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Therapeutic Architecture and Temporality: Evidence-Based Design for Long-Stay Facilities for Individuals with Severe Intellectual Disabilities and Challenging Behaviour

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Abstract: Since individuals with severe and profound Intellectual Disabilities (IDs) have no concept of time, it is difficult for them to autonomously maintain daily structures. Those affected are dependent throughout their lives on external care structures. Even though research suggests that individuals with IDs should live in smaller facilities, individuals with higher support needs are more likely to be placed in large institutions and clustered group homes. The aim of this study was to define design criteria and test their applicability to a residential building design whose architecture enables individuals with IDs to develop autonomy through spatially experienced temporality. Qualitative data was collected in a mixed method evidence-based design approach: systematic behavioural observations, structured interviews, focus groups, and the UV-index method. Four design criteria could be described that contribute to an autonomy-promoting temporality: (a) spatial sequencing and repetition, (b) privacy-related variation of spatial dimensions, (c) spatial orchestration of daylight, and (d) constant emotional proximity to the caregiver. The hypothesis of using architecture to promote temporality in clients with IDs and Challenging Behaviour (CB) has proven to be potentially effective in designing a therapeutic environment. Our findings provide valuable data on how long-stay facilities should be designed in the future.

Keywords: intellectual disability; challenging behaviour; temporality; evidence-based design; architectural psychology; healing architecture; spatial sequencing; privacy; light; emotional proximity

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Citation: Vollmer, T.C.; Koppen, G.; Iovița, C.; Schießl, L. Therapeutic Architecture and Temporality: Evidence-Based Design for Long-Stay Facilities for Individuals with Severe Intellectual Disabilities and Challenging Behaviour. *Architecture* **2024**, *4*, 541–570. https://doi.org/10.3390/architecture4030029

Academic Editors: Kevin Nute, Zhuo Job Chen, Philip Speranza and Martina Decker

Received: 31 May 2024
Revised: 25 July 2024
Accepted: 29 July 2024
Published: 1 August 2024

1. Introduction

Individuals with severe and profound Intellectual Disabilities (IDs) have little to no concept of time [1,2]. As a result, it is difficult for them, or even impossible, to independently establish or maintain daily structures. Those affected are dependent throughout their life on external structures that make their life and coexistence with others possible [3]. On one hand, this dependency leads to high intensity of care [4] and, on the other, to stagnation in the development of autonomy. The result is a vicious circle in which the two factors are mutually dependent. At the same time, some individuals with IDs exhibit extremely Challenging Behaviours (CBs) that often put those affected at risk for themselves and their social and physical environment [5]. Both endogenous impulses and external stressors, like the environment, can trigger CB and often link it to precise temporal rhythms.

Neither the architecture nor the spatial structure of the facilities, in which individuals with IDs and CBs are currently accommodated, deal with time-related behaviour or their lack of understanding of temporality [6–8]. Therefore, our evidence-based design study—reported in this article—is aimed at defining design criteria and testing their applicability to a residential building design whose architecture enables individuals with IDs and CBs to develop autonomy through spatially experienced temporality. The leading hypothesis for the design was that the architectural temporality, e.g., spatial sequencing, and the regular and repetitive use of it, could positively impact the autonomous use of the space and consequently the autonomy of the residents. In the long term, the increased autonomy should lead to more impulse control, less CB, and reduced intensity of care. When designing long-term facilities for individuals with IDs and CBs this way, architecture has the ability to become a co-therapist.

1.1. Therapeutic Architecture

According to Ulrich's Supportive Design Theory [9], a healthcare environment should be designed to promote well-being and reduce stress. Based on his theory and subsequent research in behavioural sciences, architectural psychology, and health-related fields, it is now known that architecture can contribute to healing and health [10,11]. Between 2010 and 2023, Vollmer and Koppen empirically proved that seven environmental variables (orientation, odorscape, soundscape, withdrawal and privacy, power points, view and foresight, and human scale) influence the stress perception of hospitalised outpatients with cancer [12–14]. These scientific findings underpinned the demand and necessity for evidence-based design (EBD) in Europe. In addition, it has been shown that the variables also affect other user groups who have high stress levels due to illness or other predispositions [15]. Although all variables appear to be relevant for the design of stress-free environments for people with IDs and CBs [6], in our study, we addressed those that were assumed to be relevant to a temporality-related development of autonomy: orientation, withdrawal and privacy, view and foresight, and human scale. EBD originated in North America [16] and refers to a design whose criteria have been scientifically confirmed [17,18]. In order to develop the impact of architecture on human health as specifically as possible, a distinction must be made between three areas: preventive (PA), curative (KA), and rehabilitative (RA) architecture [19,20]. The term "Therapeutic Architecture" belongs to the third area and includes EBDs for care- and long-stay facilities for individuals with various disabilities.

1.2. Architectural Temporality

Time and space are inextricably linked. They are also both fundamental aspects of architecture. It is through time that space becomes activated, while they both encompass the physical world as we see and perceive it. Architecture is encountered and its meaning is understood through one's full presence in space, even though the experience is not perpetual. "Time and the way it is handled have a lot to do with the structuring of space" [21] (p. 173). Based on Hall's theory, there are two ways of handling time: monochronic and polychronic. Monochronic people are low-involvement people who tend to compartmentalise time and do one action at a time. To function better, monochronic people choose to separate their activities spatially, while polychronic people tend to combine activities in one space.

Numerous psychological, philosophical, and architectural theories on the relation of space and time have been developed over the decades. The translations of the abstract quantity of time into concrete architecture have emerged, such as the Long Island Slow House by Diller and Scofideo or Kieslers' Endless House. As a further development, empirical research is testing some of these theories [22]. In addition to basic neuroscientific research on the processing of time and spatial perception in the brain [23–25], environmental research is currently investigating three areas of the space–time relationship. These areas are (1) the perception of time and boredom as a dependency of spatial design and architecture, (2) the temporal perspective and future orientation as a dependency of spatial design and architecture, and (3) the use of these dependencies to influence mental health through spatial design and architecture. Nute and Chen [26] give a broad overview of some of the implications.

Normally, humans switch flexibly between the temporal perspectives of the past, present, and future: we either recall past events, concentrate on a present situation, or imagine a possible future. Chen and Nute [27] tested in a randomised controlled trial how changing the spatial parameters of a view may affect an observer's sense of the future. In a sample of 488 Caucasians, they found a significant relation between spatial view (through a window) and the feeling of being connected to the future. Most significantly, the path between visual prospect and a sense of the future was found to run via optimism. They concluded that spatial prospects do not just evoke a sense of the future; they seem to encourage positive feelings about what lies ahead.

Critical life events, such as a life-threatening illness, can dramatically shorten a person's future perspective and allow the present perspective to become dominant [28]. This leads to a more intense focus on the passage of time at any given moment, which results in a prolonged experience [29]. In severely ill patients, the prolonging of perceived time durations in non-distractive environments, as the usual hospital environments, is significantly related to depression [29,30]. In 2010 [31,32], Vollmer and Koppen first described the correlations between temporality and perspective-oriented architecture to how breast cancer patients experience stress. "Being without a view is like looking in my death-related future". Their analysis of more than 50 interviews and a controlled trial on psychological and physiological distress in 196 patients and their healthy partners revealed that the need for view and foresight was significantly higher in the severely ill [33]. Hospital environments that provided architectural space described as open, transparent, and with a multitude of sightlines (creating perspective) were likely to have a positive impact on the stress perception of the patients [13,34]. Ulrich [35] showed that an unobstructed view from a patient room's window reduced pain medication in patients who had undergone surgery. The compared view of a brick wall (no perspective) did not reduce pain, and patients remained longer in the hospital. Based on their findings, 'view and foresight' became one of the most important design factors in reducing stress in seriously and chronically ill patients [14]. The important role of views in human perceptions of natural and built environments goes back to Appleton and Lorenz, who both theorised that visual prospect, in combination with refuge, would provide a key survival advantage: "to see without being seen" [36,37] (p. 181). Studies have attempted to test this idea's veracity, with mixed results [38,39]. Although research regarding the influence of architecture (or individual design criteria) on time perception and temporality is still in its infancy, the initial successes presented confirm the construct of our study's hypothesis.

1.3. Time Perception and Temporality in Individuals with Intellectual Disabilities

An ID is described as deficits in learning, problem solving and judgement as well as problems in daily activities, such as communication skills and social participation [40]. They arise during the developmental period (childhood or adolescence) and are characterised by intellectual functioning and adaptive behaviour that is significantly below average [41]. ID is classified into four categories: mild (IQ between 69–55), moderate (IQ 54–40), severe (IQ below 39), and profound (IQ below 39) [15]. Worldwide, approximately 1% of the population has an ID, and out of those, 85% have a mild ID [42]. Individuals with IDs frequently show mental or neural disorders as comorbidities. Those include Autism Spectrum Disorder (ASD), epilepsy, attention-deficit hyperactivity disorder (ADHD), impulse control disorder, depression, and anxiety [42].

Time perception can be described as "the feeling of time as perceived by individuals" [43] (p. 1) or as the "subjective feeling of time passing and the sense of duration" [44] (p. 1). Temporality, as a broader construct, refers to the "experience of and in time" [45] (p. 2). Time perception, as well as time processing, is an important skill in daily life [46]. It is needed for, e.g., the coordination of our movements, correctly timed reactions and responses, the anticipation of events happening in the future, and the planning of activities [46]. The attention paid to time influences how the passing of time is perceived [47].

