform any meta-analyses.

## Results

### Search and Selection Results

The search strategy revealed 3,095 documents, and after the removal of duplications, 1,922

remained. Screening of the titles and abstracts resulted in the exclusion of 1,447 documents because they indicated that the document did not meet the inclusion criteria, for example, with respect to our definition of the built environment or the context of long-term care facilities. For the 475 remaining potentially relevant documents, full-text versions were obtained. Based on the reading of the full texts, 199 documents were excluded. The 276 documents that fulfilled all of the inclusion criteria were included in this scoping review. Figure 1 displays the entire selection process of the flow diagram.

**Table 1.** Included Documents: Numbers by Document Type and User Group.

User Groups	Document Types					Total
	Reviews	Original Research (Quantitative/Qualitative Studies)	Dissertations	Descriptive Documents	Books/ Chapters	
Intellectual disabilities	2	19	0	3	4	28
Psychogeriatric disorders or disabilities	38	137	10	26	7	218
All others	2	20	0	8	0	30
Total	42	176	10	37	11	276

### Document Types and User Groups

The 276 included documents were classified by document type and user group (Table 1). The following categories were used for the documents: reviews (literature reviews, systematic reviews, meta-analyses), original research (quantitative and qualitative research studies), dissertations, descriptive documents (nonresearch-based publications, such as reports, narrative analyses, policy documents, practical descriptions, expert opinions, theories), and (chapters from) books. The user groups were classified according to the categories in the aforementioned definition of individuals with disabilities.

Table 1 shows the relation between the number of documents found in User Group 1 (intellectual disabilities,  $n = 28/276$ ), User Group 2 (psychogeriatric disorders or disabilities,  $n = 218/276$ ), and User Group 3 (all others,  $n = 30/276$ ). Of the 276 documents included, almost all reviews, dissertations, and most descriptive documents and books/chapters were related to people with psychogeriatric disorders or disabilities. The study ratio of the original research studies on individuals with intellectual disabilities, compared to all other user groups in long-term care facilities, is:  $R = 19/176 = 11\%$ . This ratio indicates the underrepresentation of empirical research on individuals with intellectual disabilities in the group of long-term care facility users.

### Design Components and Outcome Variables

With respect to associations between design components and outcome variables in research publications (reviews, studies, dissertations) that have empirical support, 26 design components were

found, clustered into six basic concepts and a “rest” category: context and view, typology, size, lay-out, signage, visual barriers, environmental quality, homelike environment and personalization, sensory stimulation, interior, doors, floors, cues, art, light, sound, color and contrast, temperature and humidity, common areas, dining rooms, private rooms, bath rooms, activity areas, multisensory rooms, gardens, and technology. In addition, 19 clusters of outcome variables (related to health, behavior, and quality of life) were defined: inclusion, quality of life, privacy, choice, problem behavior, mood, cognition, orientation, activities of daily living, activity, social behavior, health, falls, medication, psychiatry, apathy, eating, sleeping, and constraint. Table 2 shows the design components in the built environment (vertical axis) for three user groups: intellectual disabilities, psychogeriatric disorders or disabilities, and all others (horizontal axis). Table 3 shows the outcome variables (vertical axis) for three user groups: intellectual disabilities, psychogeriatric disorders or disabilities, and all others (horizontal axis). An X in the tables indicates that a design component or outcome variable has been found in a user group. The description of the design components can be found in Table 2 and the description of the outcome variables in Table 3.

The largest number of studies focus on housing types. In individuals with psychogeriatric disorders or disabilities, most research is available on the impact of specific design components. In general, research on the impact of the built environment is evaluated mostly on the basis of outcome variables related to quality of life (inclusion, general quality of life, privacy, choice) and outcome variables related to behavior (problem

**Table 2.** Design Components Found in Research Publications (Reviews, Studies, Dissertations), Broken Down by User Group.

