

Healing environment and patients' well-being

Finding the relationship between healing environment aspects and patients' well-being involving Dutch hospitals



Janine van Nijhuis
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Master thesis

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Abstract

Increased attention is paid to design elements of healthcare facilities for their positive effect on patients' well-being. Through the application of evidence-based design elements, a healing environment can be created. This research aimed to find out to what extent well-being of patients relates to their perception of healing environment aspects and what explains for possible found differences between hospitals by comparing different hospitals with each other. Through a questionnaire, 230 patients of three different hospitals indicated how they perceived different healing environment aspects in their patient room and their level of well-being was measured. Results show significant differences in the perceived healing environment aspects between the hospitals. Through a factor analysis the different healing environment aspects are reduced to six factors: personal and social privacy, sound control, positive distractions, staff interaction, light and physical comfort. No significant relationships were found between the well-being of patients and healing environment aspects at individual hospitals. In a regression analysis, the data of the three hospitals together do show a significant relationship between healing environment aspects and patients' well-being. Healing environment aspects explain 12.9 percent of the variance in the level of well-being when controlling for length of stay. Two factors are significant, namely: positive distractions and physical comfort. The results imply that healthcare practice should pay attention to these aspects for their positive relation with patients' well-being. In particular positive distractions, this concerns nature and art. On average, these aspects scored lowest in all three hospitals. Further research should be done to the effect of healing environment aspects on patients' well-being in order to guide evidence-based decision making in the design of healthcare facilities.

Keywords: healing environment, well-being, evidence-based design, patients, length of stay, positive distractions

Preface

This report is the final result of my Master thesis, the final research project I conducted for the master Management, Economics and Consumer Studies at Wageningen University.

I would like to thank everyone that helped me during this research project. First of all I would like to thank my supervisors from Wageningen University. Herman Kok, thank you for your guidance and feedback during the final part of my study. Thank you Carlijn Wentink for your constructive feedback and advice.

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In particular, I would like to thank all the patients that participated in the research by completing the questionnaire. Although they did not always feel good (which is an understatement), they completed the questionnaire anyway. Their effort is highly appreciated.

Janine van Nijhuis

Amersfoort, March 2017

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Executive summary

The stay of patients in hospitals usually is associated with anxiety, uncertainty and insecurity. These emotions reflect poor well-being. Increased attention is paid to design elements of healthcare facilities for their positive effect on patients' well-being. Through the application of evidence-based design elements, a healing environment can be created. This research aimed to find out to what extent well-being of patients relates to their perception of healing environment aspects and what explains for possible found differences between hospitals by comparing different hospitals with each other.

The literature study showed that well-being is a person's cognitive and affective evaluation of his or her life. The level of well-being can vary among individuals and can be influenced by the level of income, income equality, unemployment, age, gender and marital status. In a healing environment, physical, psychological and social aspects contribute to the well-being, recovery and healing of a client and can reduce patient stress and stimulate the self-recovering ability of the patient. Although concerning different environmental aspects, a healing environment is experienced holistically. Herein the physical aspects are related to the psychological and social aspects of healing environment. Age and social class may influence the relationship between healing environment aspects and patients' well-being. By explaining the different aspects to patients and measuring the perceived environmental quality, the perceived healing environment can be measured. The WHO-5 measurement scale is an appropriate scale to measure patients' level of well-being.

The conceptual framework gives an overview of all the physical and psychological and social healing environment aspects and relates these to patients' well-being. This relation is influenced by the moderating variables: gender, age, unemployment, marital status, room type, type of ward, length of stay and previously hospitalised. The conceptual framework is used to develop the questionnaire that is used to measure how patients perceive the healing environment aspects, how patients assess their well-being and to measure the moderating variables. 230 patients of three different hospitals participated in the research by completing the questionnaire. Results show significant differences in how the healing environment aspects are perceived between the hospitals. In all three hospitals the aspects concerning nature and art score low. Overall scores hospital 2 the best, followed by hospital 1. These hospitals both have recently build facilities. Hospital 3 overall scores lowest which seems logical since it has the oldest hospital building.

Through a factor analysis the different healing environment aspects are reduced to six factors: personal and social privacy, sound control, positive distractions, staff interaction, light and physical comfort. No significant relationships were found between the well-being of patients and healing environment aspects at individual hospitals. The data of the three hospitals together do show a significant relationship between healing environment aspects and patients' well-being. Healing environment aspects explain 12.9 percent of the variance in the level of well-being when controlling for length of stay. Two factors are significant, namely: positive distractions and physical comfort. The results imply that healthcare practice should pay attention to these aspects for their positive effect on patients' well-being. In particular positive distractions, this concerns nature and art. On average, these aspects scored lowest in all three hospitals. Further research should be done to the effect of healing environment aspects on patients' well-being in order to guide evidence-based decision making in the design of healthcare facilities.