Individuals with depression and higher anxiety levels experience the passing of time slower [29,47,48], as well as individuals who feel socially excluded [49]. Children with ADHD, learning disabilities, and borderline intellectual functioning seem to have problems with time processing [46,50] and time perception [50]. Research suggests that impulsivity in these groups could be linked to their altered perception of time [44,46]. A review of time perception and ASD shows that results are somewhat inconsistent [51]. Only time perception tasks that involved a high level of cognitive functioning showed consistent differences between children with ASD and children without ASD. Individuals with mental disabilities have difficulties with the concept and passing of time [52]. This leads to limited abilities in time management, which often results in reduced autonomy and increased dependence on others [52]. The more severe the ID, the lower the ability to estimate time [53]. Owen and Wilson [1] hypothesize that, for individuals with IDs, problems in perceiving time might be intensified by poor and inconsistent cues in their environment. Because of the living circumstances of individuals with IDs, they often do not have the same vocational and social activities others have. As a result, they do not experience the tasks and changes associated with the developmental stages of adulthood [1]. The authors speculate that this might make it harder to understand the passing of time and temporality.

Since individuals with profound and severe IDs show a mental age ranging from 3 months to under 6 years [54], they cannot judge the order of daily activities and estimate the length of time intervals between these activities. This ability develops in children at the age of 5 [55]. Research shows that infants can learn how much time passes between two events by the age of one month [56], and by 6 months they are surprised if an event takes longer than they had previously learned [57]. This illustrates that infants from an early age have a "primitive" sense of time [58]. This sense of time improves during childhood [59]. In various experiments [58], time perception abilities (judging the similarity between durations) were shown to increase between the ages of 3 and 10 years.

1.4. Challenging Behaviour and Housing Individuals with Intellectual Disabilities

About 18% of adults with IDs show CBs [5]. CB is defined as "culturally abnormal behaviour(s) of such intensity, frequency, or duration that the physical safety of the person or others is likely to be placed in serious jeopardy, or behaviour which is likely to seriously limit use, or result in the person being denied access to, ordinary community facilities" [60] (pp. 4–5). This includes serious physical aggression, destructiveness, self-injury, and health-threatening behaviours, such as smearing faeces over the body or eating inedible objects [61]. The display of CBs is associated with various negative outcomes, such as physical injury to the person, or to other individuals with IDs and staff, social exclusion, isolation and neglect, abuse from caregivers, restrictive treatment, and stress among caregivers [62]. Bowring et al. [5] proposed a revised framework for understanding CB. They argue that an accumulation of vulnerability factors influences CB. Under those are the psychosocial factors, which include institutionalised accommodation [5].

Individuals with lower cognitive abilities and adaptive functioning tend to show more CBs [5,63]. The most common management strategies are physical and mechanical restraint, sedation, and seclusion [62]. Therapeutic interventions that are commonly used seem to be goal setting, antipsychotic medication, intervention programs, and behaviourally oriented programs [62].

More CB leads to an increased need for support, especially social support, and the maintenance of emotional well-being [64]. In the Netherlands, it is possible to request funding for extra intensive support in cases where intensive support is not sufficient [65]. This means more direct care involvement and a higher staff-to-client ratio (often reaching 1:1). In the sample of a study by Verhaar et al. [65], after receiving 3 years of extra intensive support, the intensity of CBs decreased.

As a therapeutic intervention focusing on environmental changes, Tyrer and Bajaj [66] proposed nidotherapy. It focuses on changing the environment, rather than the person, to create a better fit between the two [66,67]. To achieve this goal, all sorts of changes are relevant, including changes in the physical, social, and personal environment [66,67]. Nidotherapy was developed for patients with persistent mental illnesses and was recently evaluated in 85 individuals with IDs. The results are promising for managing aggressive CB in care homes, but it must be mentioned that the observed change was nonsignificant [68].

When CB occurs frequently, the personal space of the person is deconstructed repeatedly [69]. To prevent more harm to the space and the person itself, materials are removed time after time, which, in turn, makes the space look more sterile, with little to no sense of home [70]. This can even lead to a bare and inhumane environment [69].

Since healthcare has changed during the last decades and disability funding has been introduced in many countries, housing for individuals with IDs has changed accordingly [71]. Opportunities for individualised accommodation were created, as an alternative to the institutional care settings [71]. In the last 50 years, long-stay facilities have been closed and support for individuals with IDs has changed to more community-based services [72]. Those are typically shared accommodations in small groups with 24/7 professional assistance or supported living, where individuals live in their own housing and receive individually tailored support [72]. Smaller settings with small group sizes facilitate meaningful contact between staff and clients with IDs who show CBs [73], with better quality of life outcomes in settings of up to six tenants [72] and less loneliness [74]. In large residential centres, self-injurious behaviour was 7–50%, while smaller residential settings reported 2–5% of self-injurious behaviour [75]. A study by Young [76] illustrates the advantages of smaller facilities. Adaptive and maladaptive behaviour, choice-making, and objective quality of life were measured, via staff reports, of 60 adults with moderate and severe IDs and CBs. They were relocated from an institution to dispersed housing in the community (1–3 individuals with IDs) or clustered centres (20–25 individuals with IDs). After moving to the new facilities, both groups showed increased adaptive behaviour, choice making and quality of life. The increase was significantly higher for individuals in the smaller group [76].

Even though research suggests that individuals with IDs should live in smaller facilities (up to six tenants), a review from Roebuck [77] indicates that individuals with higher support needs are more likely to be placed in large institutions and clustered group homes. This especially applies to individuals with severe or profound IDs and individuals who show CBs [77].

2. Materials and Methods

Based on the hypothesis that residential architecture influences impulse control, CB, and the intensity of care for individuals with IDs, the present study aims to examine whether this relationship can be explained by an influence on temporality (comprehension of temporal sequences) and the associated autonomy of clients (Figure 1). The diagram shown in Figure 1 demonstrates the potential dependencies within the correlation of architecture and impulse control, CB, and intensity of care (c): Either the architectural design fosters temporality in individuals with IDs (a1) and directly affects impulse control, CB, and intensity of care (b); or it indirectly affects those by impacting autonomy (a2 and a3).

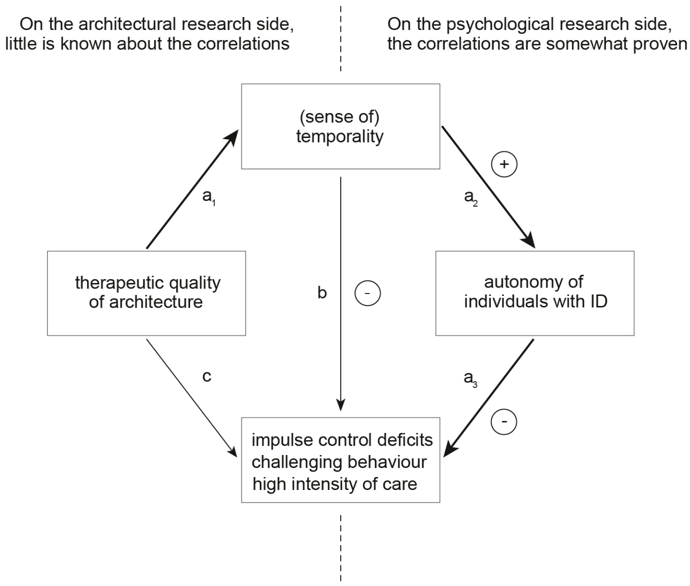

Figure 1. Hypothesis diagram with potential dependencies.

This study investigates which design criteria (described in Figure 1 as "therapeutic quality of architecture") potentially influence temporality and to what extent they can be applied to a realistic design of residential architecture for individuals with IDs and CB.

2.1. Study Design

The study was conducted in the Netherlands between 10/2021 and 03/2023 in three residential groups, with the support of experts from the IPSE de Brugge organisation in Zwammerdam. Our research was preceded by a one-and-a-half-year literature review on the relationship between the built environment and health, behaviour, and quality of life in individuals with IDs [6]. The findings of the literature review revealed that (a) more empirical research should be conducted on the impact of the built environment on individuals with IDs, as this user group is almost as large as the psychogeriatric user group, but is under-represented in research, (b) these studies should examine specific design components and address all aspects of quality of life, and (c) significantly, more solid evidence on the specific needs of individuals with ID in long-term care should be gathered to derive reliable hypotheses for further interventions in the built environment [6]. These three aspects were the starting point for our study and the decision to use a qualitative study design, according to international recommendations for evidence-based design studies, EBD level 3 [78,79]. Design criteria resulting from that level can be described as "(. . .) recommendable for a design decision even if there is weak evidence of impact" [78,79] (p. 10).

The data collection was divided into three steps: 1. systematic behavioural observation of the target group individuals in two existing buildings, 2. structured interviews with 15 experts in the field, and 3. repetitive focus groups with interdisciplinary members of experts in the field. In all three steps, qualitative data on the residential architecture-related behaviour of individuals with IDs and CB was collected, documented, and categorically analysed. The results of the qualitative data analyses were transferred into design criteria according to the UV-index method [13,14,80]. The methods and study steps are described in detail in the following sections.

2.2. Sample

The study was conducted in three residential groups with the support of experts from the IPSE de Brugge organisation in Zwammerdam, The Netherlands. The criteria for selecting the residential groups were: (a) most of the individuals in the residential groups had IDs of the highest levels and regularly exhibited CBs of varying degrees, (b) the group size was five to six individuals with IDs (hereinafter referred to as clients), (c) the clients were accommodated in small, single-story buildings from the 1970s and single rooms, and (d) a minimum of three caregivers worked in each residential group. Due to the severity of the developmental disorders, the clients themselves could not be interviewed or included in focus groups. For recording the clients' needs of autonomous behaviour in relation to their living environment, the method of systematic behavioural observation was therefore chosen as the first methodological step (see Section 2.3).

2.3. Systematic Behavioural Observation

Behavioural observation is the systematic recording of behaviour by at least one external observer. The systematic nature of behavioural observation is characterised by carefully detailed procedures that are designed to collect reliable and valid data on client behaviour and the factors that control it [81,82]. In our study, two independent observers used the daily routine as the systematic structure of recording. They recorded the time, the location/space, the architectural quality of the space (connectivity, dimensions, daylight, and occupancy rate), the activity of each client in the observed residential group, and sudden challenging behaviour. The observations were conducted throughout the day and began when the clients woke up or got up and ended when clients went to bed. Each of the observers took up a fixed position that did not disrupt the clients' daily routine. The observations were immediately recorded graphically, following the architectural psychology research guidelines [78]. The principle of the graphical documentation can be seen in Figure 2, whereby the actual living environment was sketched instead of the ideal spatial sequencing (which ultimately represents the design criterion). The graphs of both observers were finally compared and only the matching observations were used for the analysis of the three residential groups that were observed. The results showed that the same daily routine takes place in all residential groups and that this routine is characterised by eight different activities (Figure 2, x-axes). Due to the spatial and design limitations and to avoid CB, all activities (except sleeping) had to be carried out in direct contact with the caregiver and/or the group. The results of this part of the study have also been published in detail [83].