Design Components	Description of the Design Components	User Groups		
		Intellectual Disabilities	Psychogeriatric Disorders or Disabilities	All Others
Residential concept Context and view	Neighborhood, residential location, the environment around the house, the view from the house	X	X	
Typology	Types of residential care accommodations, such as nursing homes, special care units, small-scale housing, green care farms, hostels, institutional facilities, community-based residential settings	X	X	X
Size	Dimensions that may relate to different units, such as the facility as a whole, the building, the unit/department, and the group size	X	X	X
Spatial organization Layout	Spatial arrangement of a space, floor plan		X	
Signage	Visual cues such as signs, room numbers, nameplates, pictures, icons, arrows or text on the floor, which help to find one's way		X	
Visual barriers	Distracting signals or disguising exits		X	
Spatial character				
Environmental quality	Overall quality of the environment which includes several aspects at once, such as safety, hygiene, noise, maintenance		X	X
Homelike environment and personalization	Homelike environment refers to the "look and feel" and is also referred to as homelikeness, homeliness, ambiance, noninstitutional, atmosphere, home-feeling. Personalization refers to personal items in the room.	X	X	
Sensory stimulation	Multisensory environment, also called multiple or enriched sensory environment: an environment rich in visual, auditory, tactile and/or olfactory stimuli that stimulate the senses		X	X
Furnishing and upholstery				
Interior	Furnishing and decoration of the room	X	X	
Doors	Doors, images on doors, and related items such as doorknobs or mailboxes		X	
Floors	Types of flooring, and contrasts and patterns on floors		X	
Cues	Objects that are intended to point individuals to something or serve as memory aids		X	
Art	Sculptures, paintings, etc.		X	
Climate Light	All types of light sources, both daylight and artificial lighting		X	

(continued)

**Table 2.** (continued)

Design Components	Description of the Design Components	User Groups			
		Intellectual Disabilities	Psychogeriatric Disorders or Disabilities	All Others	Others
Sound	Sound levels, reverberation times, background noise, and music	X			X
Color and contrast	Use of color and contrast on things like walls, in table settings, and floors				X
Temperature and humidity	Temperature and humidity in the room				X
Specific spaces					
Common areas	Areas that are accessible to all residents, such as living rooms or meeting places	X			X
Dining rooms	Rooms where residents take their meals				X
Private rooms	Individual sitting rooms and/or bedrooms of residents				X
Bathrooms	Rooms where residents can wash and bathe themselves				X
Activity areas	Indoor and outdoor spaces where residents can perform (physical) activities				X
Multisensory rooms	Specially designed multisensory space, with visual, auditory, tactile and/or olfactory stimuli, designed to create a multifaceted sensory experience				X
Gardens	Outdoor spaces, with use of greenery				X
Technology	Use of technological aids such as tracking devices, alarm systems, automatic lighting, prompting systems, etc.				X



**Table 3.** Outcome Variables Found in Research Publications (Reviews, Studies, Dissertations), Broken Down by User Group.

Outcome Variables	Description of the Outcome Variables	User Groups		
		Intellectual Disabilities	Psychogeriatric Disorders or Disabilities	All Others
Quality of Life				
Inclusion	Social inclusion, participation, social integration, which includes contact with and participation in society, such as in community activities	X		X
QoL	Quality of life (general), well-being, satisfaction, happiness	X	X	X
Privacy	Privacy (sense of), private, for example having your own room		X	X
Choice	Freedom of choice, self-determination, autonomy, control, (co)decision making, e.g., deciding when you come and go, having your own key, being able to choose your own caregiver	X	X	X
Behavior				
Problem behavior	Behavior, behavioral problems, e.g., agitation, aggression (verbal/physical), confusion	X	X	X
Mood	Mood, emotions and emotional well-being, e.g., feelings of depression, anxiety, stress		X	X
Cognition	Cognitive and neurological functions, attention/concentration, intelligence, nervous system.		X	X
Orientation	Orientation ability, wandering, escaping, compulsive walking, crossing boundaries of areas that are off limits, exit seeking behavior (e.g., rattling doors)		X	X
ADL	Functioning in everyday living activities, adaptive behavior, (in/dependence in) practical skills, such as washing, dressing, setting table, eating		X	X
Activity	Household (participate in/be involved in), leisure and physical activities	X	X	X
Social behavior	Social behavior, interactions, relationships, communication, loneliness, social isolation	X	X	X
Health				
Health	Physical health, illness, death, hospitalization, infection, injury, condition	X	X	X
Falls	Falls, motor functions, walking problems, balance, mobility		X	X
Medication	Medication use		X	X
Psychiatry	Psychiatric disorders and symptoms (such as psychotic symptoms), behavioral and psychiatric symptoms of dementia, or neuropsychiatric symptoms (general)		X	X
Apathy	Apathetic behavior, lethargy, passivity, low alertness	X	X	X
Eating	Food and fluid intake, weight, tube feeding		X	X
Sleeping	Sleep, sleepiness, sleep deprivation		X	X
Constraint	Containment, fixation, locked door, restraint		X	X