1. Introduction

This MSc thesis research focuses on healing environment and the relation of the environment with the well-being of patients in hospitals. In this chapter the background of healing environment, the problem analysis, the objective and the research framework and questions are given.

1.1 Background of healing environment

In the 1990's the healthcare industry recognised the value of the physical environment of the healthcare facility and how this affects its users (Fottler et al., 2000). According to Van den Berg (2005), more and more healthcare administrators and medical professionals are realising that healing environments are needed that support the needs of patients. The main reason for this is growing scientific evidence of the impact of the physical environment on patients' health and well-being (Van den Berg, 2005). Herweijer-van Gelder (2016) argues that healing environment owes its credibility to Evidence-based design (EBD). EBD is used for finding design solutions in healthcare facilities with the goal to improve patients' health and well-being (Herweijer-van Gelder, 2016). According to Hamilton (2003), decisions in EBD are made on the basis of credible research and evaluations of projects. Especially in healthcare this is an effective method because it improves the experienced quality by patients and family, it improves organisational effectiveness and it helps the hospital board that seeks evidence to justify making costly decisions (Hamilton, 2003). A healing environment is considered the outcome of EBD (Mobach, 2009). A healing environment is an environment that contributes to the well-being, recovery and healing of a client and can reduce patient stress and stimulates the self-recovering ability of the patient (Bovenberg et al., 2010). In a literature review on evidence-based healthcare design, Ulrich et al. (2008) describe that implementing the right design factors, such as single-bed rooms and access to daylight, can lead to reductions in hospital-acquired infections, medical errors, patient falls, pain, stress, depression and length of stay. In addition, it can lead to improvements in patient sleep, patient satisfaction, patient privacy, communication with patients and family members and social support. Also the staff can experience less stress and injuries and be more effective and satisfied when implementing healing environment interventions.

A healing environment is regarded as a holistic entity wherein different components all play a synergistic role (Fottler et al., 2000). However, in order to be able to understand through what design aspects a healing environment can be created, the concept generally is broken down into aspects or categories that reflect a larger subject for example privacy and control or design elements such as single-patient rooms and art. Ulrich (1991) for example mentions the sense of control: patients' sense of control is often low because of their illness which is uncontrollable but also the healthcare facilities that are often noisy and confusing. The lack of control is associated with negative consequences such as depression and elevated blood pressure. However, the lack of control can be mitigated by giving patients control over certain environmental aspects such as temperature and lighting and by improving patients' privacy (Ulrich, 1991).

A distinction can be made between design elements of a healing environment that affect staff outcomes, patients' health and patients' well-being (Herweijer-van Gelder, 2016). The staff outcomes concern design elements that reduce staff injuries and stress and improve staff effectiveness and satisfaction. Patients' health can be improved through design elements that concern the prevention of infections, medical errors and patient falls. Design elements that are related to patient well-being concern the basic physiological needs, control and privacy, social support, positive distractions and suppression of negative emotions.

1.2 Problem statement

The stay of patients in hospitals usually is associated with anxiety, uncertainty and insecurity (Dijkstra, 2009) and increased levels of stress (Van den Berg, 2005), which are indicators of poor well-being from a hedonic point of view (Sirois and Molnar, 2016). As shown from the literature above, a lot of research is done with respect to different aspects of healing environment that promote well-being of patients in hospitals. It is however unclear which aspects have the strongest relationship with patients' well-being (Herweijer-van Gelder, 2016). In addition, healthcare practice is looking for evidence that implemented healing environment design elements have the intended effect. For example the Meander Medical Center recently occupied a new building wherein they tried to create a healing environment. It is however unclear whether the implemented healing environment aspects show a relation with patient well-being (S. de Jong, personal communication, May 9, 2016).

This research compares the perceived environment and patients' well-being of different hospitals in order to find out whether the proposed relationship between different environmental aspects and patient well-being can be found in practice and which aspects have the strongest relationship. In addition, this research aims to find how the different aspects relate to each other and what explains for found differences between hospitals. This research is conducted from a (facility) management perspective, opposed to a medical perspective, and therefore focuses on the design elements of the physical environment and their relation with patient well-being.

1.3 Objective

The objective of this research is: *to find out to what extent well-being of patients relates to their perception of healing environment aspects and what explains for the found differences between hospitals by comparing different hospitals with each other.*

1.4 Research framework

The research is divided into four parts as shown in the research framework, figure 1. First of all in part A, literature is reviewed on well-being of patients and healing environment. These two concepts are defined thoroughly but also the effect of healing environment aspects on patients' well-being and how these concepts can be measured are explained. This results in the theoretical framework, part B. In part C, patients' well-being and their perception of the healing environment aspects is measured. This data is analysed in part D in order to find the relationship between healing environment aspects and patients' well-being. The hospitals are compared to each other and found differences are tried to explain.