2.4. Structured Interviews

In structured interviews, 15 experts in the field from therapy, care, facility management, and parenthood of the target group were confronted with the result of the systematic behavioural observation. The experts were randomly recruited by the IPSE de Brugge organisation. Less than five years of experience with people with profound IDs and CBs was the only exclusion criterion. Each expert answered the following three questions:

1. Do you think that more autonomy in the eight observed and repetitive activities within a day could help the client show less CB?
2. In which of the eight observed activities within a day could it be helpful for the development of autonomy . . .
    (a) . . . having less contact/proximity to the group. Please label the group contact as "stimulating";
    (b) . . . having more contact/proximity to the group. Please mark the group contact as "stimulating";
    (c) . . . having less contact/proximity to the caregiver. Please mark the caregiver contact as "calming";
    (d) . . . having more contact/proximity to the caregiver. Please mark the caregiver contact as "reassuring".
3. What spatial or design interventions could you imagine to be helpful to achieve 2(a)–(d)?

Questions (1) and (2) were answered on a paper matrix and evaluated using a mean value analysis. The answers to question (3) were saved as audio recordings, transcribed, and analysed. The data analysis was carried out according to Mayring [84,85], who proposed to condense and abstract the original content while retaining its essence. For this, the text is (a) paraphrased, (b) generalised, and (c) reduced. The resulting eight most frequently occurring "space" categories are shown in Figures 2–5 (Section 3) and are labelled with the capital letters (A) to (G) in the diagrams.

2.5. UV-Index Method

The results of the qualitative data analyses were transferred into design criteria according to the UV-index method [13,14,80].

The UV-index method examines the extent to which certain environment-dependent needs can be met by architectural interventions. The test is carried out based on plan analyses of floor plans, sections, and perspectives. It results in design criteria that can be used to run through and compare potential behavioural options within architecture or a building section. The scientific roots of the UV-index method can be traced back to the Polish researcher Niezabitowski [86], who in 1987 proposed a complete assessment of the living environment by its users. This evaluation was based on an assessment of the degree to which people's basic psychological needs were met in relation to their living environment. Koppen and Vollmer [12] built empirically on his theory when they were commissioned by the Dutch Ministry of Science and Education to investigate the relationship between the hospital environment and the stress experienced by women with cancer. For the first time, they used plan analyses in which the analysis criteria were derived from the previously qualitatively determined needs of the patients (e.g., visibility or privacy) and systematically examined individual sections of the environment (e.g., treatment room, waiting area, etc.) according to the degree to which the needs were fulfilled by "architecture" (e.g., what visual references are there, what room depths, etc.). Finally, different degrees of fulfilment could be distinguished, which made it possible to predict the patients' experience of stress in these rooms and areas. The method was not given the name UV-index method until 2021 as part of the German-language publication: "Architecture as a second body. A design theory for evidence-based healthcare building design" [13].

The UV-index method was used comparatively in our study. The activities of the clients resulting from the observation (Section 2.3) were analysed in relation to the needs assessment of the experts (Section 2.4). This means that schematic floor plans and sections were generated. The drawings used different architectural design criteria trying to provide the time-dependent activities with the respective degree of stimulation or regeneration required, as well as proximity or distance (to the caregiver and/or the group). From the multitude of possibilities, those were selected that, in the opinion of a group of experts, have the greatest probability of achieving the desired goal. In our case, this means selecting the one that guarantees the greatest possible autonomy for clients with IDs and CB through a temporality-promoting architecture.

2.6. Focus Groups

The focus group technique was used for both the UV-index analysis and the final stage of the study—the testing of the applicability of the design criteria. In both research steps, the qualitative data were collected according to methodological approaches from participatory design [87–89], whereby the focus group described was regarded as the "user". The representatives of the focus groups were experts in the fields of psychology, occupational therapy, ergo therapy, caregivers, facility management, architecture, and architectural psychology. The experts were randomly recruited by the IPSE de Brugge organisation and the research team. The focus group had an average of 10 participants and took place a total of 10 times during the study period. The prerequisite for participation was a minimum of 5 years of professional experience in the respective field of expertise. For the development of the residential architecture, the experts indicated a residential group size of five individuals with IDs and CB. It was also specified that the clients are alone in the house at night, as most organisations operate with acoustic monitoring of the residential buildings and a campus night service.

3. Results

As a result, four design criteria could be described that contribute to an autonomy-promoting temporality in individuals with ID and CB. The four design criteria are introduced in the following sections (Sections 3.1–3.4). The final section (Section 3.5) presents the architectural design resulting from the application of the criteria.

As described in the methods section, the development of the design criteria is based on a mixed-method approach, with the results of individual analysis phases forming the basis of the subsequent step. For this reason, the presentation of the individual results has largely been incorporated into the following sections: Systematic behavioural observation (Section 2.3) reveals that the same daily routine takes place in all investigated residential groups and that this routine is characterised by eight different activities (Figure 2, x-axes). Due to the spatial and design limitations, all activities (except sleeping) had to be carried out in direct contact with the caregiver and/or the group in order to avoid CBs. The results of this part of the study have also been published in detail [83].

In total, 95% of the experts interviewed believed that the autonomous behaviour of the clients could be improved in all the activities observed. To achieve this autonomy, it is important to be able to carry out certain activities with an appropriate degree of group and caregiver contact, or with appropriate degrees of privacy. Figures 3 and 5 show the exact classifications that were made. The qualitative content analysis of the interviews reveals that the ambivalence of the clients plays an important role in the classification: depending on the daily mood of a client, the need for reassuring closeness to the caregiver can vary just as much as the tolerance of contact with other residents. The resulting eight most frequently occurring "space" categories are shown in Figures 2–5 and are labelled with the capital letters (A) to (G) in the diagrams.

3.1. Temporality through Spatial Sequencing and Repetition

The first design criterion, "spatial sequencing and repetition", specifies that the daily repetitive activities (daily routine) must be displayed in clearly structured spatial sequences. The spatial sequence must be designed so the clients repeat the same route several times daily. At fixed routing points, they always carry out the same activities. The routes of the individual clients should overlap only minimally to avoid conflict-laden encounters and thus reduce the number of stimuli for CB.

Figure 2 diagrammatically illustrates the design criterion "spatial sequencing and repetition". The longitudinal section shows how the client experiences daily time-related activities ((1)–(8); x-axes) as a function of the spatial sequence or room successions ((A) to (G); y_2-axis) and as a function of the repetition that is performed in the home environment per day (y_1-axis). The diagram reads from left to right: The client's bed niche (A) is located at the outermost point of the building and is, both spatially and temporally, the start and end point of the daily route. The activities "sleep, rest, withdrawal" are linked to this space. The private room (B1) with e.g., "dressing or undressing" (2) and the private bathroom (B2) for "washing, showering and using the toilet" (3) directly follow the bed. The client has direct access to a private garden (C) from the private room. He can "ventilate, relieve stress or spend time alone outside the house or in nature" (4). The private room can be closed and leads to the individual anteroom (D). In this space, "the client is busy alone and within the house" (5). Depending on his daily condition, there it is also possible to "eat alone". The anteroom is open to the adjoining common room. The common room with the central kitchen (E) is where all the clients living in the house come to "spend time together, cook or do household chores" (6). Adjacent to the common room and set aside is the dining room (F) where, depending on the clients' constitution, "they eat meals together or have table activities" (7). The dining room is directly connected to the exit and the inner courtyard (G). It spatially marks the end point of the building. From here, the client walks spatially "back in time" and starts a new space-related activity route (y_2-axis). In the inner courtyard, the client group "engages in activities outside the home, such as sports, games, exercising or walking to the workshops" (8).

The design criterion "spatial sequencing and repetition" aims to enable individuals with IDs and CBs to develop a sense of temporality by linking repetitive activities to a clear spatial structure (a sequence), thereby promoting autonomy.

