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Inside outside: how the outdoor environment affects patients' physical activity in a rehabilitation center

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Abstract: People in rehabilitation have been found to be motivated to be physically active by accessible and attractive outdoor environments, both vicinity of healthcare facilities and in the larger neighborhood. Nevertheless, even when available, outside space is not always optimally used. We aim to gain insight into how the outdoor environment of a rehabilitation center, on and beyond its premises, hampers or supports patients to be physically active. We conducted a qualitative ethnographic study informed by quantitative physical activity data. Semi-structured and walking interviews with 16 patients from one rehabilitation center were supported by output from activity trackers. Two focus-group interviews with four nurses and a physio- and an ergo-therapist provided extra perspectives. All data were inductively analyzed guided by a grounded-theory based approach. An analysis of sensory information, affordances and meaning making showed a wide variety in the roles the outdoor environment plays in patients' physical activity, both inside and outside the building, ranging from patients travelling to near villages to others staying inside all day but enjoying the view when walking to the end of the hallway. Concrete destinations motivate patients to go outside and be physically active, but also smaller interventions like avoiding even the smallest physical boundaries, facilitating visual control, and providing psychological support have a positive impact. If a rehabilitation center is to encourage physical activity amongst patients, inside and outside, it is important that inside and outside spaces are connected physically, visually, and psychologically.

Keywords: experience of space, healthcare design, outdoor environment, physical activity, rehabilitation center,

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1. Introduction

Ever since Ulrich's (1984) study pointing at how a view on green affects patients' recovery, the presence of nature has been identified as an important quality of a healing environment (e.g. Huisman et al., 2012; Ulrich et al., 2008; Zhang et al., 2019). Although hospital outdoor space impacts on users' physical, emotional, social, and spiritual needs so far it is mostly considered as residual space to support medical activities (Djukanovic

et al., 2017). Available outdoor spaces are mainly intended for passive use, i.e. sitting and enjoying the greenery. A literature review (Weerasuriya et al., 2019) foregrounded as factors that affect accessing green spaces around a rehabilitation hospital (1) awareness, (2) accessibility, (3) comfort, (4) flora and foliage, (5) views, (6) water features, (7) sun, rain, fresh air, and wind, (8) animal life, (9) diverse textures, heights, and shapes, (10) lawn, (11) natural versus artificial materials, (12) rest areas, (13) shade, (14) private areas, (15) play equipment, and (16) safety. In most but not all situations, the former three were considered as barriers, the latter thirteen as facilitators (Weerasuriya et al., 2019). Studies about the physical (built and green) environment in relation to patients' physical activity in rehabilitation are few. Those that exist mostly focus on the potential of the indoor environment -communal areas, patient rooms, and hallways- to support or hinder the rehabilitation process (Colley & Zeeman, 2020; Law et al., 1996) by enhancing patients' well-being and safety, and staff's safety and effectiveness. Access to outdoor areas is mentioned as a spatial quality adding to patients' well-being in rehabilitation (Killington et al., 2019).

Physical activity benefits the functional recovery and symptom management for a variety of rehabilitation patients, be it people with Multiple Sclerosis (e.g. Fortune et al., 2020), stroke (e.g. Simpson et al., 2021), or locomotor issues (e.g. Papalia et al., 2020). A recent study on the experience of outdoor space in a rehabilitation center (Tseung et al., 2022) pointed at how outdoor spaces help patients focus on life beyond illness, the role of design in facilitating patients' access to outdoor space, and the benefits of programming activities outside for healing and recovery. Yet, neither of these studies make an explicit connection between (use of) outdoor space, physical activity in rehabilitation, and its impact on patients' health and well-being.

As illustrated above, the presence and use of outdoor space can have a positive impact on health and well-being of patients. Physical activity is beneficial for functional recovery and symptom management for a variety of rehabilitation patients (e.g. Fortune et al., 2020; Papalia et al., 2020; Simpson et al., 2021). Connecting the benefits of accessible outdoor space and physical activity with how the organization of care in rehabilitation is approached shows potential to improve patients' health and well-being.