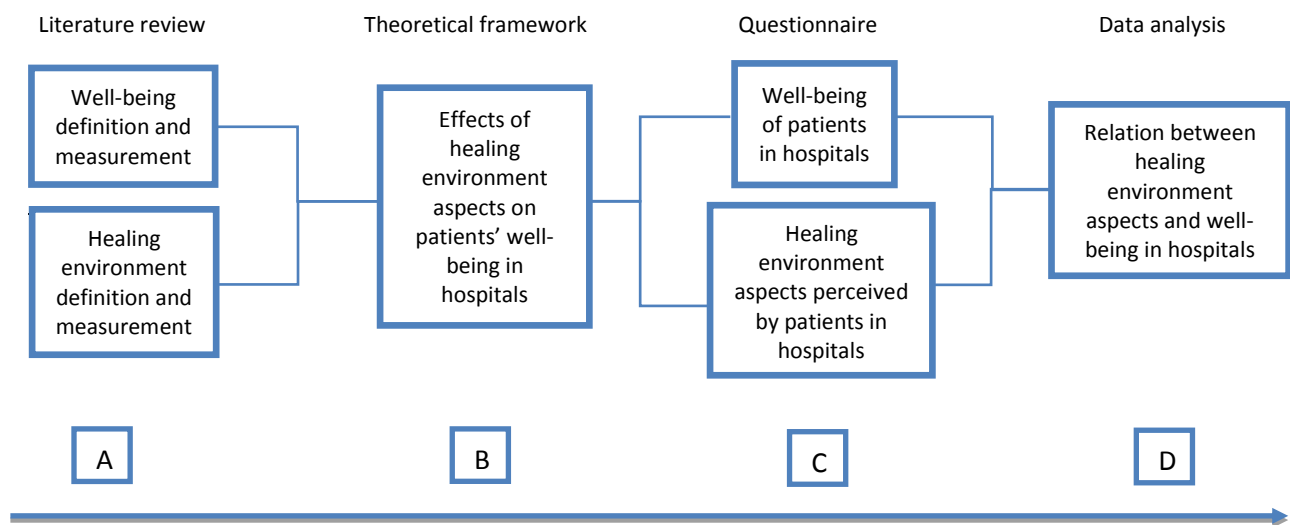


Figure 1: research framework

1.5 Research issue

Main research question

To what extent do healing environment aspects, as perceived by patients in different hospital settings, relate to patients' well-being and what explains for possible found differences between hospitals?

Sub questions

Literature review

1. What is well-being of patients?
2. What is a healing environment in hospitals?
3. What effects do different healing environment aspects have on the well-being of patients?

Empirical research

1. How do patients perceive the healing environment aspects present in their vicinity?
2. How do patients assess their well-being?
3. What relationship exists between the perceived healing environment aspects and patients' well-being within the different hospitals?
4. What explains for the possible differences found between the different hospitals?

2. Theoretical framework

To be able to find a relationship between healing environment aspects and the well-being of patients, both concepts need to be defined thoroughly in order to understand what exactly needs to be measured. Therefore, first the concept of well-being is defined. The second paragraph zooms in on the concept of healing environment, its aspects and the effect these aspects can have on patients. These two paragraphs are related to each other in the third paragraph where the theoretical framework is defined.

2.1 Well-being

In order to understand the concept of well-being, this paragraph defines the concept. In addition, moderating variables are given.

2.1.1 Definition of well-being

Well-being is a broad concept with many definitions. This is also visible in table 1, which gives an overview of definitions.

Table 1: Definitions of well-being

Concept	Definition	Reference
Well-being	A positive state of affairs in which the personal, relational, and collective needs and aspirations of individuals and communities are fulfilled.	Prilleltensky (2005)
	Well-being exists in two dimensions, subjective and objective. It comprises an individual's experience of their life as well as a comparison of life circumstances with social norms and values.	WHO (2012)
Hedonic well-being	Feeling good and evaluating one's life as satisfying.	Sirois and Molnar (2016)
Eudaimonic well-being	Having a purpose in life, personal growth and having positive relations with others.	Sirois and Molnar (2016)
Psychological well-being	The combination of feeling good and functioning effectively.	Huppert (2009)
	The state in which the individual can fulfil an active role in society, interacting appropriately with others, and overcoming difficulties without major distress or disturbances in behaviour.	Kiefer (2008)
Emotional well-being	An individual's avowed feelings toward and emotional reactions to their lives.	Kiefer (2008)
Subjective well-being	A person's cognitive and affective evaluations of his or her life.	Diener et al. (2002)