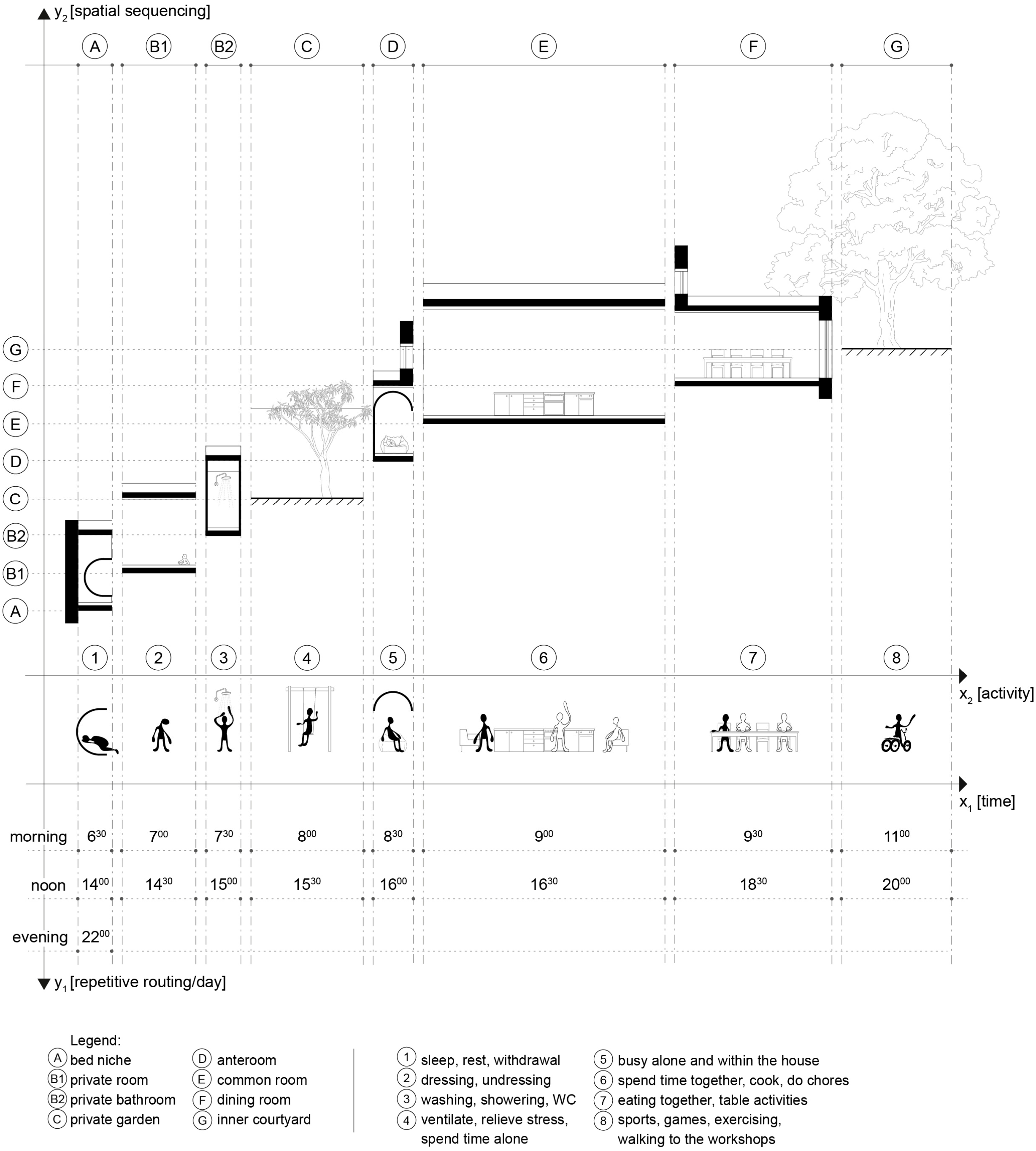

Figure 2. Diagrammatic representation of the first design criterion, "spatial sequencing and repetition". The section illustrates how the client experiences daily time-related activities ((1)–(8); x-axes) as a function of the spatial sequence ((A) to (G); y2-axis) and of the daily routine repetition (y1-axis).

3.2. Temporality through Privacy-Related Variation of Spatial Dimensions

The second design criterion, "privacy-related variation of spatial dimensions" specifies that the daily repetitive activities (daily routine) must be displayed in the spatial dimensions by reacting to the specific needs for privacy in individuals with IDs and CBs. This concerns the volume of space, and especially the room heights, but also the experienced density of space.

Since social behaviour is underdeveloped, the architecture of the residential building must shape the spatial dimensions in a way that enables the client to clearly recognise whether a certain activity takes place in the group (public), in indirect group contact (semi-public), or without group contact (private). To minimise abrupt encounters and confrontations or abrupt withdrawal within the client group, the architectural dimensions should provide a gradual (rather than abrupt) progression of the experienced privacy.

Figure 3 diagrammatically illustrates the design criterion "privacy-related variation of spatial dimensions". The longitudinal section shows how the client experiences daily time-related activities ((1)–(8); x-axes) in relation to the experienced privacy (y_1-axis) and as a function of the spatial dimensions (y_2-axis) that determine the privacy experience. The diagram reads from left to right: The client's bed niche is designed to have the smallest room volume with a low ceiling height by creating a bed alcove (cocoon) (A). It has the highest level of privacy. The client's bathroom and private room (B1 and B2) have small spatial dimensions with a normal ceiling height. Each of these spaces can be closed. Although this ensures full spatial privacy, the experienced privacy level is slightly lower compared to the bed alcove. The private garden (C) is directly accessible from the room. To guarantee privacy, it is naturally enclosed by the building. A maximum of one other client can use it. The individualised anteroom (D) is open to the adjoining common room and forms a space similar to a loggia. This means that both wall sides are tapered and the ceiling is lowered. The client should clearly recognise the spatial boundary at the transition from the private to the "public space" and feel optimally embraced and secure. The common room (E) has the highest ceiling height and creates a volume where clients and caregivers can be together in the smallest possible density. The room is "public", and the experience of privacy is relatively low. In the shared and adjoining dining room (F), privacy decreases close to zero. The ceiling height is the same as in the private rooms and the perceived density is maximal (x_2-axis). The public square, the inner courtyard (G), is encompassed by several residential buildings. It is used publicly (by other residential groups), but is also experienced as "protected".

The design criterion "privacy-related variation of spatial dimensions" aims to enable individuals with IDs and CBs to develop a sense of temporality by linking the need for privacy (which gradually varies in connection to repetitive daily activities) to spatial dimensions, thereby promoting autonomy. In this way, the architecture helps them to distinguish which daily activities are considered private and when they should "be functioning" in a group. This allows avoiding contact with the group when impulses for CB are triggered.

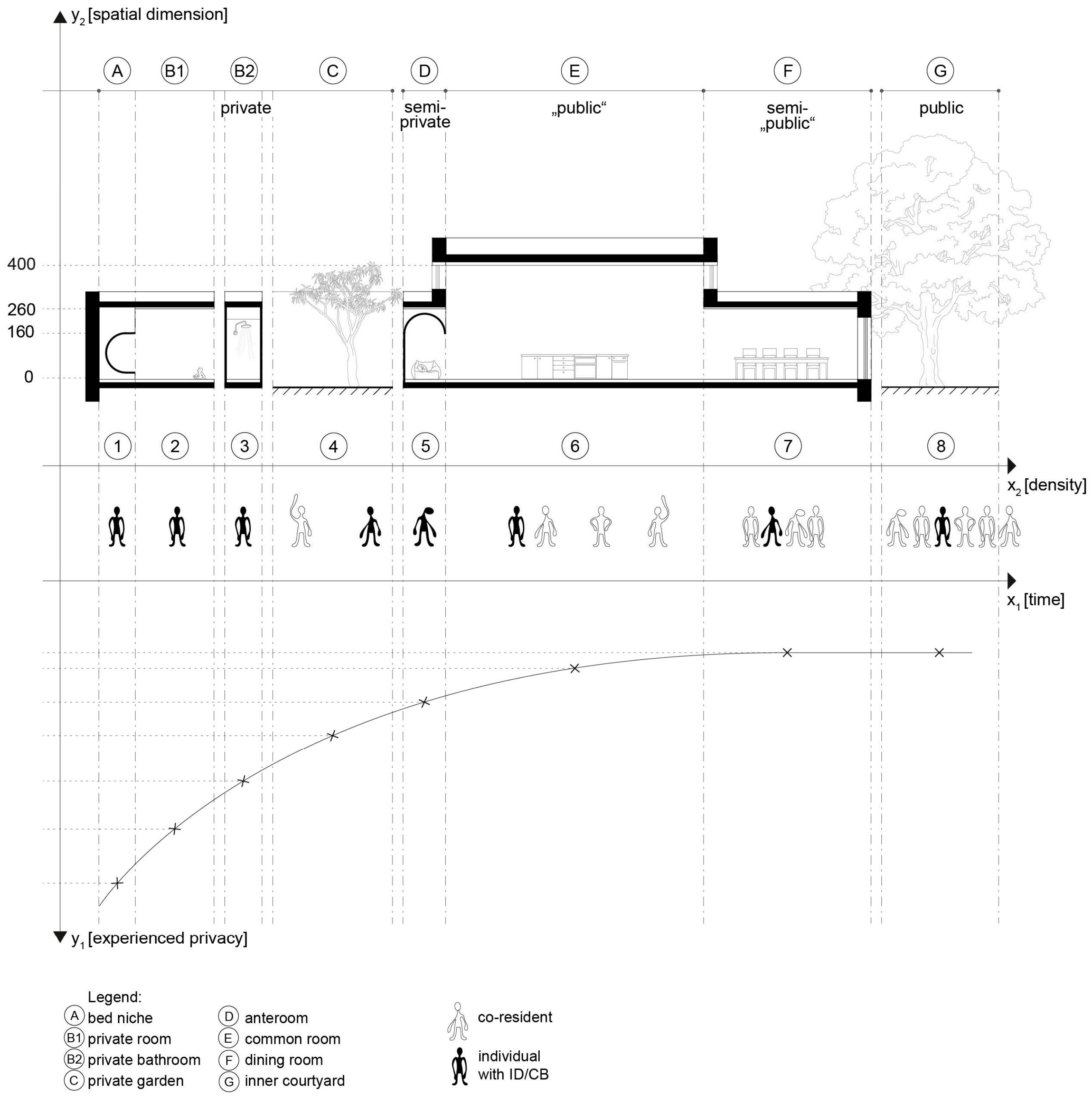

Figure 3. Diagrammatic representation of the second design criterion, "privacy-related variation of spatial dimensions". The section illustrates how the client experiences daily time-related activities ((1)–(8); x-axes) as a function of the spatial dimensions (y2-axis) and of the experienced privacy (y1-axis).

3.3. Temporality through Spatial Orchestration of Daylight

Daylight determines a person's circadian rhythm and is an important stimulator. However, for individuals with IDs, it can also be a factor triggering CBs. The third design criterion "spatial orchestration of daylight" assumes that different levels of stimulation are necessary for the individual activities within the daily routine. Therefore, the criterion specifies that the direction and the intensity of the daylight must respond to the specific activation needs of individuals with ID and CB, corresponding to the daily repetitive activities (daily routine). The architecture should react to the light changes throughout the day and simulate a natural rhythm of activation and regeneration for the clients. It should enable the client to experience the spatially created temporality by visualising the movement of light and shadow. Too much daylight or direct sunlight is controlled through mechanically and individually steered shutters.

