

Research Article

Designing Recovery: Women and Midwives' Perspectives on Design Factors in The Postnatal Hospital Environment

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Abstract

Background: The postnatal phase is a critical time for women to rest and to recover after giving birth, and the hospital environment can influence the wellbeing experiences of new mothers. Existing research found aspects of the physical environments that are supportive of women during labour and birth, but research focusing on the environmental factors in postnatal environments, where women recover after birth, is limited and important. **Purpose:** The study investigated environmental factors and spatial features in postnatal environments that make an impact on women's physical recovery and wellbeing following birth. **Methods:** Data were collected through online survey questionnaires from 229 postnatal women who gave birth in New Zealand hospitals and from 58 midwives (N = 287) who worked in postnatal settings. Midwives recruited women and their colleagues using a snowball sampling method and provided dedicated links to women and midwives to access the online survey questionnaires. Midwives filled out identical questionnaires as women; the only difference was data related to their demographic characteristics. Descriptive statistics and the independent-samples t-test were used to analyse the data. **Results:** Women's and midwives' have strong preferences for single-occupancy rooms, visual or physical connection to the outdoors, and views of nature, all of which were ranked significantly high, indicating both women and midwives desire personal control in the space, as well as connections to the outside during postnatal hospitalisation. The study participants also indicated a strong preference for air quality and room freshness, adequate daylight in the room, art and nature images and the presence of colours in the interior spaces. These design features were thought to be critical design elements for promoting rest, recovery and psychological wellbeing in postnatal settings. **Conclusions:** The results of this study highlight the importance of several key environmental design features, providing beneficial insights into women's psychological recovery and wellbeing and suggesting the need for awareness by architects, and healthcare providers for creating restorative postnatal healthcare settings for women following birth.

Keywords

Environmental Factors, Healthcare Environment, Postnatal, Recovery, Wellbeing

1. Introduction

Physical healthcare environments can communicate different meanings and can affect the state of health of their users. Numerous studies have shown that patients' health

outcomes are affected by design elements and spatial structures [1, 2]. In addition, existing research suggests that building design and hospital layout where women go to give birth

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can trigger stress, affect physiological and psychological wellbeing, and deny autonomy within the birth space [3]. This is because births in healthcare facilities are now the norm for both developed and developing countries because they confer safety and minimise the risks to both mothers and infants. However, there is an abundance of research studies where women have expressed their feelings and experiences of hospital births in negative terms: stressful, unfamiliar environment, and lacking personal control and autonomy [4-7], particularly blaming hospital environments as an impediment to health and emotional wellbeing [8]. Efforts by the natural childbirth movement, informed by consumers and a feminist viewpoint, led to the demand for control in decision-making regarding the so-called paternalistic environment, and included a proposal for a say by women in choosing birth locations [9, 10]. Notably, this effort highlighted the need for patient-centred care, with improvements in hospital settings and birthing environments [11, 12]. These landmark efforts paved the way for the emergence of evidence-based design (EBD), defined as using credible research findings in creating healing environments, resulting in increased research into healing environments [2, 13, 14].

The design of birth environments can support women during labour and birth, but it may also not improve women's birth experiences [5, 15]. While there is an increasing attention by healthcare providers to improve the birth experiences of women, through improvements in birth facilities, the postnatal environments would merit attention as this is the environment where women receive firsthand postnatal care after the birth, which may likely have an impact on their initial recovery and subsequent physical health and wellbeing [16-18]. Existing studies indicate that noise is a major issue in healthcare settings, particularly for women in postnatal wards due to increased disruptions from noise as well as disruptions from healthcare providers [19], triggering sleep deprivation and inability to rest [20]. This situation also contributes to affecting midwifery practice by creating difficult cognitive and emotional responses for midwives who work in such spaces [21, 22]. Existing studies on interior environmental comfort in maternity wards found that women on the postnatal ward were negatively affected by noise, in contrast to the labour ward [23]. A restful, healing environment based on patient-centred care has been suggested to foster improved sleep and healing in postnatal spaces [24, 25].