In the context of this paper, we aim to gain insight into how the outdoor environment of a rehabilitation center hampers or supports patients to be physically active. To this end, we analyze data collected in an overarching ethnographic study -about what patients in a rehabilitation center considered physical activity and what affects it- with a focus on the outdoor environment. The insights gained are discussed in relation to literature about the role of the physical environment in rehabilitation, both inside and outside. We conclude that for the outdoor environment of a rehabilitation center to encourage patients being physically active, inside, and outside, a visual, physical, and psychological connection between inside and outside spaces is important.

2. Theories and Methods

Patients' experience of their physical activity in relation to the built environment is personal and constructed through their interactions with others and the environment. Our study therefore aligns with a constructivist paradigm (Crotty, 1998), as it focuses on interactions -in this case between patients' experience of physical activity, their actual activity, and the built environment. Instead of beginning with a theory and testing a clear hypothesis, we begin with an examination of the empirical world (Esterberg, 2002).

The study took place in a free-standing rehabilitation center situated in a green environment (Figure 1), affiliated with a general hospital in a nearby town. The center is surrounded by different types of housing for people with an impairment (mostly Multiple Sclerosis), ranging from group residences to family houses. Near the center there is an animal park with farm animals and a small forest with paved tracks.



Figure 1. Aerial view of the rehabilitation center and its surroundings (source: open streetmap, with additions by the first author)

In total 16 patients with various diagnoses and various abilities to move around the rehabilitation center and its surroundings, were recruited (Table 1), between October and December 2019. Based on the criteria of being inpatients in the center for at least a week and the ability to participate in a face-to-face interview, head nurses provided a list of possible candidates. The first author (henceforth ‘the researcher’) approached each of them, briefly explained the aim and approach of the study and, if a patient agreed, organized the further steps of the study in dialogue with the participant. Patients’ participation in the study consisted of a semi-structured interview about their physical activity and the built environment, wearing an activity tracker for 48 hours, and optionally keeping a diary or documenting their physical activity and/or the built environment through pictures. After two days a follow-up interview took place during which information from the activity tracker (and the diary and/or pictures) was discussed. With participants who liked, we did a guided tour lead by the participant to show the researcher the places discussed during interviews (see Table 1 for more info on participants and applied methods). The combined interviews lasted per person between 30 minutes and 1 hour and 21 minutes with an average of 58 minutes.

Additionally, two online focus-group interviews were conducted with care professionals, one with the head therapists (of physiotherapy and ergotherapy, $n=2$), the other with the head nurses of the four wards ($n=4$) respectively in July and December 2020. Each lasted approximately 1,5 hours.

The interview guide for the first semi-structured interview was based on previous experience (with qualitative research about the built environment in other healthcare contexts), insights from preparatory observations, and relevant literature.

Participating patients’ physical activity was registered based on their bodily position (lying down, sitting, or moving) and intensity of movement. To do so we used Axivity AX3 activity trackers (Axivity, 2015). The approach was informed by the outcomes of a pilot study (Annemans et al., 2020).

Interviews and guided tours were audio-recorded, transcribed verbatim and pseudonymized. The data of the activity trackers were processed in MATLAB (2019). The information collected through the activity trackers, the diaries, and the pictures is not analyzed by itself but integrated in the analysis of the interviews in which they are discussed with the participants. Transcripts were inductively analyzed according to a grounded-theory based approach (Dierckx de Casterlé et al., 2012). Transcripts and complementary material were imported into qualitative data management software NVIVO 12 to support the data analysis.

Quotes were translated from Dutch to English by the authors.

Approval for the study was obtained from the Social and Societal Ethics Committee of KU Leuven and the hospital's ethical committees.