Figure 4 diagrammatically illustrates the design criterion "spatial orchestration of daylight". The longitudinal section shows how the client experiences time-related activities ((1)–(8); x-axis) in relation to the experienced stimulation (y_1-axis) and as a function of the spatially directed daylight (y_2-axis) that determines the stimulation experience. The section reads from left to right: The spatial and "temporal" start of the building, the client's bed niche (A), has little to no access to daylight. The functions "sleep, rest, withdrawal" (1) are linked to maximum spatial regeneration and freedom from stimuli. In the private room (B1), daylight is permitted as a lateral light source to stimulate the client. Lateral means that the light does not fall frontally on the client's face when entering the room or getting out of bed. Frontal light stimuli can lead to CB. The private bathroom (B2) has no daylight. Actions on the body, such as washing or showering, are strong stimuli for the clients and additional triggers should be avoided. These rituals are also used to "cool down". In the private garden (C), directly adjacent to the private room, daylight maximises activation. The individual anteroom (D) doses the daylight to "below private room level", as it should be experienced as a transition zone from "private to public". It also provides a space for withdrawal to clients already at a high stimulation level but not able to disconnect from the group or the caregiver. The common room (E) adjoining the anteroom has the lowest possible stimulation through daylight. All activities linked to the presence of all clients and caregivers happen here (6). As the internal stimulation level is already high, the external stimuli must be minimised. Access to daylight should subsequently be as indirect and controlled as possible. In the adjoining dining room (F), the level of daylight and stimulation increases to the anteroom level. Both are at a maximum in the inner courtyard (G).

The design criterion "spatial orchestration of daylight" aims to enable individuals with ID and CB to develop a sense of temporality by linking the need for stimulation (which varies in connection to repetitive daily activities) to daylight. In this way, the architecture simulates a natural rhythm of activation and regeneration and enables the client to synchronise with it autonomously.

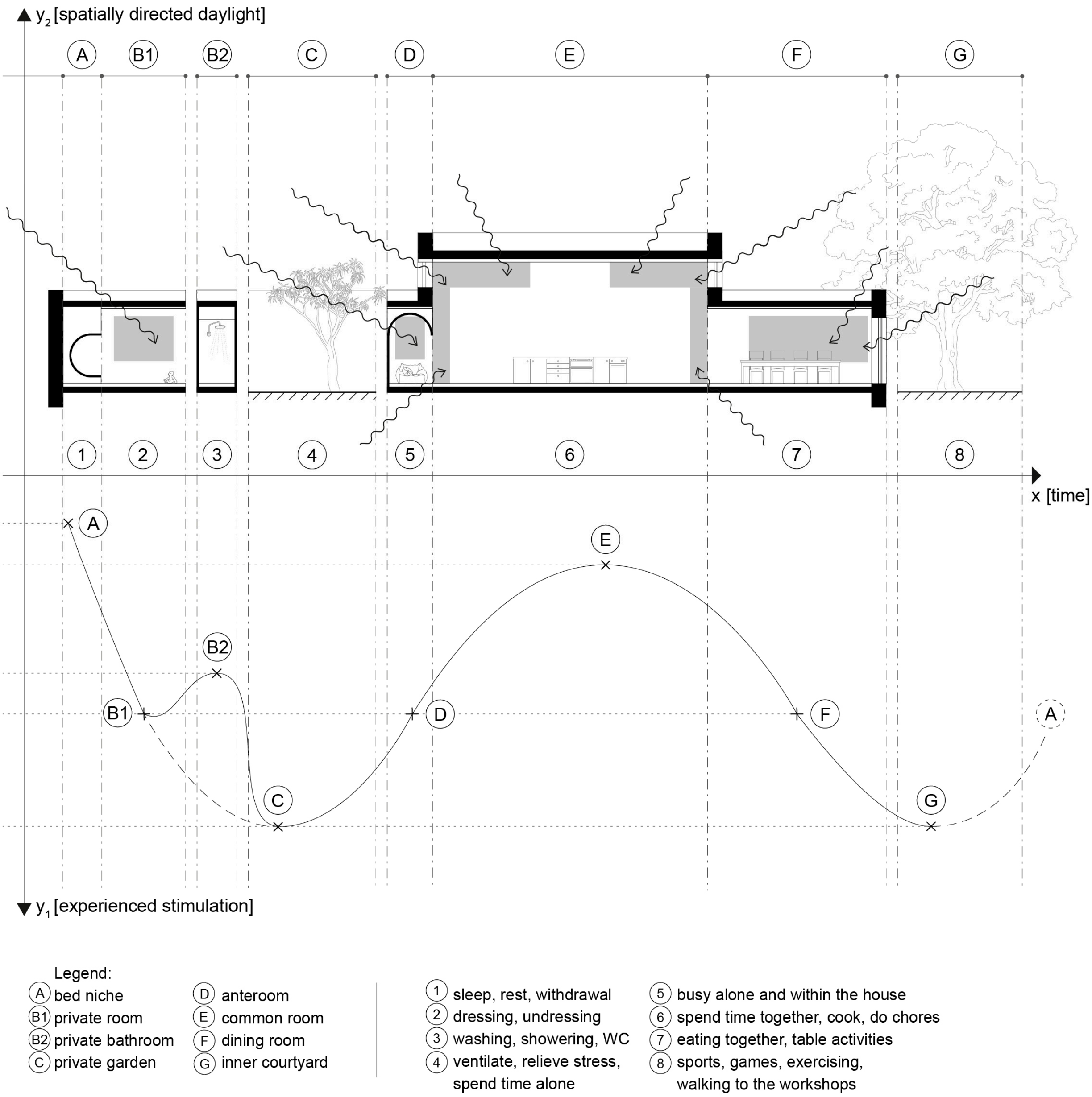

Figure 4. Diagrammatic representation of the third design criterion, "spatial orchestration of daylight". The section illustrates how the individual experiences daily time-related activities ((1)–(8); x-axes) as a function of the spatially directed daylight (y_2-axis) and the experienced stimulation (y_1-axis).

3.4. Temporality through Spatial Regulation of Emotional Proximity to the Caregiver

Individuals with IDs and CBs are strongly attached to their caregivers. They are the immediate—and usually the only—person with whom the clients experience security, relaxation, and reassurance. If the bond is loosened or broken, the frequency of CB increases. A close bond is also demanded spatially. Since there is a lack of transition spaces in current residential facilities (they only consist of a row of private rooms along a corridor and a big common space), the client and caregiver have to keep continuous contact. However, to enhance autonomy, the client must be able to carry out daily activities independently from the caregiver. The fourth design criterion, "constant emotional proximity to caregiver", specifies that, for the individual activities within the daily routine, different spatial distances must be created between the client and the caregiver without changing the perceived distance (emotional proximity).

Architecturally, this is achieved by ensuring sightlines between almost every location of the caregiver and the client inside and (to the) outside of the building. Private rooms and areas are opened in various ways to provide these sightlines. At the same time, safety needs to be guaranteed. Therefore, it must be ensured that the caregiver can reach the client within 30 s. Figure 5 diagrammatically illustrates the design criterion "spatial regulation of emotional proximity to caregiver". The longitudinal section shows how the client experiences his time-related activities ((1)–(8); x-axis) in relation to the emotional proximity to the caregiver (y_2-axis) and as a function of the spatial distance and sightlines to the caregiver (y_1-axis). The latter determines the experience of proximity. The diagram reads from left to right: when the client is located in certain areas at certain times, according to the daily route, the caregiver can maintain different distances to him. First in bed (A), then in the private room (B1) and bathroom (B2), in the private garden (C), and so on. At each point in time (and daily route of the client) there are at least three possibilities to be either very close to the caregiver or at a distance. The field with the symbolic figures below the x-axis shows the resulting high variance in proximity-distance regulation. The permeability of the building expressed in the numerous sightlines (b-b, b-c, b-a, a-e or d-c, d-e, d-f, etc.), ensures that the emotional proximity between client and caregiver remains constant over time (y_{2-} axis).

The design criterion "spatial regulation of emotional proximity to caregiver" aims to enable individuals with IDs and CBs to move freely in space regardless of the physical distance to the caregiver, thereby promoting their autonomy. In this way, the architecture helps the client to accept spatial distances from the caregiver and to regulate them independently. Ultimately, this could also relieve the caregiver and reduce the care intensity.