The multidimensional needs and tasks of women during the postnatal phase, such as caring for newborns, maintaining hygiene, learning parenting skills and responding to midwives/physicians' instructions on how to "normalise" following the birth event are likely to correspond to having a variety of physical environments. Previous studies suggest the recognition of environmental design factors and spaces in the planning and designing of healthcare facilities with specific aspects to meet the needs of specific groups, fostering improved healthcare settings [26, 27]. Women in postnatal hospitalisation would benefit from improved design of such

spaces, particularly if tailored to cater for rest, sleep and recovery care.

Previous research investigations into environmental factors in hospital environments have examined unit layout, floor material, room features, noise/acoustics, lighting, nature, indoor air quality and ventilation, and music. These environmental factors play an important role in creating a restorative environmental design, which helps to promote wellness in healthcare facilities [28]. Subsequently, they enjoy attention and form the focus of many studies in healthcare research. For example, research has found that daylight can have both physiological and psychological effects on patients [29, 30]. Interventions for improving sleep and disruption [31], including noise [32], and even size of art images [33], have significant impact on users' satisfaction, quality of care, and health recovery. Numerous studies regarding these environmental factors and design elements have been conducted in healthcare settings. For example, Schafthuizen and colleagues [34] compared sleep quality, duration, and efficiency over 72 hours and assigned participants to three different types of rooms: staying alone with two-and four-bedded rooms, sharing a room with one to three other patients, or staying alone in a semi-private room (SPR). The study found that sleep quality of patients in semi-private rooms (SPRs) was significantly higher than those patients who stayed in multioccupancy rooms. Moreover, having access to private outdoor spaces was shown to have significant restorative outcomes and increased satisfaction for nursing staff [35], and exposure to nature views has been shown to have a positive benefit for patients compared with those who do not have access to windows [36]. Additionally, daylight presence was found to be of higher benefit to patients in rehabilitation units, emphasising that size and placement of windows had an impact on their stress levels and moods [37]. The presence of environmental noise has also been shown to interfere with sleep and have other negative health consequences [38]. Overall, while existing evidence showed that noise, daylight, temperature, fresh air and ventilation, room features, and nature all have an impact on health and wellbeing outcomes in healthcare settings, it is unclear whether these environmental factors would produce similar or different health outcomes for women and clinicians in postnatal settings. Given the foregoing, designers and researchers need to consider stakeholders' (women and midwives/nurses) opinions in planning or refurbishing existing postnatal healthcare facilities where recovery and wellbeing after birth are key.

Numerous studies indicate that extensive research has been conducted on the connection between the physical childbirth environments and women's birth experiences and health outcomes, including birth space design that supports birth processes [39-42]. However, few empirical studies have considered the ideal physical hospital environment and spatial features for the recovery experiences of postnatal women and for staff who need to provide postnatal care [43-47]. In

addition, whilst Setola et al.'s study [48] identified eight important building spaces for the intrapartum maternity care, their study did not give attention to the environment for postnatal care.

In 2023, Reyhan and team conducted a multi-stakeholders' study, comprising postnatal women, midwives, and physicians to determine their views about the ideal birth unit and to develop a reliable tool for evaluation of the effects for postnatal women in terms of physical and emotional factors and their satisfaction with the birth unit. Their study found five dimensions physical features of hospital, features of the birth room, privacy, aesthetics and support, which are critical for postnatal women's evaluation of the effect of the birth unit [45]. In general, the findings from these studies showed that little attention or no attention has been paid to postnatal environments, implying that women's postnatal experiences are being missed, including a lack of specific design factors for women-oriented design interventions in postnatal environments. Currently, postnatal wards seem to be isolated or separated, in terms of layouts, from labour and delivery rooms in healthcare settings.

In order to address this knowledge gap, the present study investigated several aspects of environmental factors and spatial features in postnatal hospital environments including, air quality and room freshness; daylight in a room, privacy; noise control; decoration of a room with nature art and images; colours; the provision of a single-occupancy room, and connection to the outdoors. By examining the needs and responses of women and midwives, this study aims to identify environmental factors and design features that can foster optimum rest and recovery for women's wellbeing, as well as effective spaces that assist midwives in providing quality postnatal caregiving for women during the postnatal hospital stay.