behavior, cognition, activity of daily living, activities, and social behavior). In fewer user groups, the impact on health (such as illness and psychiatric symptoms) was tested, and only in individuals with psychogeriatric problems, the research evaluated the variables: mood, orientation, falls, medication, eating, sleeping, and constraint.

For the specific group of individuals with intellectual disabilities, a total of 28 documents on the impact of the built environment in long-term care were found. These included two reviews, 19 original research studies (of which four were qualitative), three descriptive documents, and four books. Table 4 presents information from the 19 studies found on individuals with intellectual disabilities. Descriptions of the associations found in the reviews, supplemented by those found in the original research studies between the design components and outcome variables, are provided below.

**Context and view.** One study included view. It shows that a greater variety and stimulation through interesting views from windows are associated with greater adaptive behavior and community integration (Heller et al., 1998).

**Typology.** A large proportion of the documents relate to comparisons between different types of housing/care facilities. In residential care for individuals with intellectual disabilities, deinstitutionalization and social integration have been major goals since the 1970s. In this process, clients moved initially from large institutional facilities (hospitals, hostels) to nursing homes, then to small-scale or community-based residential settings, and, more recently, to all types of assisted living facilities. Initially, one mostly investigated the effect of the facilities on behavior. Only around the turn of the 21st century did people begin to look more broadly at the influence on the well-being and quality of life (conceptualized by Schalock and Verdugo, 2002).

Felce and Emerson (2001) indicate that studies of different types of residential facilities are often difficult to compare because there is no uniform classification. In addition, descriptions are often incomplete, vary across countries, and do not always adequately account for the influence of

other variables, such as work practices, vision, and quality of staff. Overall, however, the movement from institutional to community care has increased the quality of life of individuals with intellectual disabilities (review Bertelli et al., 2013; review Felce & Emerson, 2001; McConkey et al., 2016). The improvements mentioned relate to more adaptive behavior, less behavioral problems/aggression, more access to and participation in household/leisure activities, more community involvement (activities), more choices, and more social interactions. According to Bertelli et al. (2013), the residential solutions that were considered best in terms of impact on quality of life are small apartments in the community and new housing clusters. They have the best outcomes in terms of self-determination, control/choices (e.g., with respect to housing and care: when to come and go, own key, choice of caregiver), opportunity for paid work, and activities. More personal relationships/social contacts are also mentioned, although the risk of social isolation among individuals living alone is also pointed out.

Mixed results have been reported with respect to health and mortality. For example, moving older residents and those with the most severe intellectual disabilities and problem behaviors can lead to poorer health (Bertelli et al., 2013). Hsieh et al. (2009) examined the extent to which residential characteristics (and social factors) are associated with mortality in adults with intellectual disabilities who live or have lived in nursing homes and moved to community settings over a 10-year period in the United States. After controlling for personal characteristics, it appears that, among other things, higher diversity of the physical environment (personalization of residents' rooms and distinctiveness of all living spaces) is associated with lower mortality for these residents, regardless of where they stayed.

**Size.** There are conflicting results regarding the effects of housing size, with some studies reporting that a smaller home size is a significant predictor of more frequent community participation, while others do not find these results (Felce & Emerson, 2001; Heller et al., 2002; Thompson et al., 1990). There is little evidence that smaller

**Table 4. Information From Original Research Studies Found on Individuals With Intellectual Disabilities in Long-Term Care.**