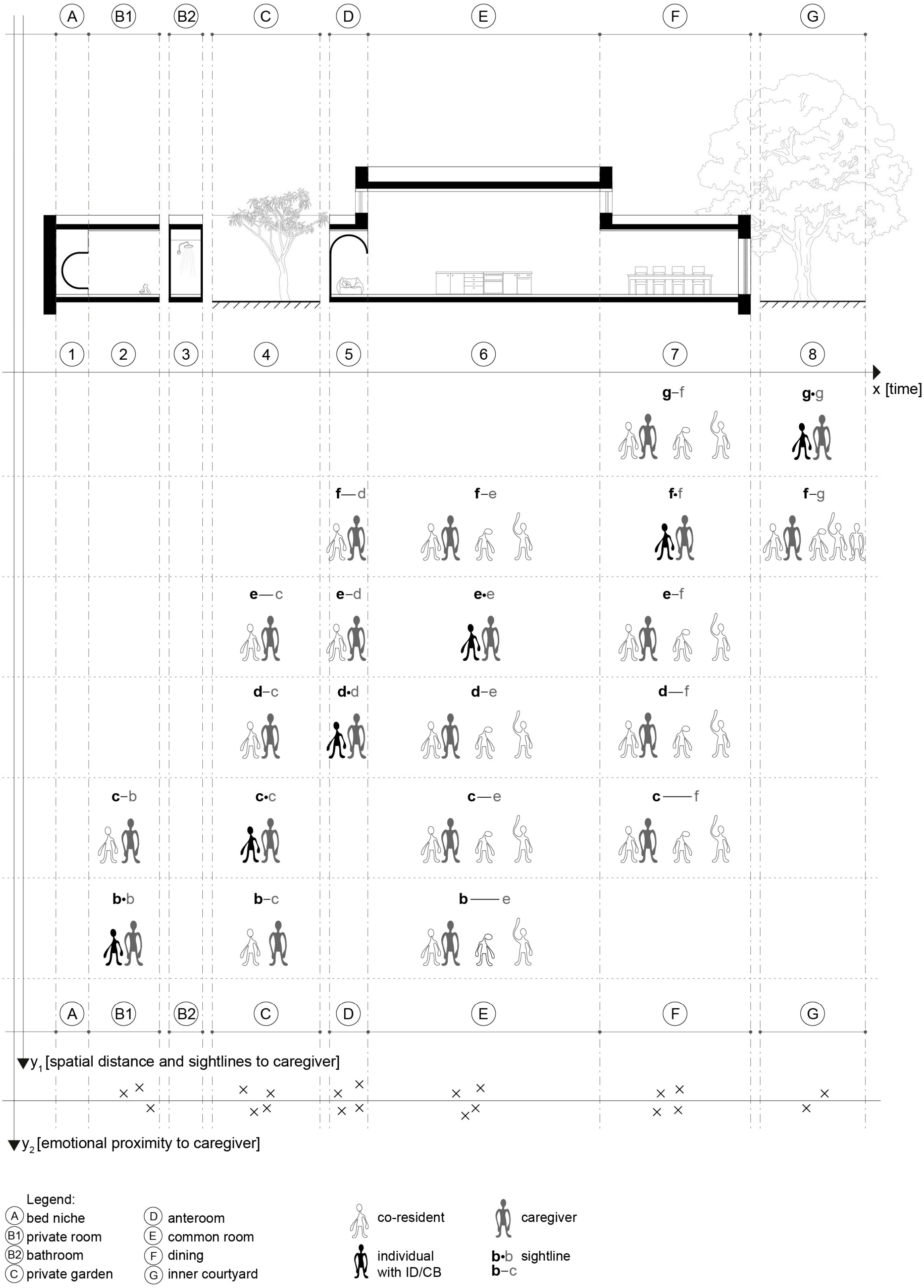

Figure 5. Diagrammatic representation of the fourth design criterion, "spatial regulation of emotional proximity to caregiver". The section illustrates how the individual experiences daily time-related activities ((1)–(8); x-axes) as a function of the emotional proximity to the caregiver (y_2-axis) and of the spatial distance and sightlines to the caregiver (y_1-axis).

3.5. Application of the Four Design Criteria to Architecture: IPSE-Plus Typology

Applying the four design criteria to a residential building (long-stay facility) for five clients and their caregivers leads to a new typology of therapeutic architecture for individuals with IDs and CBs, as shown in Figure 6. We coined it as the IPSE-plus typology. The architecture of the IPSE-plus typology is mainly characterised by three aspects: (1) the cross-shaped floor plan, (2) the absence of corridors and hallway structures, and (3) the personalisable and semi-open anterooms.

The cross-shaped floor plan (Figure 7) allows each client to move through the building following their daily routine on an optimally individualised route. If CB develops in one, the experience of temporality (as a temporal sequence of spatial sequences) of the other clients is hardly affected. The IPSE-plus typology is a symmetrical, single-story building with a gross floor area of around 330 m^2. It is accessed from the side, between the two wings of the cross, which primarily contain the communal functions (dining room, client bathroom, snoezelen room, laundry room, and food storage). The entrance leads directly into the heart of the building: the large common room with a central, semi-open kitchen. While the wings of the cross have normal ceiling heights (around 2.6 m), the central core has a ceiling height of around 4 m (Figure 6). In this area, mainly used as a group gathering room, daylight enters indirectly from all four directions through skylights.

At the same time, the symmetrical floor plan is illuminated via three wing axes. The lateral window openings in the anterooms and the small dining room also provide indirect light to the interior. Similar to a sundial, the layout of the three daylight sources creates wandering lights and shadows on the walls (Figure 8). Temporality—as required—can be experienced spatially by the clients.

The cross-shaped floorplan consists of four wings. Three of them accommodate the five private rooms, each with an individual bathroom (shower, washbasin, and toilet). The two bathrooms in one wing are arranged in a way that provides additional acoustic isolation between the private rooms. The private rooms are divided into a low-noise sleeping area with a lowered ceiling (bed alcove), an open area, a wall closet, and an anteroom. From the room, the client has direct access to the private garden, shared with the client in the second wing. The clients and the caregivers can see the common room and the central kitchen from the garden, the private room, and the anteroom. Therefore, the spatial arrangement of the IPSE-plus typology allows one caregiver to look after at least two clients at the same time, if the daily routines of two clients start at different times.

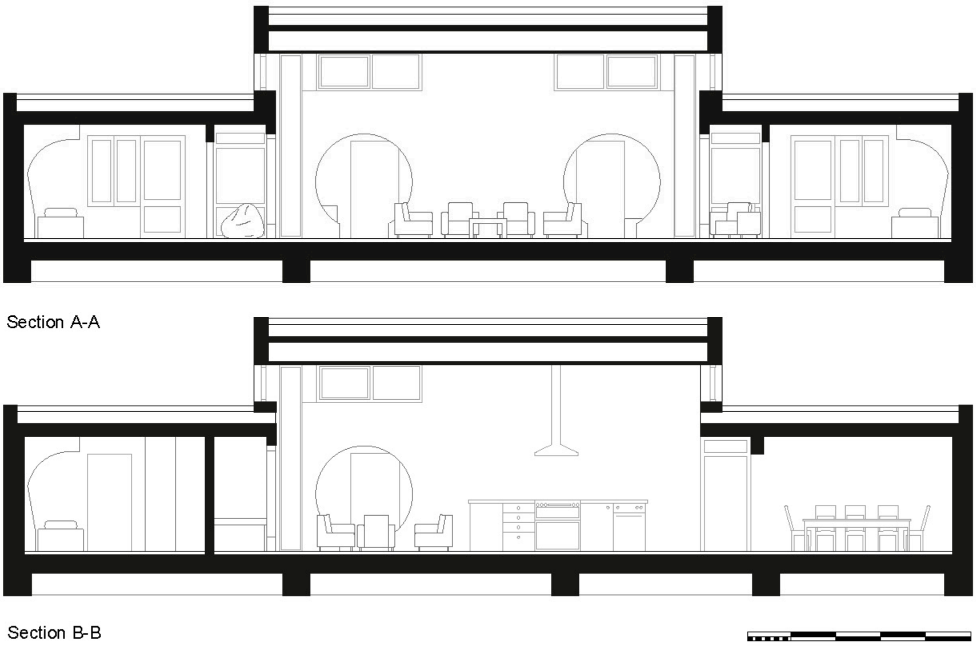

Figure 6. IPSE-plus typology: exterior view and sections. © Kopvol architecture & psychology.

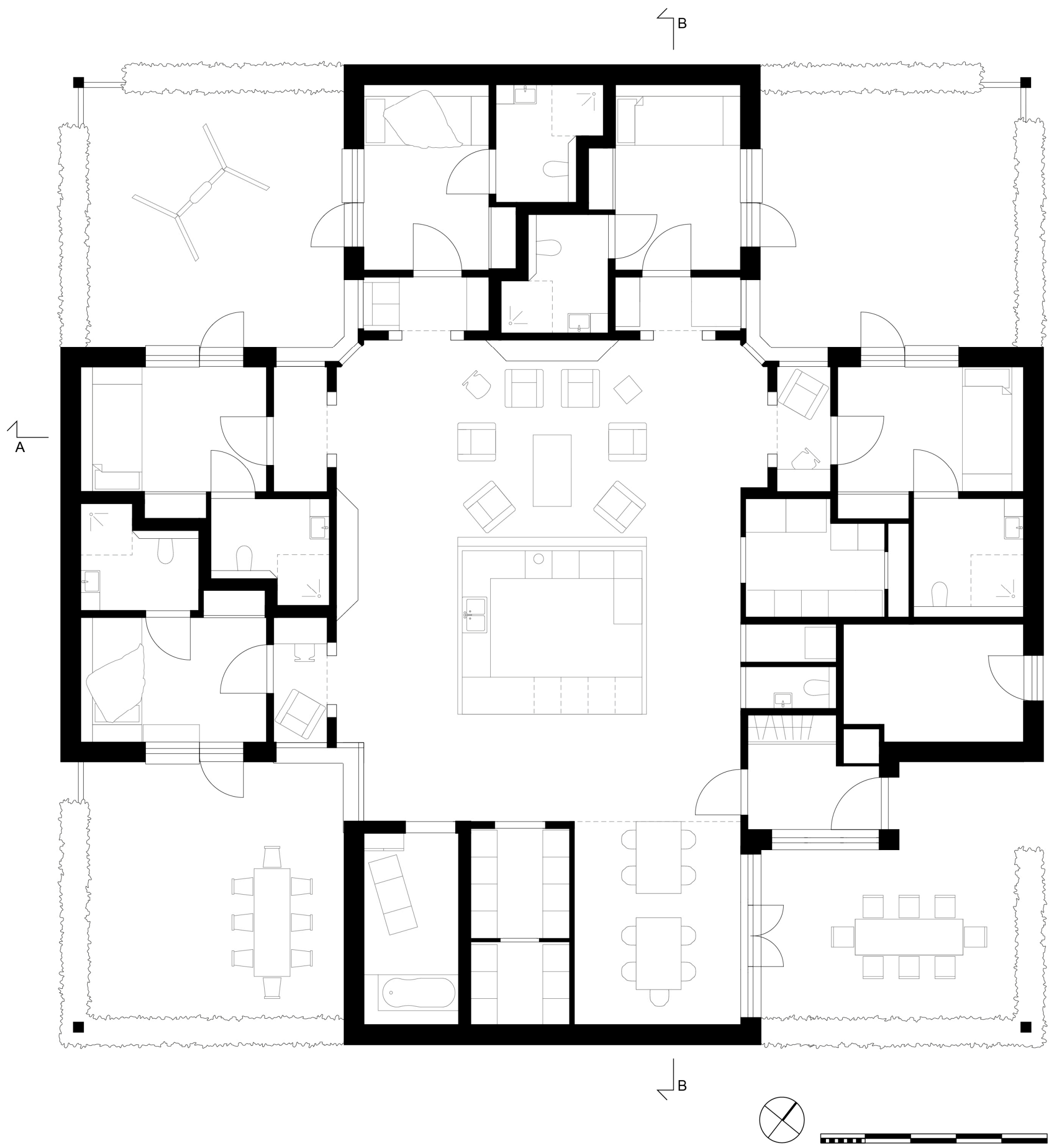

Figure 7. IPSE-plus typology floor plan. © Kopvol architecture & psychology.