2. The Impact of Supportive Design

Within the context of Ulrich's theory of supportive design [49], the impact of design elements and environmental factors in the healthcare environment have received attention and findings are generally implemented in the mainstream healthcare practice [50, 51]. Ulrich proposes that a supportive design enables patients to cope better with the stress of illness and hospitalisation. A supportive design comprising a sense of control, social support, and positive distractions [49, 52] can alleviate stress and improve health and wellbeing of users in healthcare facilities [53]. Notably, Florence Nightingale in *Notes on Nursing* [54] laid the foundation for the first design principles for hospital wards, which established important connections between built environments, health, and wellbeing. She demonstrated that adequate sunlight, warmth, fresh air ventilation, cleanliness and quiet have a key role in health outcomes for patients. Enabling opportunities for choices in the physical surroundings of healthcare buildings such as colourful lighting, nature scenes, and soundscapes

can reduce patients' anxiety, enhance staff satisfaction and facilitate recovery for patients [55-57].

A group of researchers and scholars, following the trends in patient-centred care, designed studies that incorporate innovations and preferences and autonomy for birthing women, potentially offering them sensory stimulations in traditional labour and delivery rooms [8, 58]. For instance, a "snoezelen room" reportedly offered distractions from pain, relaxation, environmental control, and reduction in oxytocin use for women, and a feel of home-like atmosphere. A previous study has suggested the use of this innovation in birthing environments [59]. Whether these features are appropriate for rest, sleep and recovery experiences of women in postnatal environments is yet to be determined. Thus, this study seeks to understand the environmental factors in interior and exterior hospital environments that may make a difference to the recovery of women by alleviating stress and disruption during postnatal hospitalisation.

3. Materials and Methods

3.1. Study Design

The study employed a survey questionnaire to investigate participants' perceptions of the environmental factors and spatial features that may contribute to the recovery care and emotional wellbeing of new mothers during the postnatal phase in hospital environments. Because women spend little time in the postnatal environment after the birth, a survey approach enables a fast, easily quantifiable collection of data, which also require less time to analyse [60]. This method also allows several independent and dependent variables to be investigated at the same time [61]. In addition, participants were free to express their individual opinions and perceptions of environmental factors and acted under their own control afforded by the online survey.

3.2. Survey Procedure and Participants

The survey was conducted through Qualtrics [62] from October to November 2017. Notably, the online survey was cheaper and faster and could easily be accessed by participants, particularly within the comfort of their homes or workplaces. Moreover, the study used a snowball approach to recruit participants. The researcher built on initial contacts of midwives (during lactation/breastfeeding classes), who then assisted to recruit women in the study. Midwives assisted with the distribution of the survey questionnaires to women through special links of women who gave birth in New Zealand hospitals and midwives' colleagues. Inclusion criteria for women were that they should be postnatal women whose most recent birth was between 1 day old and 2 years postnatally, and who were cared for in postnatal wards. Also, all participants needed to understand English. Midwives' eligibility criteria required them to have worked or be work-

ing in postnatal hospital settings. The snowball technique has proven to be effective for recruiting hard-to-reach groups based on its referral and networking potentials [63]. 229 women and 58 midwives filled out the online survey questionnaires. The participants were first required to read the instructions, after which they gave their informed consent and then responded to the questions.

The midwives were Core midwives who retain their services with the hospitals' District Health Boards (DHBs), and Lead Maternity Carers (LMCs) midwives who contracted with the Ministry of Health in New Zealand hospitals.

The survey included 16 questions divided into three categories: perceptions of the physical space/room, interior features, and sensory comfort features. The sensory comfort aspects were visual comfort, thermal comfort and acoustic comfort, including comfort related to choice of room types. All three aspects are crucial regarding how postnatal women experience the interior environments where they recover.

A total of two hundred and eighty-seven responses were obtained. After excluding the invalid responses, due to omission of some questions or not providing responses to any of the questions, 253 responses were left, comprising 200 women and 53 midwives. This number was retained for the analysis.