As visible in table 1, well-being can be viewed from different perspectives. However, it also shows that the concepts overlap and are intertwined. McDowell (2010) for example argues that, despite the contrasts of the hedonic and eudaimonic viewpoint, they are interdependent. The World Health Organization (WHO, 2012) argues that well-being has an objective dimension: a comparison of life

circumstances with social norms and values as well as a subjective dimension: the individual's experience of their life. When people evaluate their own level of well-being, the concept is subjective and relative rather than absolute (McDowell, 2010). It differs per individual how the concept is constructed (Diener et al., 2002).

According to Diener et al. (2002) subjective well-being concerns happiness or satisfaction and theories on the subject of happiness can be divided into three: need and goal satisfaction theories, process or activity theories and genetic and personality predisposition theories. The first two theories centre around the idea that the level of well-being can be increased when tensions are minimised, biological and psychological needs are met, meaningful activities are carried out and important goals are pursued; the third theory argues that well-being is also strongly influenced by personality dispositions such as extraversion and neuroticism (Diener et al., 2002). Ryff and Keyes (1995) distinguish six indicators of well-being:

- *Autonomy*; the sense of self-determination
- *Environmental mastery*; the capacity to manage one's life and surrounding world effectively
- *Personal growth*; the sense of continued development and growth as a person
- *Positive relations with others*; the extent to which one possesses quality relations with others
- *Purpose in life*; the believe that one's life is meaningful and purposeful
- *Self-acceptance*; the extent to which one positively evaluates oneself and one's past life

According to Frijda (1999), well-being is an emotional notion which implies affect that is at the core of emotion. The number, duration and intensity of pleasant and unpleasant emotions is likely to influence the level of well-being (Frijda, 1999).

The sense of well-being can become low when a person has extreme or long lasting negative emotions that start to interfere with the ability of the person to function in everyday life (Huppert, 2009). This is often the case for hospital patients. According to Dijkstra (2009) patients in hospitals often feel anxious, insecure and uncertain. These are indicators of poor well-being according to Sirois and Molnar (2016). Herweijer-van Gelder (2016) argues that patients have less adaptive ability and are therefore thrown of balance more easily through hindering stressors in their surroundings. Patients will have a higher level of well-being when they experience less stress and anxiety (Herweijer-van Gelder, 2016).

Well-being also has an interdependent relationship with health. First of all, the level of well-being is influenced by an individual's health (Dolan et al., 2008). According to Shields and Price (2004) this is especially the case with acute and chronic physical illness that has a negative effect on an individual's level of well-being. In addition the level of well-being also influences the level of health. According to Howell et al. (2007) a high level of well-being helps strengthen the immune system, heightens the pain tolerance and reduces the negative impact of stress. Herein transient emotions have an effect on short-term health outcomes such as infections and immune system response whereas cognitive assessments of well-being are related to long-term health outcomes such as cardiovascular health or survival (Howell et al., 2007).

To conclude, the level of well-being differs per patient and has a cognitive and emotional dimension and is subjective. Therefore, the concept of well-being is in this research defined following Diener et al. (2002): a person's cognitive and affective evaluations of his or her life. Several indicators for well-being can be distinguished: autonomy, environmental mastery, personal growth, positive relations with others, purpose in life and self-acceptance.

2.1.2 Measurement of well-being

In order to measure the level of well-being, literature is studied to find out through what measures patients' level of well-being can be measured.

Well-being is a subjective concept and it differs per person how the concept is constructed (Diener et al., 2002). Various scales and questionnaires exist to measure one's individual level of well-being (Kiefer, 2008). These can vary from single-item measures to 5 minute-questionnaires. Herein people are asked how they value certain aspects of well-being in their life in order to quantify the level of self-perceived well-being. Because the measurement of well-being is only one part of the questionnaire, the number of items that can be included concerning well-being should be limited. Thereby it is convenient if the patient is able to answer the questions without help of the researcher. McDowell (2010) compared nine different measures with each other and studied their reliability and validity. All nine measures showed good or excellent reliability and validity. According to McDowell (2010) satisfaction with life (Diener, 1985), different single item measures and the WHO-5 questionnaire meet the requirements of this study. Out of these three, only the WHO-5 questionnaire has excellent validity and is already translated to Dutch.