The anterooms form the transition space between the private areas of the clients (private rooms and gardens) and the central space as well as other communal functions. The transition is formed by a circular wall opening. This allows the clients to feel embraced and protected and minimises the effect of stimuli from the group. At the same time, the stimuli resulting from the individual design of the anteroom (with furniture, wallpaper, and personal accessories) only have a minimal impact on the group and the atmosphere of the common room (Figure 8). Even when the caregiver is in another room and the client is in the anteroom, they continue to have maximum visual contact. Thus, the emotional closeness between client and caregiver can be kept constant over time—depending on requirements—and the client can use the anteroom when in different moods (high or low impulse levels). At present, most facilities do not have any transition zones, or they are designed as counterproductive corridors. Therefore, when impulses for CB occur, the client must immediately leave the group accompanied by one or more caregivers.

Figure 8. IPSE-plus typology: view from the common room. © Kopvol architecture & psychology.

4. Discussion

As a result, our study described four design criteria that contribute to an autonomy-promoting temporality in individuals with IDs and CBs: (1) spatial sequencing and repetition, (2) privacy-related variation of spatial dimensions, (3) spatial orchestration of daylight, and (4) spatial regulation of emotional proximity to the caregiver. The hypothesis of using architecture to promote temporality in clients with IDs and CBs has proven to be potentially effective in designing a therapeutic environment. Applying the four design criteria to a residential building (long-stay facility) for five clients and their caregivers led to a new typology of therapeutic architecture for individuals with IDs and CBs, which we coined as the IPSE-plus typology. The architecture of the IPSE-plus typology is mainly characterised by three aspects: (a) the cross-shaped floor plan, (b) the absence of corridors and hallway structures, and (c) the personalisable and semi-open anterooms.

The American Association on Intellectual and Developmental Disabilities (AAIDD) defines individuals with Intellectual and Developmental Disabilities as individuals with significant limitations in intellectual functioning and adaptive behaviour [90], referring to conceptual skills such as the previously described notion of time perception. The AAIDD recommends providing individualised systems of supports for individuals with IDs. This means evaluating the specific needs of the individual and creating strategies and services that better answer their needs, rather than moulding the individual into existing service models. The system of supports is defined as strategies aiming to enhance, among others, one's independent functioning [90]. Adapting the living environment is an important tool in implementing the system of supports. It acts as a mediator between the multidimensional aspects of ID and individual functioning, enhancing adaptive behavioural skills. In 1973, Lawton and Nahemow already described adaptive functioning in the environment to be dependent on the interaction between stimuli in a person's physical and social environment and the individual's competence in meeting these demands, which is shaped by such personal characteristics as physical health and cognitive and perceptual abilities [91]. Accordingly, our study was concerned with the scientific derivation of design criteria for residential architecture that impact CB by promoting a sense of time and fostering the development of autonomy. In the following section, the results of the study are discussed in the context of international research and theories.

4.1. Spatial Sequencing and Repetition for Individuals with ID and CB

Our research indicates that clients' daily routines should be reflected in a clear and repetitive spatial structure (sequence) of the residential architecture. This structure should allow a minimal overlap of the clients' individual paths to minimise conflictual encounters and to emphasise the experience of undisturbed linearity on the individual routes.

Following Sörgel [92], the continuity of a room is a temporal, successive, and perceptible sequence. This temporal sequence can be perceived as a spatial sequence and ultimately as a unit. Schmarsow [93,94] already described space as a function of time. He postulated that a space can only be experienced through movement in time. Our findings demonstrate that this postulate also applies in the opposite direction: the repetitive experience of a spatial sequence and the specific activities along it can induce a sense of temporality in individuals with an underdeveloped time perception.

In their systemic review, Ellis and Yi [95] identified 32 articles on evidence-based design (EBD) and evidence-based practice (EBP) dealing with environmental design strategies that assist individuals with Intellectual and Developmental Disabilities. These strategies should help individuals with IDs to understand, recognise, and regulate their environment, and to respond to and cope with its stimuli. Their analysis suggests that efficient circulation, preferably one-way circulation and clear paths minimises disruptions [95]. Additionally, three of fourteen studies on CB reveal that a clearly structured layout of the built environment plays an important role in preventing CBs [96]. A concept analysis revealed that routines in institutional care settings generally foster adaptations. They are especially adaptive in stressful situations or changes. Routines seem to coordinate and organise activities along different axes, e.g., time or physical contexts [97]. It is well documented that routines are important for individuals with Autism Spectrum Disorders (ASD) and CBs since routines foster predictability in their daily lives [98]. A scoping review by Roos et al. [70] distilled environmental factors that impact stress for autistic individuals and those engaging in CBs. Among those factors are predictability and a clear, visually calm layout of the space [70]. Qualitative research on 168 [99] and a quantitative controlled intervention study on 12 [100] individuals with Intellectual and Developmental Disabilities described spatial sequencing as highly relevant for stress regulation and the resulting CBs. A variety of scoping reviews reveal that spatial sequencing should be designed according to the daily routine [70,96] and repetition can help clients to better understand their environment [95].

Although spatial sequences and clear, time- and activity-related structures are likely to be helpful for individuals with IDs and CBs, most residential buildings are not designed accordingly. Either functions are scattered and not sequenced, or they are bilateral and not linear. This means that the clients are always "fixed", either in a communal area or in a private area (in close connection to their caregiver), without any spatial gradation. These predominant layouts are characterised as institutional and non-supportive contexts [77].

4.2. Privacy-Related Variation of Spatial Dimensions

Our research indicates that clients' daily routines should be reflected in spatial dimensions that react to the specific needs for privacy in individuals with IDs and CBs. This concerns the space volume, especially the room heights, as well as the experienced density in a certain space. To minimise abrupt encounters and sudden confrontations within the client group, the architectural dimensions should provide a gradual (rather than abrupt) progression of the experienced privacy.

De Long conducted precise observations under controlled conditions on how different individuals experience the passage of time when interacting with environments of different scales [101]. He demonstrated that the scale of the environment influences time perception. However, it has to be mentioned that subjects were asked to project themselves into the environment by identifying with one of the human figures placed there. Furthermore, electroencephalography studies (EEG, measuring the brain activity) conducted as part of de Long's research seem to indicate that the mediating mechanism is the brain itself. The brain's function to speed up time is directly proportional to the environmental scale [102]. At the same time, being in a closed room without distraction subjectively elongates time. This can result in feeling stressed. Contrary, big windows emphasising spaciousness let time pass faster [103]. A closed room without any stimulation can extend the subjective feeling of time passing by [103].

Our results suggest letting the clients gradually walk through space and time using the described interdependency of spatial dimensions and time while changing the experience of privacy. In this way, transition spaces are created. From their systematic review, Ellis and Yi [95] concluded that transition zones could assist individuals with IDs to make sense of their environment. Being able to see co-residents and having an overview of the building, supports the clients in predicting their environment and decreases stress [104]. Half walls and preview windows are suggested to increase visibility [70,95]. Being able to access the normal functional areas via transition spaces or zones correlates with participation in household tasks and general activities [105].

Our results suggest a privacy-related variation of spatial dimensions. In this way, the residential building provides different volumes, which are likely to have a positive impact on individuals with IDs and CBs [106]. In a longitudinal study of 268 individuals with IDs, being in an environment that showed environmental diversity was associated with greater adaptive behaviour [107]. As exposure to undesired and extended social situations may cause stress, a diversity of spaces is desired. These could include social (general purpose rooms, dining areas, niches, or alcoves within corridors), quiet, and ample personal areas [95].

Our study reveals that, apart from the diverse spatial design inside the building, providing access to nature (as part of the architecture) creates the opportunity to design on different scales and dimensions. Outdoor areas were highly valued by residents, their families, and staff in a descriptive study [108]. They were described as calming, recreational spaces and as a link to the wider community [108]. A case study redesigning rooms for three individuals with IDs and CBs found that a connection to the outdoor areas improved the well-being and quality of life while decreasing emotional and behavioural problems [69]. Quantitative studies on healthy students show an elongated time perception when exposed to nature [109,110]. At the same time, being exposed to nature reduces stress and improves the mood state of a person in comparison to being enclosed in a built environment [109]. Access to nature is also likely to have a positive influence on individuals with IDs [108], as are a natural view and lighting [6,95].

Although the variety of spatial dimensions and their relation to the needs of individuals with IDs and CBs are likely to be helpful, most residential buildings are not designed accordingly. Due to the high demands on vandalism resistance, hygiene, and minimal budgets, buildings are usually designed uniformly and monotonously. They are characterised as institutional [77], and their aesthetic counteracts the concept of temporality.

4.3. Spatial Orchestration of Daylight

Our research indicates that daily routines in long-stay facilities should be reflected in the spatial orchestration of daylight that reacts to the specific needs for stimulation and regeneration in individuals with IDs and CBs. This also concerns the circadian rhythm of the individuals.

The early experiments of Aschoff revealed the correlation of exposure to natural time cues, e.g., access to daylight and time perception. His study with individuals living in underground isolation chambers for several weeks demonstrated that humans become unaware of the real passage of time, overestimate time intervals, and lose interest in it [111].