The majority of the women (38.2%) were between the ages of 30 and 34, with 35 to 39 years old accounting for the second-highest proportion (35%). Additionally, most of the women were first-time mothers (88.5%), with only 8 percent having given birth twice. On the other hand, the majority of midwives (48.1%) were between the ages of 46 and 64, while the second largest number of midwives (33.3%) were between the ages of 36 and 45, with 3.7% being less than 25 and 9.3% being over 65. Furthermore, 78 percent of the midwives had between 5 and 35 years of experience working in various areas of the birth environment.

3.3. Data Analysis

The data were analysed using SPSS version 24. The Independent-samples *t*-test was performed to assess the difference between the means of the variables and between the responses obtained from women and midwives, where the variances are equal and in cases where variances are not equal Welch's test was used. Descriptive statistics of the ratings of preference for the interior features, sensory comfort, and postnatal room design features are presented in Tables 1, 2, and 3.

4. Results

4.1. Interior Features, Recovery, and Wellbeing

Women and midwives were asked to rate how important they think it is to have these five aspects: "a restful room," "a room that daylight can easily enter," "decoration in a room," "be in a room where door is closed for privacy," and "be in a room with colours" for the postnatal recovery phase. An association of recovery and wellbeing was found with a restful room and natural daylight. The exception is privacy, where opinion differs considerably between women and midwives.

The Independent-samples *t*-test further revealed there was no significant difference among respondents: Room restfulness, equal variances not assumed $t(59.905) = 1.43, p = 0.158$; Natural daylighting, $t(248) = 0.259, p = 0.796$. Overall, both women and midwives ranked both natural daylighting and room restfulness as more important for recovery care and wellbeing (see Table 1).

There was a significant difference in the opinion on privacy between women and midwives. Privacy: $t(244) = 3.30, p < 0.001$. Having privacy is linked to the type of rooms that women get for the postnatal recovery phase. The difference among the means is presented (see Figure 1).

Table 1. Means and Standard Deviations of Preference Ratings for Interior Environment Features.

	Women		Midwives		
Category	Mean	SD	Mean	SD	P
Interior features					
A restful room is important to recovery	4.89	0.38	4.77	0.52	0.158†
A room daylight can enter	4.50	0.62	4.52	0.58	0.796†
Decoration in a room (nature art & images)	2.96	1.05	3.56	1.07	0.001*
Be in a room where the door is closed for privacy	4.46	0.85	4.00	0.97	0.001*
Bright colours in a room	2.19	0.91	2.86	1.03	0.001*

Note: † means are not significantly different at $p > 0.05$; * statistically significant at $p \leq 0.05$; ** statistically significant with Bonferroni

adjustment at $p < (0.05/4 = 0.0125)$

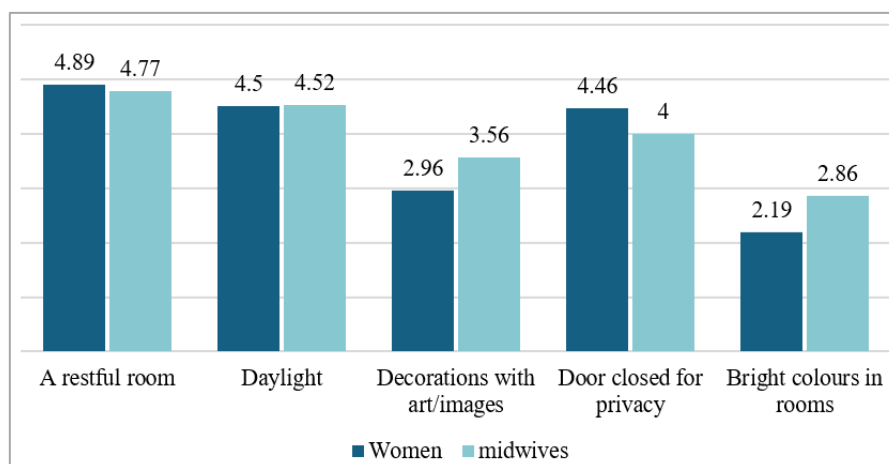


Figure 1. Preference Ratings of Interior Environment Features Bar Graph.