Author; country	N (Residents)	Population <sup>a</sup>	Subject, Regarding Physical Environment	Design Components	Outcome Variables	Key Findings
Chung et al. (1995); United Kingdom	15	Intellectual disabilities: profound multiple learning difficulty, preverbal, verbal	Moving from large- to small-scale accommodation	Typology Size	Problem behavior Social behavior	The more communicatively able clients were those who improved the most in both communication skills and behavior after moving to smaller sized living units.
Dalgleish (1983); United Kingdom	x	Mentally retarded adults	Comparisons between hospitals, health authority hostels, and local authority hostels	Typology	Inclusion	Individuals with more severe handicaps lived in units which had less homelike environments (hospitals) and less involvement with the community than did facilities occupied by less handicapped individuals (hostels).
Egli et al. (2002); United States	36	Adults with mental retardation/developmental disabilities	The influence of home-likeness on community participation	Homelike environment and personalization Sound	Inclusion Social behavior	Residential home-likeness exerted an influence on staff-initiated interactions with clients, which in turn, exerted an influence on community participation.
Egli et al. (1999); United States	x	Adults with mental retardation	Acoustical characteristics in residences	Sound	Problem behavior	Reverberation times in living and dining rooms were negatively correlated with mean home-likeness ratings. This raised the possibility that residential acoustics can have indirect effects on behavior. The results also suggest possible direct effects: Reverberation times may interfere with speech perception.
Felce et al. (1985); United Kingdom	12	Severely and profoundly mentally-handicapped adults	Comparison of small community-based houses and traditional institutions	Typology Interior	Activity	Residents of the small homes lived in more materially enriched environments, and these were shown to provide the opportunity for improvement in the level of resident activity compared to institutional settings.
Heller et al. (2002); United States	186	Adults with mental retardation/developmental disabilities	Environmental characteristics of nursing homes and community-based residential settings	Typology Size	Inclusion ADL Health	Residents who moved to community settings had higher levels of adaptive behavior and community integration than residents who remained in nursing homes. Health was not influenced by any of the environmental variables examined. Not size or type of facility but specific aspects of smaller, community-based residences (e.g., opportunity for autonomy and physical attractiveness) were likely associated with well-being.
Heller et al. (1998); United States	249	Adults with intellectual disability	Environmental characteristics of nursing homes and community-based residential settings	Context and view Typology Size Interior	Inclusion ADL Health	Type, size, and characteristics of the environment were related to the level of adaptive behavior and community integration at follow-up. Residents living in community-based settings had better health and greater levels of community integration than residents living in nursing homes. Residents living in smaller facilities had greater adaptive behavior than residents living in larger facilities. More variety and stimulation in the residential physical environment was associated with greater adaptive behavior among residents and community integration among their residents.

(continued)

**Table 4.** (continued)

Author; country	N (Residents)	Population <sup>a</sup>	Subject, Regarding Physical Environment	Design Components	Outcome Variables	Key Findings
Howie et al. (2012); United States	103	Adults with intellectual disabilities	Availability of physical activity resources in group homes and those living alone or with family	Interior	Activity	Adults with intellectual disabilities had few physical activity environmental resources and opportunities available to them, especially those not living in group homes.
Hsieh et al. (2009); United States	330	Adults with intellectual disabilities	The influence of residential characteristics after moving from nursing homes to community settings	Typology Size Interior	Health	Higher environmental diversity was associated with lower mortality for residents regardless of where they resided.
Lowe et al. (1998); United Kingdom	41	People with severe intellectual disability and severe challenging behavior	Comparison traditional services (hospitals, hostels), community houses and family homes	Typology	Problem behavior ADL	The family home group had slightly higher adaptive behavior scores than residents in community housing. Both groups had higher scores than the hospital and hostel residents. Assessments of challenging behavior showed the groups to be similar.
McConkey et al. (2016); Ireland	89	People with intellectual disability	Contrasts between personalized arrangements, community group homes, and congregated settings	Typology	Inclusion Choice Activity Social behavior	Persons moving to rented accommodation with personalized support had greater control and choice in their lives, more community engagement, more activities, and increased personal relationships compared to residents in group homes, but those remaining in congregated settings fared worse of all.
McConkey et al. (2005); Ireland	106	People with intellectual disabilities	Comparison campus settings and community housing	Typology	Inclusion	Although the type of accommodation did have a significant effect on residents' social inclusion in families and communities, the best predictor of this was the individual's level of dependency in personal self-care.
Olin and Jansson (2008); Sweden	34	People with intellectual disabilities	Common areas in various kinds of group accommodations	Common areas	Social behavior	Common areas in group accommodations may play a significant role in the development of a social togetherness, identification with others, and exchange of experience between individuals with intellectual disabilities. Three types of common areas were consequently identified: the restrictive, the familiar, and the neutral room. Setting, layout, interior decoration, and accessibility influenced use and character of the social interactions.
Rawlings (1985); United Kingdom	23	Severely and profoundly retarded noncommunicating adults with disturbed behavior	Comparison hospital wards and small nonhospital residential homes	Typology Interior	Problem behavior Activity	The small homes residents showed higher engaged activity than those in hospital wards and twice as much stereotyped behavior in the wards.
Salovita and Aberg (2000); Finland	54	People with learning disability	Comparison hospitals, community group homes, and apartments	Typology Size	Choice	Self-determination was highest in the apartments, while hospital wards and group homes did not differ from each other. The amount of places in the housing unit made no difference.
Thompson et al. (1996a); United States	x	People with mental retardation	Rating home-likeness and institutional features	Home-like environment and personalization	x	Clusters of physical features identified were found to be associated with home-likeness ratings.