Table 1. Overview of information on participating patients and collected optional documentation

Pseudonym	Age bracket	Sex	Length of stay (at first interview)	Diagnosis	Optional documentation
Mary	60+	F	1 month (yearly)	Multiple Sclerosis	Guided tour
Eddy	45-60	M	3 months	Multiple Sclerosis	Diary
Bill	60+	M	3 months (yearly)	Multiple Sclerosis	Guided tour
Kelly	30-45	F	6 months	Multiple Sclerosis	Diary and pictures
Sharon	30-45	F	6 weeks	Multiple Sclerosis	Guided tour
Christine	60+	F	11 months	Multiple Sclerosis	None
Ronny	45-60	M	5 months	Multiple Sclerosis	Guided tour
Alma	60+	F	2 weeks	Knee surgery	Guided tour
Dora	60+	F	2 weeks	Knee surgery	Diary and guided tour
Bob	30-45	M	3 months	Foot amputation	Diary and guided tour
Antonio	60+	M	3 months	Shoulder, arm and leg injuries	Guided tour
Fred	60+	M	3 weeks	Stroke	Guided tour
Steven	45-60	M	8 months	Brain tumor and Parkinson	None
Suzanne	60+	F	13 months	Stroke	None
Michelle	45-60	F	5 weeks	Stroke	Diary and guided tour
Jenny	45-60	F	3 weeks (after 8 months in a hospital)	Stroke	Diary and guided tour

3. Results

We aim to gain insight into how the outdoor environment of a rehabilitation center hampers or supports patients to be physically active. Our research shows that how the physical environment is experienced by patients plays an important role in their (de) motivation to be physically active. In this study we therefore structure our results based on the understanding of experience as a combination of 1) information from the senses, 2) affordance -what a space allows people to do-, and 3) meaning making (Vaes et al., 2014).

3.1. Information from the senses

Based on the interviews we found that regardless of patients' capacity to undertake physical activities, and actually go outside, a visual connection with the outside can still impact on someone's feeling of connection with the world beyond the center. A large window provides an ideal destination for daily walks on the ward, as it allows both sitting silently looking outside and starting a conversation about the ever-changing view. For

those (considering) going outside, being able to visually prospect the options and prepare for the trip lowers the threshold to do so.

Patients stress the importance of being seen from inside to feel safe. They need the reassurance of someone taking care of them when something would go wrong.

[Bill] Here I tripped with the scooter [...] and I lay there and couldn't see anything [...] Nobody had seen me. Then after a while, half an hour later, someone came, three women [...] You're lying there, eh, I couldn't get up, nothing.

The presence of sunlight and fresh air are the main reason to go outside. At least one participant also mentions the soundscape as an important element:

[Dora] For a moment soaking in the sun [...] ooh I love it! Then it's a little warmer [...] you see the birds flying around and you know, when in the morning when I'm going to the physiotherapy, I come here to listen to the birds, and then I know immediately, it's going to be a good day, or a cloudy one.

Sensory discomfort due to weather conditions -being too cold or warm, (too much) rain or sun- hampers initiatives to use the outdoor environment.

[Physiotherapist] Yes, the rehabilitation garden is being used, but then of course we're in Belgium with weather that's often not cooperating. The population here finds it too cold or too hot or too much sun, or too much shade, or they didn't bring a jumper to therapy or there's too much wind or it's chilly.

For some their changed bodily condition influences temperature experience:

[Jenny] if it had been nicer weather then I'd often have been outside. I lost a lot of kilo's and now I'm much more sensitive to the cold.

Several have not even been outside but decide to stay in based on what they expect the weather to be like what they see from inside.

3.2. Affordance

The interviews show that both the built environment and the care organization impact on the extent to which outdoor physical activity is afforded. First and foremost, participants point at the importance of the built environment being highly accessible, meaning barrier free, to the last detail. Even a small threshold like a slight difference in height at the door, can be considered a huge barrier for someone with a walker to go outside. Whereas most patients are familiar with the inside of the building and considered it almost perfectly accessible, they often mention they do not dare to go outside due to a lack of control over small unevenness's in the pavement or unexpected obstacles along the way. Secondly, walking patients (with or without walker) or patients in manual wheelchairs are often unable to cover large distances on their own at once. Providing resting spaces along the way, as is done inside the building, is highly appreciated. Thirdly, the connection between inside and outside and the time it takes to travel between them influences the use of the outdoors. The large distance between the wards and the outdoors hampers the possibility to quickly get some fresh air.

[Antonio] I've been around, but not now anymore. It's too cold. Then you have to put on thick clothing, only for five minutes ... [and therefore you need to go all the way upstairs] so [the building hampers me to go outside]...