4.2. Sensory Comfort Features and Recovery

Turning to sensory comfort features, respondents were asked how comfort-related indoor climate features such as room temperature, sound, and air quality, among others, influenced postnatal recovery and wellbeing.

An association of postnatal recovery and wellbeing was found with a quiet room, and hygiene/cleanliness for the postnatal comfort features. There was no significant difference among respondents regarding air quality and room

freshness: Equal variances assumed $t(241) = 0.44$, $p = 0.620$; Hygiene/clean postnatal environment, $t(241) = 0.26$, $p = 0.796$. Regarding noise control: $t(241) = 3.88$, $p < .001$, which indicates there was a significant difference in the opinion on noise control between women and midwives. A possible explanation might be that women have no control over noise or noise reduction measures in the postnatal hospital environment. Similarly, daylight in the room also showed a significant difference between the respondents. The difference among the means for all the five features is illustrated (see Figure 2).

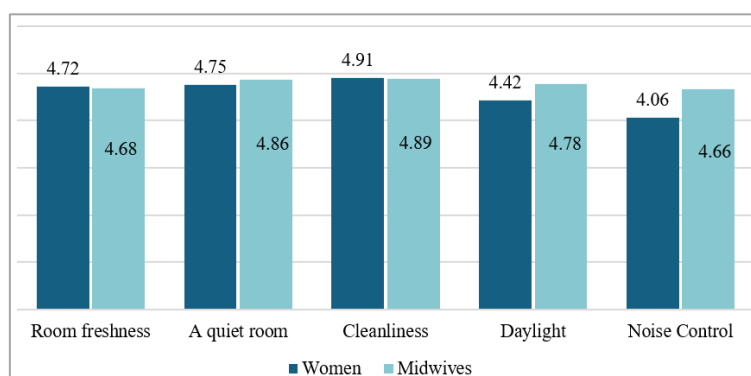


Figure 2. Preference Ratings of Sensory comfort Features Bar Graph.

Table 2. Means and Standard Deviations of Preference Ratings for Sensory Comfort Features.

Category	Women		Midwives		P
	Mean	SD	Mean	SD	
Sensory comfort					

	Women		Midwives		
Category	Mean	SD	Mean	SD	P
Sensory comfort					
Air quality and room freshness	4.72	0.53	4.68	0.59	0.620†
Provision of a quiet room	4.75	0.62	4.86	0.35	0.080**
Hygiene/clean environment	4.91	0.34	4.89	0.38	0.796†
Adequate daylight in the room	4.42	0.73	4.78	0.47	0.001*
Noise control from equipment	4.06	1.03	4.66	0.48	0.001*

Note: † means are not significantly different at $p > 0.05$; * statistically significant at $p \leq 0.05$; ** statistically significant with Bonferroni adjustment at $p < (0.05/4 = 0.0125)$

4.3. Postnatal Room Features, Recovery and Wellbeing

Regarding the postnatal room features, respondents were asked to rate how environmental factors such as a room that feels quiet, views to nature, a single room, access to the outdoors, and having colours in the room versus a plain room impact recovery and wellbeing.

The results showed that all the five design features were ranked high with exception of colours in the room versus a plain room, which received relatively lower ratings compared to the rest. Additionally, an association of postnatal recovery and wellbeing was found for quietness in rooms and views to nature. There was no significant difference between the mean scores of women ($M = 4.75$, $SD = 0.61$) and midwives ($M = 4.60$, $SD = 0.61$; $t(260) = -1.61$, $p = 0.11$, two tailed). In addition, views to nature, also showed similar results. Mean score for women ($M = 3.94$, $SD = 0.73$) and midwives ($M = 4.04$, $SD = 0.61$; $t(260) = -0.865$, $p = 0.39$).

Furthermore, all three factors; a single room for recovery, accessible room to the outdoors, and preference for colours in room versus plain room, were ranked significantly high by both women and midwives. The details of the mean scores

for the two groups of respondents are shown in Table 3. For example, a single room for recovery: equal variances are not assumed based upon the result of Levene's test, $F(260) = 135.20$, $P = < 0.001$ hence Welch t' test was used; $t(52.31) = 4.90$, $p < 0.001$, two tailed), indicates there was a significant difference in the opinion on single room for recovery between women and midwives. As stated, although the mean scores were very high for both groups (women and midwives), a single-occupancy room was mostly preferred by women, but such wishes may not be realised as women have no control over the types of room they are allocated. However, for midwives, even though a single-occupancy room may be likely ideal for the care of new mothers, that would mean more workload for the staff compared to when women were attended in open bay wards with multiple beds.