(continued)

**Table 4.** (continued)

Author; country	N (Residents)	Population <sup>a</sup>	Subject, Regarding Physical Environment	Design Components	Outcome Variables	Key Findings
Thompson et al. (1996b); United States	80	People with mental retardation	Home-likeness and behavior	Homelike environment and personalization	Problem behavior Activity Apathy	Lethargy, stereotypy, aggression, and hyperactivity were negatively correlated with home-likeness ratings. Those in more homelike residences were more likely to be involved in independent household chores, meal-related activities, and individual activities.
Thompson et al. (1990); United States	x	People with mental retardation	Features that constitute home-likeness and institutional	Size Homelike environment and personalization	x	The fewer residents, the more home-likeness. Furniture position, lighting type, and lighting flexibility were highly correlated with home-likeness, whereas building code-specific features and seating type were minimally related to home-likeness.
Zarcone et al. (1993); United States	1,388	Individuals with developmental disabilities	Quality of care in two state facilities	Typology	Health	Both facilities scored high in the categories concerning the condition of the clients.

<sup>a</sup>Terminology in accordance with the study.

size leads to more indoor activities (Felce & Emerson, 2001) and the number of residents does not affect the degree of self-determination (Saloviita & Aberg, 2000). Chung et al. (1995) found that (especially more communicative) clients benefit from moving to smaller settings in terms of progress in communication and problematic behavior. In studies that corrected for additional variables (such as nonrandom assignment, difference in philosophy of care, programs of care, and staff training, which also often play a role in moving from large to small institutions), few changes in client behavior after moving are found based on group size (Thompson et al., 1990). Institution size appears to have primarily an indirect effect, as it is closely related to other variables that more directly affect outcomes, such as staff ratio or home-likeness (Felce & Emerson, 2001). The larger the facility, the less homely it is perceived to be (Thompson et al., 1990).

*Homelike environment and personalization.* A factor that has proven relevant is home-likeness. Thompson et al. (1990) found that home-likeness could be reliably evaluated and investigated which design components were associated with the concept (Thompson et al., 1996a). Their results showed, that a more homelike interior is experienced with smaller wards, rooms of different sizes with windows of different sizes and in different places, public (common) spaces closer to the front door, unique bedrooms, wooden doors, wallpaper, carpet, art, less reverberation, more light points in the living room, and personal objects in the room. A more institutional feel is caused, for example, by: more office, less public space, the same bedrooms, wide hallways, large rooms, high ceilings, more passageways, rough (stone) walls, vinyl floors, little lighting, fixed ceiling lights, more fire alarm systems, bare walls, different chairs, rows of toilets and sinks, paper towel dispensers, grab bars, and more adaptations to disabilities. In terms of the exterior, a building where the roof is less visible from the street, the driveway is longer, there are more windows in the facade, and there is less greenery around the building is perceived as more institutional and less homelike. Finally, there is the question of the effect of home-likeness on client

behavior and integration. More home-likeness seems to be associated with less stereotyped behavior, less physical aggression, less lethargy, and less hyperactivity (Thompson et al., 1996b). In addition, in a more homelike environment, clients are more involved in household tasks and cooking and engage in more individual activities. Home-likeness also has a positive impact on positive staff-initiated interactions, which, in turn, have a positive impact on participation in social activities (Egli et al., 2002).