Apart from extreme experimental conditions, each environment presents stimulation. If it over- or understimulates individuals with IDs, this could result in CB [95]. In particular, the orchestration of daylight and its capability to stimulate several senses at once is important, because individuals with IDs are likely to be highly sensitive to sensory experiences [104]. Several studies recommend low-arousal visual, auditory, tactile, and olfactory environments [95]. Understimulation as well as overstimulation should be avoided when building for individuals with IDs [74,95,96], since both can result in problem behaviour.

At the same time, a closed room, without any stimulation, can extend the subjective feeling of time passing [103]. It might be possible that understimulation creates a feeling of time passing slowly and results in boredom. Therefore, multiple sensory options and activation should be included [95]. Similar findings were reported in the scoping review of Casson et al. [96], where sensory experience and stimulation were important features to address in the housing design for individuals with IDs and Complex Behavioural Needs [112]. Variability and stimulation were associated with better adaptive behaviour [107]. Recognisable design features, such as environmental cues or colour contrast, are also suggested by the literature [95]. Natural lighting should be included [6,95] to maintain normal sleep patterns [106]. Findings in patients with depression also suggest that access to natural daylight has a positive effect. Patients in hospital rooms facing southeast were discharged earlier than patients in rooms located on the north-western side of the building [113]. External views from indoor spaces were associated with a sense of the future and higher optimism [27]. Having a sense of the future means sensing temporality.

Although including daylight stimulation of circadian and activity-related rhythms for individuals with IDs and CBs through architecture is likely supportive, most residential buildings are not designed accordingly. They are built without paying attention to different levels of stimulation and regeneration needs. Most institutions include artificial lighting rather than natural lighting and are characterised as institutional [77]. Their aesthetic counteracts the concept of temporality.

4.4. Spatial Regulation of Emotional Proximity to Caregiver

Our research indicates that daily routines in long-stay facilities should be reflected in the spatial regulation of the actual distance between an individual with ID and CB and his or her caregiver. The regulation should result in a high variety of possible distances within a certain timespan and, at the same time, in constant emotional proximity, which is described as a profound need of individuals with IDs and CBs. Sightlines and open connections within the building are possible tools to guarantee different degrees of spatial connection and create a sense of safety and support. As a result, these tools will foster the autonomous use of the space and performance of daily activities.

Experts in the field often explain that in a long-stay facility, the relationship between individuals with severe IDs and the caregiver is comparable to a parent and child when hospitalised. In 2010, Koppen and Vollmer first described the parent–child–patient relationship in the hospital environment [114]. Their observational study on long-term hospitalised children with cancer indicated that parents' and children's well-being is correlated with the provided variety of spatial distance between them. As a result, in the Netherlands, special parent–child–patient units were designed to tackle the challenges of sharing a hospital room, while maintaining autonomy and privacy [115,116]. In 2024, in a controlled trial, flexible distance and emotional proximity were proven to be elementary environmental factors in creating health and autonomy-supportive environments for hospitalised children and their parents [117].

In their case study of redesigning rooms for three individuals with IDs and CBs, Roos et al. [69] discussed that direct sightlines from the client's room to a spot where caregivers are located could be explanatory for improved well-being and quality of life. The same study showed a decrease in emotional and behavioural problems of the clients. Visual access in the built environment for individuals with IDs is described as supportive by Ellis and Yi [95] and Roos et al. [104]. They suggest that a visual and auditory connection between residents of very intensive care units and their care providers is crucial for both the residents and staff [104]. Staff members report that being able to see and hear their clients helps to detect signs of stress and to intervene at the onset of CBs. The ability to regulate the distance from other individuals is also concluded as important [70], as a closed environment can cause aggression [74].

Although the spatial regulation of distance and emotional proximity to the caregiver are likely to be helpful for individuals with IDs and CBs, most residential buildings are not designed accordingly. In these facilities, the rooms are either closed, with a lack of sufficient connectivity and sightlines, or are placed bilaterally. When closed, this could disconnect daily activities from the necessity of total proximity. This results in clients being in either a common or a private area, but constantly in close connection to their caregiver. These predominant layouts, in which transition spaces are missing, are characterised as institutional [54] and counteract autonomy development.

4.5. The IPSE-Plus Typology

Applying the four design criteria to a residential building (long-stay facility) for five clients and their caregivers leads to a new typology of therapeutic architecture for individuals with IDs and CBs, as shown in Figure 6. We coined it as the IPSE-plus typology. The architecture of the IPSE-plus typology is mainly characterised by three aspects: (1) the cross-shaped floor plan, (2) the absence of corridors and hallway structures, and (3) the personalisable and semi-open anterooms. Our findings indicate that the cross-shaped floor plan is the most effective and natural way to assemble five individual, spatially-sequenced routes with maximum privacy and the least disruption between clients. Placing the kitchen at the centre of the common area ensures a visual and spatial connection for the residents. The application of all the design criteria, especially the necessity of clear sightlines and close proximity of the caregiver to the client, resulted in this central space. At first, it can be associated with a panopticon-type of spatial intervention, where the observer is in the centre of the space and the observed are dispersed around it. Initially, the panopticon was designed as a way to watch and control the inmates, without them knowing if they were watched or not [118]. Thus, it is associated with loss of privacy, control, and intimidation. However, when control and connection are a need of the observed party, the placement no longer carries the same meaning. In order to feel safe, the observed, in our case the clients with IDs and CBs, need to have constant emotional proximity to their caregivers. This centralisation ensures a clear sightline and fulfils the need of both the caregiver to see and react and the client to see and ask for help. Having their private rooms around the central space, the clients have an overview of the area which helps them decide whether they can face the existing stimuli or not.

The IPSE-plus typology suggests incorporating customisable and semi-open anterooms. The clients can individually choose the design, picking out different wallpapers, furniture, and personal accessories. A scoping review by Roos et al. [6] finds that personalisation positively affects health, behaviour, and quality of life (see also [106]). Based on research and practice literature, environments should meet the needs and preferences of the individual concerning space, aesthetics, sensory preferences, noise, lighting, state of repair, safety, and use of equipment [112]. Roos et al. [69] presented three study cases of room redesign, answering the case-specific needs of individuals with IDs and severe CBs residing in long-stay facilities. It was observed that the well-being of the clients increased six months after the redesign (t1), as well as at the follow-up (t2). Quality of life increased in two of the three cases. Emotional and behavioural problems decreased in two of the study cases, with significance in one during the follow-up (t2). It has to be noted that the data was collected retrospectively for the six months before the redesign (t0) and six months after the redesign (t1), with a twelve-month follow-up (t2). Redesigning the rooms appropriate to the client's needs, and the following improvements, made the staff's environment more safe, pleasant, and less stressed. Additionally, it made them more aware of their client's specific conditions [69]. Contrary to the personalisation of the private rooms, in the IPSE-plus typology resulting from our study, the anterooms take the role of ensuring a gradient stimulation for the clients. Individuals with IDs show high sensory sensitivity [104]; therefore, low-arousal visual, auditory, tactile, and olfactory environments are recommended [95].

4.6. Study Limitations

This study has several limitations. First, as the database for the development of quantitative testing was not sufficient and was difficult to generate in the target group, the study had to be designed qualitatively and, due to this, with a low sample size. As this is an understudied target group, the scarce research and literature resources available limited the discussion of our findings. Second, no socio-demographic or medical data were collected from the sample (people with IDs and CBs).In addition, no socio-demographic data on the other study participants (beyond the inclusion criteria described in the methods section) were collected. Further research should pay more attention to these analytical key variables and use a higher sample size. Third, the hypothesis that the application of the evidence-based design criteria in a long-term residential building may increase the autonomy of the target population and, therefore, lead to a reduction of CB and intensity of care is not definitively confirmed. Further quantitative research on the impact of the built environment on individuals with IDs and CBs should be conducted. The herewith identified design criteria could e.g., form the starting point of a pre-post evaluation of long-term care facilities in an EBD-controlled trial, level 4.

5. Conclusions

In conclusion, the design criteria resulting from our study could provide an important basis for the architectural design of long-stay facilities for individuals with IDs. The hypothesis of using architecture to promote temporality in clients with IDs and CBs has proven to be potentially effective in designing a therapeutic environment. Although the authors have conducted previous work on architectural temporality in the severely ill and their built environments, to our knowledge, this is the first study to show that utilising the connection of space and time perception could potentially impact behaviour—in our case, the autonomous exercising of daily routines in people with profound IDs and CBs. It should be noted, however, that the evidence was derived from a qualitative study design. Under these preconditions, the hypothesis that the built environment can act as a co-therapist to reduce CB, impulse control deficits, and high care intensity could also be confirmed. Conclusively, our study provides valuable data on how long-stay facilities should be designed in the future. It contributes to closing the knowledge gap in evidence-based design for individuals with severe and profound IDs and CBs. Nevertheless, further research is needed on this topic as quantitative data are required to definitively confirm the hypothesis that fostering the sense of temporality through architecture leads to a measurable therapeutic increase in autonomy.

Author Contributions: The authors contributed to this study's design, data analysis, representation and interpretation. T.C.V. wrote the first draft of the manuscript; G.K., L.S., and C.I. reviewed and edited the manuscript; G.K. and C.I. did the visualisations. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by Ipse de Bruggen, Zwammerdam.

Informed Consent Statement: Informed consent was obtained from all subjects or legal caregivers involved in the study.

Data Availability Statement: Data are contained within the article.

Acknowledgments: From the bottom of our hearts, we thank Ipse de Bruggen for the opportunity and freedom to combine the design for their VIC units with an EBD study approach. We would especially like to thank the contributing team members for their professional support and expertise.

Conflicts of Interest: The authors declare no conflicts of interest. Kopvol architecture & psychology was commissioned to design long-stay facilities for individuals with severe and profound Intellectual Disabilities and Challenging Behaviour (VIC units) for Ipse de Bruggen. It was disclosed and transparent to all parties at any time that the design would be developed through an evidence-based design research approach. Ipse de Bruggen supported the study by giving access to their clients and experts and by organising the interviews and focus groups. The organisation had no role in the design of the study; in the collection, analysis, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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