On the aspect of having colours in the room versus a plain room, the question was not specific about the colour types, which may explain why it was ranked differently by women and midwives. Nonetheless, the finding indicates that colours in the room would be a valuable design element that could enhance positive mood and wellbeing during postnatal hospitalisation. The difference among the means for the five features is illustrated in Figure 3.

Table 3. Means and Standard Deviations of Preference Ratings for Postnatal Room Features.

	Women		Midwives		
Category	Mean	SD	Mean	SD	<i>P</i>
Room features					
Quietness in rooms	4.75	0.61	4.60	0.61	0.11†
Views to nature	3.94	0.73	4.04	0.61	0.39†
A single room recovery	4.88	0.37	4.20	0.97	<.001*

Category	Women		Midwives		P
	Mean	SD	Mean	SD	
Access of room to the outdoors	3.74	1.13	4.14	0.70	<.002*
Colours in room vs a plain room	3.16	0.72	3.44	0.71	0.012**

Note: † means are not significantly different at $p > 0.05$; * statistically significant at $p \leq 0.05$; ** statistically significant with Bonferroni adjustment at $p < (0.05/4 = 0.0125)$

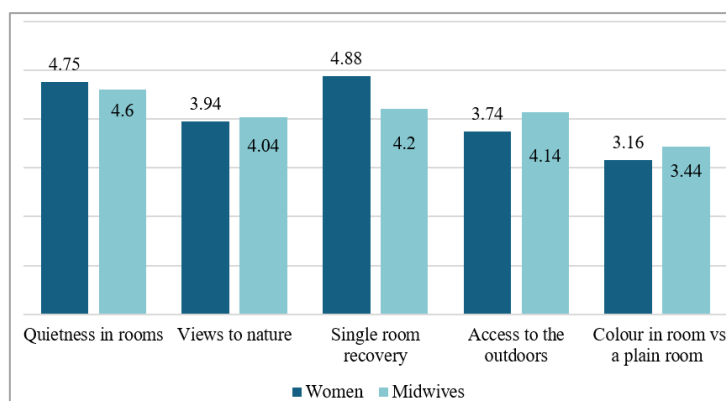


Figure 3. Preference Ratings of Postnatal Room Features Bar Graph.

5. Discussion

The postnatal environment plays a key role in the recovery process. Rooms that feel restful with comforting and relaxing features are cherished by women and their caregivers and should be prioritised for women during the postnatal phase. Creating an interior environment in which women and their caregivers can feel comfortable is also vital in the postnatal environment. Women should be provided spaces or rooms where they can get direct access to daylight into the room spaces. Daylighting can ameliorate anxiety and stress associated with the birth processes and can contribute positive emotional wellbeing during the hospital stay. Alongside this, views to nature enhance the quality of postnatal recovery experience, and this can be realised through having rooms with operable windows; this confers personal control as opposed to fixed windows. Additionally, daylight in the room also showed a significant difference between the respondents, supporting previous findings on the importance of daylight for patients and staff's restoration and health outcomes [25, 35]. As Verderber [64] notes, an appropriate contact with windows and views assists patients in achieving balance of perceptual and cognitive links with an outdoor environment. The current findings resonate with past research on the beneficial health outcomes of daylighting in healthcare settings [65, 66] as well as in office spaces [67]. The main conclusions indicate that daylighting rather than electric lighting

was not only pleasant but has positive impact on health and physical recovery [2].