*Interior.* More variety and stimulation, for example, by customizing rooms with personal items and variations in decoration throughout the building, has been found to be associated with more adaptive behavior and integration (Heller et al., 1998). Greater diversity in the physical environment is associated with lower mortality (Hsieh et al., 2009). Greater accessibility of materials (material enrichment) leads to increased participation in household tasks and activities (Felce et al., 1985; Rawlings, 1985). The presence of stimulating environmental features (such as indoor and/or outdoor recreation facilities) can enhance the likelihood of physical activity (Howie et al., 2012).

*Sound.* Reverberation has an indirect effect (through home-likeness) on behavior. Reverberation time in living and dining rooms is negatively correlated with home-likeness: the less reverberation, the more home-likeness one feels (Egli et al., 1999). More home-likeness, in turn, has a positive effect on behavior (see above). In less homelike environments, insufficient sound absorption is usually due to inadequate sound-absorbing furniture. There may also be a direct effect of reverberation on behavior: Reverberation times can interfere with the speech perception of hearing-impaired individuals (Egli et al., 1999). No association was found between noise level and home-likeness.

*Common areas.* The purpose of living outside the institutions was to create a living environment in a private atmosphere, in contrast to the collective treatment in the institutions. A qualitative study on the function, use, and staff ideas about common spaces in different types of group accommodations

(Olin & Jansson, 2008) argued that, with the advent of individual apartments, the emphasis is sometimes too much on individualization and that common spaces can play an important role in the development of social belonging, identification with others, and exchange of experiences among individuals with intellectual disabilities. Their comparison of three different common areas shows that the layout, location, decoration, and accessibility of common areas (along with staff perceptions) influence the use of such areas and the character of social interactions. Thus, a warm, personal, shared space creates conditions for spontaneous use and the emergence of mutual relationships. An impersonal interior lends itself to a more organized formal use (Olin & Jansson, 2008). In addition, the location of a shared space (within the building or elsewhere in the neighborhood) may influence its use (as a living room vs. a more neutral meeting place; Olin & Jansson, 2008).

## Conclusions and Implications for Further Research

### Quantity of Documents

This article presents the available information regarding the impact of the built environment on health, behavior, and quality of life of individuals with intellectual disabilities in long-term and 24/7 care. Although some design components could be discriminated that have an impact on individuals with intellectual disabilities, there is a clear underrepresentation of research studies in this group compared to other user groups of long-term care facilities. This result is a striking outcome as these individuals usually reside for a lifetime in care facilities, unlike some other individuals who stay for only a short period of their lives in long term care, for example, in psychogeriatrics. The figures of the Central Bureau of Statistics in the Netherlands (regarding “residential care in kind”) for 2019 show that 64,745 individuals received 24/7 care in long-term care facilities on the basic category of “intellectual disabilities” and 71,935 on the basic category of “psychogeriatric disorders” (Centraal Bureau voor de Statistiek, 2021). In conclusion,

there is no significant association between the number of revealed documents and the incidence of certain user groups in the Netherlands. The underrepresentation of research and publications in intellectual disabilities might be explained by the fact that it is still a relatively young discipline, which goes against taboos in society and tries to stimulate community participation (International Association for the Scientific Study of Intellectual and Developmental Disabilities, 2018). Moreover, intellectual disabilities belong to the care discipline, which claims less than half of the research resources in the Netherlands compared to the medical disciplines (Rathenau Instituut, 2020). We urgently call on researchers to conduct more empirical studies on individuals with intellectual disabilities in order to meet the need for more evidence.

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### Needs Analysis

The impact of built environments on long-term care is much more focused on reducing problems than on improving the healing process, as studied in hospitals (Devlin & Arneill, 2003; Schweizer et al., 2004; Ulrich, 1995; Ulrich et al., 2008; Vollmer & Koppen, 2010, 2016). Although reducing problematic behaviors can have a positive impact on certain aspects of quality of life, self-regulation, and independence, some of these spatial interventions also create limitations that negatively impact other aspects of quality of life. A common example of this is covering doors to prevent the escape of residents with dementia, some of whom may be disoriented (Joseph et al., 2016; Marquardt et al., 2014; Woodbridge et al., 2018). This intervention, which is helpful on the one hand, removes residents’ freedom of

choice and movement on the other. Studies that simultaneously examine all aspects of quality of life as a construct of health in long-term care facilities are, therefore, of importance in the future in order to be able to make reliable statements about sustainable effects of the built environment for residents. In addition, there is an urgent need to conduct basic research on needs assessment of individuals with intellectual disabilities in long-term care, which will enable the development of meaningful hypotheses for intervention studies in the first place that do not focus exclusively on problematic behavior.