The WHO-5 questionnaire consists out of the following five statements:

Over the last two weeks:

1. I have felt cheerful and in good spirits
2. I have felt calm and relaxed
3. I have felt active and vigorous
4. I woke up feeling fresh and rested
5. My daily life has been filled with things that interest me

Per statement respondents can indicate how they have been feeling with respect to that statement for the past two weeks. Every answer has a number ranging from zero to five. The sum of the five answers given, gives a raw score varying from zero to twenty-five. Zero representing the worst possible feeling of well-being and twenty-five representing the best possible feeling of well-being. By multiplying the score by four, a percentage score can be obtained. This percentage score is considered the level of well-being.

Different scales and questionnaires are used to measure the level of well-being. The WHO-5 is a validated and reliable measure in Dutch, has a limited number of items and can be answered by the patients themselves and is therefore an appropriate measure to find out the level of well-being in this study.

2.1.3 Moderating variables

The concept of well-being is influenced by several factors. These factors are explained in this paragraph and considered moderating variables in this research for they may influence the strength of the relationship between healing environment aspects and patients' well-being.

Socioeconomic factors

Huppert (2009) describes socioeconomic factors that are related to well-being; these are: level of income, income equality and unemployment. A high level of income and socioeconomic status is associated with a higher level of well-being. When income equality is higher, scores on well-being measures are higher and income equality is also linked to a higher prevalence of mental illness. The presence of mental health problems is also higher when people are unemployed.

Demographic factors

According to Huppert (2009) it is less clear how demographic factors influence well-being. A lot of research is done on the relationship between gender and well-being, but the outcomes are divided; some studies showed higher scores for men whereas others showed higher scores for woman (Huppert, 2009). The relationship between age and well-being is sometimes found in a U-shaped relationship (with the middle aged having a lower well-being score) and sometimes in a linear relationship (well-being improves with advancing age) (Huppert, 2009). A third demographic factor that has a relationship with well-being is marital status: life satisfaction, as an emotional or subjective measure of well-being is usually higher when a person is married (Dolan et al., 2008).

To conclude, the level of well-being can be influenced by the level of income, income equality, unemployment and marital status. Also, age and gender may influence the level of well-being, although literature is divided over the type of relationship it concerns.

2.1.4 Conclusion

To conclude, well-being is a person's cognitive and affective evaluations of his or her life. The WHO-5 measurement scale is an appropriate scale to use in this study. The level of well-being can vary among individuals and can be influenced by the level of income, income equality, unemployment, age, gender and marital status.

2.2 Healing environment

The concept of healing environment is already explained briefly in the first chapter, in this paragraph a more detailed explanation of the concept and its aspects are given.

2.2.1 Healing environment definition

A healing environment is commonly considered as one that contributes to patients' health and well-being. This idea is not new. Florence Nightingale (1863) wrote already in the nineteenth century about the positive effects of daylight and ventilation on patients' health. In fact, the concept of healing environment can be traced back to ancient Greece where nature was used in the healthcare environment for its positive effect on patients (Van den Berg, 2005). Although the term healing environment is used often, a precise and generally accepted definition seems to be lacking (Van den Berg, 2005). Bovenberg et al. (2010) describe a healing environment as an environment that contributes to the well-being, recovery and healing of a client and can reduce patient stress and stimulates the self-recovering ability of the patient. In most studies on healing environment, the environment is operationalised through physical aspects such as daylight and nature that have proven their positive effect on patients' health and well-being. The physical environment includes all physical entities that are in and around organisations (Mobach, 2009). Evidence-based research on positive effects of environmental aspects in healthcare settings often refers to Ulrich (1984), studying the effect of patients view in hospital rooms. This research showed that patients that had a view of trees, needed less pain medication and had a shorter length of stay compared to patients viewing a brick wall. This is one of the first studies related to evidence-based design (EBD) of hospital environments. In EBD, decisions are made on the basis of credible research and evaluations of projects (Hamilton, 2003). Often one of the physical aspects of EBD is studied in an intervention study (e.g. Wakamura and Tokura, 2001; Swan et al., 2003; Altimier et al., 2005). All these aspects contribute to the creation of a healing environment.

The physical environment can be defined as all tangible physical entities in and around organisations (Mobach, 2009). A healing environment is considered a holistic entity wherein different components all play a synergistic role (Fottler et al., 2000). Therefore, healing environment from a holistic point of view considers these tangible physical entities of the physical environment as related having an intertwined effect on its users. In definitions of healing environment from this holistic perspective, the focus is not only on physical aspects, but also on social and psychological aspects. Jonas and Chez (2004) for example define an optimal healing environment as: *"one in which the social, psychologic, spiritual, physical, and behavioral components of health care are oriented toward support and stimulation of healing and the achievement of wholeness"* (p. 1). The social aspect of the healing environment is the possibility to immerse in healing relationships, primarily with family, friends and community (Jonas and Chez, 2004). Psychological aspects that are influenced by environmental stimuli are of a cognitive or emotional nature, for example the presence of plants in a patient room that give the patient a more homely feeling which results in less anxiety (Dijkstra et al., 2006). According to Jonas and Chez (2004), a spiritual aspect concerns spiritual and traditional religious practices and is about experiencing being connected to something greater than one's individual self. Behavioural aspects concern actions taken by individuals and groups that affect their health, for example physical exercise and addictive behaviour (Jonas and Chez, 2004). Because spiritual and behavioural aspects do not necessarily relate to physical aspect in a patient's room, these are not taken into account.