Hygiene/clean environment received higher rating from women and midwives suggesting spaces should be clean and tidy to help infection control. Maintaining proper hygiene is a key practice in mainstream healthcare organisations, so hygiene is a given and acts to support healthcare practices in a safe and healthy environments for patients and medical personnel [68]. Women have also reported they had no control over the types of room they were offered, and a greater number were attended in multi-bedrooms. Women in double rooms, if not lucky enough to be on the side where windows are located could feel deprived of contact with the outside environment. Additionally, a great amount of work in hospital room design has been led by the notion that patients or women would like their hospital room to provide as much privacy as their own bedrooms [69], this would be a welcoming offer if women had the opportunity to choose their room. This study found that women and midwives would like the postnatal environment to be restful, conducive, and restorative, which corresponds with existing studies on room types, privacy, and wellbeing [28, 34].

A restorative postnatal environment resembling home confers patients with full autonomy with a calming and welcoming ambience. Not only would it address the noisy and un-conducive hospital environment but enhance quality recovery care from caregivers as well as having the potential to contribute to physical recovery and wellbeing during postna-

tal hospitalisation.

5.1. Limitations and Further Research

No previous research has systematically examined environmental factors and design elements in postnatal hospital settings. Although this present study provides some interesting results, it has limitations. First, following previous research [41-48] and given the challenges of a short hospital stay for postnatal women, the current study only used an online survey to investigate the environmental factors and design elements, with a focus on subjective physical recovery and wellbeing. This means that the impact of each of the design factors on recovery experience and wellbeing could not be determined. Second, the study employed the views of women who had no birth complications and were physically healthy after the birth. Future work may consider including women with birth complications with longer hospital stays to see the degree to which their opinions on environmental features for recovery might vary from or be similar to their well-women counterparts. This could lead to a better and broader perspective on the environmental design elements for the restoration experiences and wellbeing of new mothers during postnatal hospitalisation.

5.2. Implications for Practice

Postnatal hospital spaces for women should be restorative and calming, with primarily single-bed rooms, and home-like features to promote the privacy needed for the rest and recovery of new mothers. Single rooms are superior to multibed rooms in terms of enhancing women's birth recovery experiences and wellbeing.

The postnatal environment should allow for daylight in the rooms, with operable windows, and a view of nature in the surroundings, leading to better recovery experiences for women and for carers.

The environment should include a range of features that are both relaxing and distracting, such as the presence of nature art and images as decorations in the spaces as well as soothing colours to facilitate restoration, acting as an emotional replenisher for women while lying in the bed or simply in the rooms.

The environment should encourage both visual connections and access to the outdoors, promoting a sense of independence on the part of women to leave their beds, thus becoming "normalised."

A restorative postnatal environment should be designed to meet women's need for rest and sleep, and it should be tranquil, health-promoting, in terms of restfulness and room ambience, whilst allowing midwives' to work more effectively for quality postnatal care.

6. Conclusions

The results from this study suggest that better-designed postnatal settings/wards can bring significant benefits both for women's recovery and for midwives who cater for them in postnatal hospital environments. In order to promote a restorative postnatal environment, efforts should be taken to ensure that the physical environment promotes tranquil and restful spaces by eliminating or minimising noise at its barest, while maintaining restfulness in postnatal environments. According to the findings, women and midwives preferred single-occupancy rooms, which can provide significant support for recovery and wellbeing. Furthermore, visual or physical connection to the outdoors and views of nature were significantly ranked high, contributing to women's wellbeing abilities for personal control, as well as opportunities to "normalise" while in hospital. The study participants also indicated a strong preference for air quality and room freshness, adequate daylight in the room, art and nature images and the presence of colours in the interiors as beneficial environmental factors and design elements that promote recovery and wellbeing in postnatal settings.

Overall, this study has provided new empirical evidence to the healthcare design community and midwifery practitioners, in identifying environmental factors and design elements that can be implemented in postnatal hospital environments to assist women during the postnatal phase. This can foster increased awareness among healthcare planners and architects to create a restorative place for women after childbirth.

Abbreviations

EBD	Evidence-Based Design
SPR	Semi-Private Room/Single Private Room
DHB	District Health Board
LMC	Lead Maternity Carer
SPSS	Statistical Package for the Social Sciences

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Author Contributions

Lateef Ademola Lawal is the sole author. The author read and approved the final manuscript.

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Data Availability Statement

The data is available from the corresponding author upon reasonable request.

Conflicts of Interest

The author declares no conflicts of interest.

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