Although there are clear indications that community care (rather than institutional care), home-likeness, and variety benefit the behavior, quality of life, and inclusion of individuals with intellectual disabilities, research on the impact of underlying factors and specific design components is still limited. Research on spatial organization is lacking, and research on furnishing and upholstery, climate, and specific spaces is limited. Descriptive documents and books provide more comprehensive information on design components, particularly regarding practical recommendations for individuals with autism spectrum disorders (e.g., Keesom, 2013; Schrameijer, 2013; Whitehurst, 2006). However, many recommendations come from general principles and design knowledge about other user groups and solutions from experts, so more empirical studies on specific design components for individuals with intellectual disabilities are necessary.

### *Quality of Studies*

As stated above, we did not assess the quality of enrolled studies; however, it strikes us that the studies are often carried out with a small sample size, little use of control groups, and variables that are neither precisely defined nor described in detail. Many authors of reviews concerning individuals with psychogeriatric disorders or disabilities conclude exactly the same deficit of the research quality (Calkins, 2018; Chaudhury et al., 2018; Woodbridge et al., 2018). They also often notice that many studies rely on subjective measures, such as the perception of family and staff. Given the methodological diversity of studies and

interventions, meta-analyses are often difficult to perform. The use of narrative techniques makes it difficult for review authors to assess the evidential value of interventions, draw conclusions, and provide evidence-based advice. In the descriptive documents, advice based on research was mixed with practical-based advice (unproven practical experiences). The field consultation shows that in the Netherlands, several organizations for individuals with intellectual disabilities consciously design the built environment; however, it often happens on the basis of practical experiences, disability expertise, intuition, and goodwill. One of the reasons is the complexity of architectural psychological studies, and many variables are often interrelated. For example, changes in institution size are often related to other variables that influence the outcome, such as changes in staff ratio, care philosophy, or home-likeness (Felce & Emerson, 2001; Thompson et al., 1990). In future research on individuals with intellectual disabilities, we recommend the development of clear definitions and descriptions of design components (longitudinal), quantitative studies, large sample sizes, control groups, well-defined variables, objective measures, and scientifically based hypotheses, to achieve evidence-based design for residents with intellectual disabilities in long-term care facilities.

### *Change Is Needed!*

Millions of euros are invested every year in renovations and new construction of long-term care facilities for individuals with disabilities in the Netherlands (Intrakoop, 2020). On account of the lack of knowledge regarding environmental adaptations for such people, architects, facility managers, and interior designers are challenged time and again to make design decisions without usable design guidelines. Guidelines that are based on some level of evidence (Koppen & Vollmer, 2022; Stichler, 2016; Stichler & Hamilton, 2008) would help improve the design of built environments for these individuals and their caregivers. As explained above, improving this situation requires more empirical research specifically on individuals with intellectual disabilities, addressing all aspects of quality of life and



specific design components, with hypotheses based on needs assessments, and the use of good research designs. To enable change, we recommend that care organizations be facilitated (subsidized) and required to systematically and scientifically evaluate building projects in long-term care on their impact on the quality of life, and that building design be developed in a scientifically based approach, rather than in a classically intuitive manner.

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## Implications for Practice

- More empirical research should be conducted on the impact of the built environment on individuals with intellectual disabilities, as this user group is almost as large as the psychogeriatric user group, but is under-represented in research.
- These studies should examine specific design components and address all aspects of quality of life.
- Significantly, more solid evidence on the specific needs of individuals with intellectual disabilities in long-term care should be gathered in order to derive reliable hypotheses for further intervention studies and interventions in the built environment.
- To generate reliable results, future longitudinal studies should have large samples, control groups, well-defined variables, and use valid methods from the field of architectural psychology.
- The government and long-term care organizations must be willing to invest time and funding to systematically and scientifically evaluate building projects in long-term care. They should also create building designs in a scientific manner, rather than in a classically intuitive manner.

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## Supplemental Material

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