Social and psychological aspects however are relevant, because they are often related to physical aspects and are closely related to well-being. For example, privacy, which can be seen as a basic

element of healing environment (Wesa and Culliton, 2004), can be related to physical aspects (e.g. single patient rooms) but also to psychological aspects (e.g. the feeling of privacy) and social aspects (e.g. privacy in conversations with others).

For the purpose of this study a healing environment is defined, using Bovenberg et al. (2010), as an environment in which physical, psychological and social aspects contribute to the well-being, recovery and healing of a client and can reduce patient stress and stimulates the self-recovering ability of the patient.

2.2.2 Aspects of healing environment from a patient's perspective

As shown in the previous section, different types of aspects can be distinguished in relation to healing environment: physical, psychological and social. In this paragraph first of all the physical aspects are explained: their effect on patients' well-being and how they should be designed in order to achieve this effect. Hereafter the psychological and social aspects are explained: their effect and which physical aspects are involved.

Physical aspects of the environment

The following physical elements are explained: spatial layout, lighting, scent, nature and natural elements, art, colour, acoustic comfort, aesthetics and ambient conditions.

- Spatial layout

- Single patient room

Having a room for their own has a lot of advantages for patients. First of all, it is more safe, because infections can be prevented: there are less people in the room (fewer patients, family and staff present) which reduces the risk of spread of infections and single patient rooms are more easy to clean which also reduces the risk on infections (Ulrich et al., 2006). Single patient rooms may reduce the number of medical errors because it is more calm and quiet in the room (Van de Glind et al., 2007). In addition, single patient rooms are associated with better communication between staff members, less transfers of patients and fewer medication errors and thereby decrease the number of medical errors (Ulrich et al., 2008). Because there are less patients in the room there is also less equipment in the room; therefore, there is less noise and patient sleep improves (Devlin and Arneill, 2003).

Also for family a single patient room is more satisfying because they can stay unlimited (Ulrich et al., 2008), they have a larger, more comfortable zone (McCullough et al., 2010 in: Herweijer-van Gelder, 2016, p. 103) and communication between the family and staff improves (Ulrich et al., 2006). Finally, single patient rooms ensure both speech and visual privacy, confidentiality and leads to a higher patient satisfaction (Ulrich et al., 2008).

To conclude, patients having a room for their own can improve patients' privacy, safety and sleep.

- Bathrooms

According to Ulrich et al. (2008) research showed that shared bathrooms are an important factor in the spread of an infection; through private bathrooms this risk can be reduced. In addition, patients' privacy increases when they have a private bathroom (Ulrich et al., 2008).

To conclude, the privacy of patients can be increased and the risk of infection can be reduced through a private bathroom.

- Windows

Windows can be seen as decoration and allow patients to mentally escape spaces that are crowded or unpleasant (Herweijer-van Gelder, 2016). According to Ulrich et al. (2008) windows should be large so that bedridden persons can look outside onto sunny nature spaces which help to reduce pain. Thereby they state that large windows might help alleviate depression because of increased exposure to daylight. A study of Wilson (1972) showed that the presence of windows may reduce the chance of getting a delirium (in: Mobach, 2009, p. 277). For patients to be able to look down from the window, adequate low parapet needs to be ensured (Van den Berg and Van Winsum-Westra, 2006). Through low parapet (or breastwork) the window becomes larger and lower which enables the patient to look down whereas high parapets may restrict the view outside.

Through large windows with low parapets, depression may be alleviated and can distract patients.

To conclude, the spatial lay-out can influence how patients feel and also may influence their health. The number of patients in one room, the number of patients that have to share a bathroom and the presence, height and size of windows are herein important.

- Lighting

Adequate lighting is identified as one component that leads to patient satisfaction (Ulrich et al., 2008). Three types of lighting can be distinguished: artificial light, daylight and sunlight. When there is appropriate artificial lighting, less medication errors occur, herein a luminance of 1570 lx shows a significant lower error rate (Buchanan et al., 1991). Bright artificial light is also effective in improving mood and reducing depression (Ulrich et al., 2008). Artificial lighting can also contribute to an aesthetically pleasing environment; in general, bright indirect lighting is recommended to prevent glare (Devlin and Arneill, 2003).