The care organization has a large impact on patients' physical activity. When therapy sessions or free-time activities are organized outside, this increases patients' familiarity with the outdoor environment and as such lowers the threshold to make use of it independently. Unfortunately, patients have the feeling that time constraints limit staff's willingness to go outside during therapy even if it would benefit them:

[Suzanne about practicing with a scooter] Outside? They don't have time for that. I'd have preferred to take the scooter outside, but the time is missing, so it has to take place inside. That's very different than going outside.

Staff plays an important role in creating an atmosphere in which patients experience going outside as part of a daily routine. Without ever having discussed it, participants assume that going outside is not allowed. Although this is the case for some, mostly due to cognitive issues, the majority is free to spend time outside (on the premises of the center).

Whereas staff organizes indoor free-time activities with the best intentions, for a minority of participating patients fear of missing these more 'organized' activities results in staying inside even though they prefer going outside.

[Michelle] Yes, I'd like to go for a walk, because now that I think about it, I haven't been outside since the weekend and that's a pity. I think you should go outside at least once a day [but when having to choose between going outside independently or joining organised activities] then I prefer the activities.

3.3. Meaning

The meaning patients ascribe to going outside impacts on their outdoor physical activity. For some going outside defines them as a person, being 'an outdoor person', 'independent', or 'not being able to stay inside [in contrast to all others]'. For most, the availability of destinations and organized activities makes going outside meaningful.

What is considered a destination and why varies amongst patients. The animal park is the number one destination, being visited by most participants, alone and accompanied. The therapy garden and sports facilities are mentioned as locations for organized therapeutic activities but are sporadically also used during free time. Whereas some take trips to cafés in nearby villages to take part in 'normal life', others enjoy the quietness of the woods surrounding the center. Even a less obvious destination like the loading dock can provide a reason to take a trip outside.

[Ronny] You want to see something, but there's not much to see or you have to ride into the woods, and I'm not from here, so I don't know the route. So you have to constantly deliberate where you should ride, what you should do, but most of the time I stay here in the parking lot, from time to time I go downstairs to the guys from the [coffee company] who do the delivery downstairs, because that company is from my region [...] I know those guys, then I go downstairs for a chat.

For those who smoke, going to the designated smoking area outside structures their day and serves as a social activity, but it is also a reason to stretch the edge between in- and outside to its limits. Even during the night, when going outside is not allowed, some wander around finding secret places to do so nevertheless and have a cigarette.

4. Discussion

The combination of sensory information, affordance or meaning making was studied to gain insight into how the outdoor environment of a rehabilitation center affects patients to be physically active. On one hand the barriers that hamper use of outdoor green space (Weerasuriya et al., 2019) and those affecting patients' physical activity show certain similarities. The results showed a lack of awareness amongst patients whether and how they can use the outdoors, and poor accessibility and comfort hinder them from going outside to be physically active. On the other hand, some spatial qualities, like visual control, are different when it comes to physical activity. Whereas more secluded places are appreciated to sit down and have a chat (Weerasuriya et al., 2019), we illustrated that when being physically active patients prefer to be seen. What someone considers the physical surroundings of the center is defined by the relation between the affordances of the built environment, one's transport mode (walking with or without aid, using a manual or electric wheelchair), and one's social support (visitors or staff taking them outside).

Based on the insight gained into spatial qualities of in- and outdoor environments, we first formulate some points of attention relevant for architects and designers. Distinguishing between spatial qualities that directly or indirectly impact on patients' physical activity could help prioritizing. Spatial qualities such as availability of safe and highly accessible routes with enough resting spaces have a direct impact. When these qualities do not meet the minimum criteria, patients are simply not capable of going outside. Spatial qualities assigned to destinations, presence of fauna and flora, water, and play equipment, have a more indirect impact as they motivate patients to go outside but do not physically withhold them if they are not present.

Besides during planned therapy moments, moving around is also an important part of patients' daily routine during free time. Focusing on the connection between physical activity and the built environment allows studying the role of outside spaces in this routine while at the same time examining the relationship between in- and outside from a spatial and organizational perspective.