The presence of daylight reduces pain and the incidence of depression (Ulrich et al., 2008). Ulrich et al. (2008) also state that the length of stay of patients suffering from depression can be reduced through morning daylight. The presence of daylight can be ensured through large windows and by avoiding that other buildings block light for others (Ulrich et al., 2008). Windows should not have awnings or permanent immovable obstructions to sunlight, ample window areas and skylights should be used as much as possible and also accessible outdoor areas can contribute to getting enough daylight for patients (Rubin et al., 1998).

Besides daylight, also sunlight is important. Research has shown that patients suffering from depression had a shorter length of stay when they stayed in sunny rooms (Beauchemin and Hays, 1996). The same applied for cardiac patients that suffered from depression but also the mortality rate was lower with patients that stayed in sunny rooms (Beauchemin and Hays, 1998). Walch et al. (2005) found that patients that had spinal surgery and were exposed to increased amounts of natural sunlight, had a decreased level of stress, pain and analgesic medication use which also resulted in lowered pain medication costs.

Lighting also has an effect on patients sleep. Through exposure to daylight or bright artificial lighting during the day and dimmed light in the patients' rooms at night, patients have a natural day/night rhythm which helps to ensure good sleep but also prevents patients from additional stress, a weakened immune system, stress and deliriums (Ulrich et al., 2008).

As described above, patients may feel better with appropriate lighting and lighting also has a positive effect on health. This involves artificial light, daylight and sunlight.

- Scent

According to Herweijer-van Gelder (2016) there are two reasons for the use of odour: it has a calming effect and can mask unpleasant hospital odours. Unpleasant odours can lead to increased heart rate and breathing, whereas specific flower and fruit scents calm breathing and reduce blood pressure and heart rate (Herweijer-van Gelder, 2016).

- Nature

Nature has always been a key component of healing environments (Van den Berg, 2005). It reduces stress (Van den Berg, 2005), it reduces negative emotions (Ulrich et al., 2006), it can enhance positive emotions (Ulrich et al., 2006), it can reduce anxiety of patients and family (Smith, 2007), it can improve health outcomes linked to post-operative complications that are coupled to stress such as headaches, it can help dealing with pain, it can lower the use of analgesic medication and it can heighten the pain tolerance (Ulrich et al., 2008).

As explained in section 2.2.1, the first research associated with evidence-based design showed that patients that had a view of trees needed less pain medication and had a shorter length of stay compared to patients viewing a brick wall (Ulrich, 1984). Also the presence of plants and flowers in patient rooms proved to lead to higher satisfaction and reduced stress, anxiety, pain and fatigue (Park and Mattson, 2009).

Besides the presence of real nature, also images of nature and murals depicting natural scenes can reduce anxiety and stress (Ulrich, 1991). In addition, providing television screens to simulate (visual and audible) nature in areas where patients undergo painful procedures can reduce severe pain (Ulrich et al., 2008). Also, the use of natural colours and natural materials such as wood and natural stones can increase the satisfaction of patients in hospitals (McCullough et al., 2010 in: Herweijer-van Gelder, 2016, p. 109).

To conclude, the positive effects of nature on patients' well-being can be achieved through views of nature through windows, images of nature on walls or displayed using technology, the use of natural materials and plants in patient rooms.

- Art

The presence of art can be a positive distraction for patients (Herweijer- van Gelder, 2016). Art stimulates the senses (Dilani, 2001), it can enhance positive feelings, hold attention and interest of patients without requiring any effort and therefore it may block or reduce worrisome thoughts (Ulrich, 1992 in: Devlin and Arneill, 2003, p. 682). Installing psychologically appropriate artwork may reduce stress of patients and improve pain relief (Ulrich and Giplin, 2003 in: Huisman et al., 2012, p. 75). Hathorn and Nanda (2008) recommend involving nature in art because patients preferred this relative to an urban environment, images of people, architectural interiors, still life, abstract images and sport

scenes. They mention the following elements of art to be appropriate in healthcare environments: waterscapes with calm or non-turbulent water, landscapes with visual depth or open foreground, trees with broad canopy, savannah landscapes, verdant vegetation or positive cultural artefacts. Flowers in the artworks should look healthy, fresh and familiar and gardens should have an open foreground; figurative art should be diverse, leisurely and have emotionally positive faces (Hathorn and Nanda, 2008).