As illustrated above, both literature and our findings confirm that the outdoor environment would benefit from spatial qualities that patients now experience inside the building and vice versa. As safety is an important issue (Colley & Zeeman, 2020) constantly being in staff's eyesight while moving, as is the case inside the building, would be reassuring for patients and thus support them going outside. The extreme high accessibility indoors, should be extended to the outdoors with specific attention for the in-between zones. Providing places where patients could enjoy fresh air, while still enjoying the comfort of being inside (Killington et al., 2019), i.e. being relatively warm and dry, could lower the threshold to go outside.

The outdoor environment provides patients the opportunity to escape the controlled environment of the rehabilitation center and stimulates them to undertake autonomous activities, which aligns with the insight that it prepares them for life beyond illness (Tseung et al., 2022). Possibly because the outdoor space is considered only a surplus (Djukanovic et al., 2017), its spatial program is not as dense as the program inside a healthcare building, it contains more undefined places. Analyzing these places brings forward spatial qualities that contribute to spaces being considered meaningful destinations, e.g. presence of animal life or play equipment (Weerasuriya et al., 2019). Additionally, it reveals how patients appreciate places that allow them to contribute to e.g. creating a cat feeding spot.

Apart from these insight into spatial qualities of in- and outdoor environments that are mostly relevant for architects and designers, our study points at care professionals'

role in how the outdoor environment is used. When care professionals organize activities outside, this benefits healing and recovery (Tseung et al., 2022) and familiarizes patients with the outdoor environment, showing them the (absence of) barriers and how to overcome them when necessary. If such outside therapy moments are not feasible, staff can provide information about destinations and routes outside, like they inform patients on what can be found where inside the building and how to reach a destination. Besides informing patients, such an approach would remove doubt about going outside being allowed or not.

Finally, we identify some limitations and opportunities of our study. We studied only a single rehabilitation center during winter. Expanding the study to others (spatial) settings and over time would allow gaining more nuanced insights. Including family members would allow broadening these insights especially regarding the affordances of the outdoor environment as social support impacts on how feasible physical activity is. Our research shows that the in- and outside environment of a rehabilitation center can strengthen each other in supporting patients' physical activity. This connection could be further explored by extending the scope of the study to the urban scale.

5. Conclusions

To allow for the outdoor environment of a rehabilitation center to encourage patients being physically active, inside and outside, a visual, physical, and psychological connection between inside and outside spaces is important. This can be achieved through spatial and organizational interventions. Treating the in- and outdoor environment as one entity and communicating about it as such, may lower the threshold for people to use the outdoors while at the same time allow a close, highly accessible connection between the two.

Data Availability Statement

Not applicable.

Contributor statement

Margo Annemans planned and conducted the research and took the lead in reporting the work described in the article. Delfien Van Dyck commented on the reporting in the article. Ann Heylighen planned the research, commented on the reporting in the article.

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References

1. Annemans, M., Van Dijck, D., & Heylighen, A. (2020). Introducing activity tracking in healthcare settings: The merit of self-reflection. In P. Langdon, J. Lazar, A. Heylighen, & H. Dong (Eds.), *Designing for Inclusion: Inclusive Design: Looking Towards the Future* (pp. 79–86). Springer International Publishing. <https://doi.org/10.1007/978-3-030-43865-4>
2. Axivity. (2015). AX3 Data Sheet: 3-Axis Logging Accelerometer. https://axivity.com/files/resources/AX3_Data_Sheet.pdf
3. Colley, J., & Zeeman, H. (2020). Safe and Supportive Neurorehabilitation Environments: Results of a Structured Observation of Physical Features Across Two Rehabilitation Facilities. *HERD: Health Environments Research & Design Journal*, 13(4), 115–127. <https://doi.org/10.1177/1937586720912546>
4. Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process*. Sage Publications.
5. Dierckx de Casterlé, B., Gastmans, C., Bryon, E., & Denier, Y. (2012). QUAGOL: A guide for qualitative data analysis. *International Journal of Nursing Studies*, 49(3), 360–371. <https://doi.org/10.1016/j.ijnurstu.2011.09.012>
6. Djukanovic, Z., Maric, J., & Giofrè, F. (2017). Evaluation of hospital outdoor spaces through users' participation analysis. *Facta Universitatis - Series: Architecture and Civil Engineering*, 15(1), 73–84. <https://doi.org/10.2298/FUACE161121005D>
7. Esterberg, K. G. (2002). *Qualitative methods in social research*. McGraw-Hill.
8. Fortune, J., Norris, M., Stennett, A., Kilbride, C., Lavelle, G., Hendrie, W., de Souza, L., Abdul, M., Brewin, D., David, L., Anokye, N., Victor, C., & Ryan, J. M. (2020). 'I can do this': A qualitative exploration of acceptability and experiences of a physical activity

- behaviour change intervention in people with multiple sclerosis in the UK. *BMJ Open*, 10(3), e029831. <https://doi.org/10.1136/bmjopen-2019-029831>
9. Huisman, E. R. C. M., Morales, E., van Hoof, J., & Kort, H. S. M. (2012). Healing environment: A review of the impact of physical environmental factors on users. *Building and Environment*, 58, 70–80. <https://doi.org/10.1016/j.buildenv.2012.06.016>
 10. Killington, M., Fyfe, D., Patching, A., Habib, P., McNamara, A., Kay, R., Kochiyil, V., & Crotty, M. (2019). Rehabilitation environments: Service users' perspective. *Health Expectations*, 22(3), 396–404. <https://doi.org/10.1111/hex.12859>
 11. Law, M., Cooper, B., Strong, S., Stewart, D., Rigby, P., & Letts, L. (1996). The Person-Environment-Occupation Model: A Trans-active Approach to Occupational Performance. *Canadian Journal of Occupational Therapy*, 63(1), 9–23. <https://doi.org/10.1177/000841749606300103>
 12. MATLAB (Version R2019b). (2019). [Computer software]. The MathWorks Inc. <https://www.mathworks.com/help/matlab/ref/rand.html>
 13. Papalia, R., Campi, S., Vorini, F., Zampogna, B., Vasta, S., Papalia, G., Fossati, C., Torre, G., & Denaro, V. (2020). The Role of Physical Activity and Rehabilitation Following Hip and Knee Arthroplasty in the Elderly. *Journal of Clinical Medicine*, 9(5), 1401. <https://doi.org/10.3390/jcm9051401>
 14. Simpson, D. B., Jose, K., English, C., Gall, S. L., Breslin, M., & Callisaya, M. L. (2021). "Factors influencing sedentary time and physical activity early after stroke: A qualitative study". *Disability and Rehabilitation*, 1–9. <https://doi.org/10.1080/09638288.2020.1867656>
 15. Tseung, V., Verweel, L., Harvey, M., Pauley, T., & Walker, J. (2022). Hospital Outdoor Spaces: User Experience and Implications for Design. *HERD: Health Environments Research & Design Journal*, 15(1), 256–267. <https://doi.org/10.1177/19375867211045403>
 16. Ulrich, R. (1984). View through a window may influence recovery from surgery. *Science*, 224(4647), 420–421. <https://doi.org/10.1126/science.6143402>
 17. Ulrich, R., Zimring, C., Zhu, X., MS, J., Seo, H.-B., Choi, Y.-S., Quan, X., & Joseph, A. (2008). A Review of the Research Literature on Evidence-Based Healthcare Design. *HERD: Health Environments Research & Design Journal*, 1(3), 61–125.
 18. Vaes, K. R. V., Stappers, P. J., & Vereniging voor Studie- en Studentenbelangen (Delft). (2014). *Product stigmaticity: Understanding, measuring and managing product-related stigma*. [Delft Academic Press / VSSD].
 19. Weerasuriya, R., Henderson-Wilson, C., & Townsend, M. (2019). Accessing Green Spaces Within a Healthcare Setting: A Mixed Studies Review of Barriers and Facilitators. *HERD: Health Environments Research & Design Journal*, 12(3), 119–140. <https://doi.org/10.1177/1937586718810859>
 20. Zhang, Y., Tzortzopoulos, P., & Kagioglou, M. (2019). Healing built-environment effects on health outcomes: Environment-occupant-health framework. *Building Research & Information*, 47(6), 747–766. <https://doi.org/10.1080/09613218.2017.1411130>