However, art should be selected carefully in order to have its positive effects; therefore the following guidelines should be taken into account (Hathorn and Nanda, 2008):

- Art should be located in the sightlines of patients;
- The needs of special patient populations should be taken into account (e.g. no images of water in areas where patients need to have a full bladder for a medical procedure or impressionistic images in areas where patients have vision problems);
- The demographic aspects of the location of the environment should be taken into account (e.g. ethnicity, gender and age) and artwork should be chosen accordingly.

It can be concluded that the presence of art may have a positive effect on patients' well-being, if the art is selected carefully.

- **Colour**

Colours have a strong impact on our emotions and feelings (Kaya and Epps, 2004 in: Herweijer-van Gelder, 2016, p. 119). However, a lot of contrasting theories and contradictions can be found in literature and research on colour (Dalke et al., 2006). Thereby, the emotions associated with certain colours differ per gender, age, culture, religion and education level (Nemsciscs, 1993 in: Herweijer-van Gelder, 2016, p. 119). Therefore, the application of colours must be designed taking into account the context. Also, other practical or diagnostic reasons should be taken into account; red and orange makes patients in dermatology departments feel itchy and is therefore not convenient whereas in maternity units the colour yellow makes diagnoses for jaundice more difficult (Dalke et al., 2004). In general, harmonious colours and a unified colour scheme with warm and cool colours are appropriate (Herweijer-van Gelder, 2016).

To conclude, the colours used in the design of the environment may influence patient's emotions and feelings and should be selected carefully.

- **Acoustic comfort**

Noise is defined as unwanted sound (Blomkvist et al., 2005) and can be a cause of stress by patients and medical mistakes (Herweijer-van Gelder, 2016). Thereby patient sleep and satisfaction is negatively influenced by noise (Ulrich et al., 2008). According to Bell et al. (2001), noise is perceived as annoying, depending on the volume, predictability and perceived control over it. High levels of noise can lead to stress but also low intensive recurrent sounds can be harmful for health and mood (Bell et al., 2001).

Noise can be reduced or prevented in several ways. First of all, noise of other patients, medical staff and visitors can be prevented through single-patient rooms (Ulrich et al., 2008). Also, furniture with sound absorbing fabric can reduce noise (Rubin et al., 1998) and sound absorbing materials such as ceiling and wall tiles can reduce sound, reverberation time and echo (Ulrich et al., 2008). Thereby noise can be prevented by the choice of medical

equipment; pagers, curtain rails and various models of drip stands and carts with squeaky wheels producing unnecessary noise. In addition, the presence of music can shut out unwanted sounds but it also can reduce anxiety, stress and pain (Devlin and Arneill, 2003).

As described above, the sounds of the environment influence patient's mood and health. Herein noise, music and the possibility to take distance of other people can be taken into account.

- Aesthetics

Herweijer-van Gelder (2016) mentions that making the environment more comfortable and aesthetically pleasing reduces patient stress and that it increases patient satisfaction with the quality of healthcare. McCullough defines aesthetic as a visual quality; herein the application of the design principles and the orchestration of individual components of colour, light, finish and texture, which is employed in an effective combination provide the viewer a coherent visual story (Herweijer-van Gelder, 2016). Swan et al. (2003) found that patients were more satisfied with their attending physicians, food-service staff and housekeeping and rated the food and hospital better when they stayed in a hotel-like room, compared to a standard room with typical hospital beds, no artwork and inexpensive family sitting chairs. In addition, a positive treatment by the staff, showing concern, kindness and sympathy also improves patient satisfaction (Attree, 2001). Other elements that contribute to the institutional character of healthcare environments are the sterile environment and uniformity of the used materials and furniture (Herweijer-van Gelder, 2016). Elements of the environment that are found aesthetically pleasing are: functional equipment (e.g. telephones, televisions), comfortable furnishings and the use of colour, artwork, wallpaper, carpeting and other homelike décor (Harris et al., 2002). In addition, a room should look clean, tidy and neat (Lawson, 2010 in: Herweijer-van Gelder, 2016).

As described above, creating a home- or hotel-like environment with a positive attitude of the staff is satisfying for patients. In addition, properly working multimedia equipment such as telephones and televisions should be offered in a clean room. However, decisions that should be made on materials that are appropriate and which type and style of furniture are suited to create such an environment may vary from setting to setting (Harris et al., 2002).

- Ambient conditions

Poor ambient conditions, which concerns temperature, air quality and light, is an environmental factor often associated with stress (Ulrich et al., 2008). It is assumed that patients in general feel comfortable with a stable temperature between 21,5 °C and 22 °C and humidity level between 30 and 70 percent (Prevosth and Van der Voordt, 2011). Good air quality can be achieved through effective ventilation and filtration and appropriate air flow direction and pressure (Ulrich et al., 2008). Also, individual thermostats can help improve the ambient conditions (Harris et al., 2002).

Psychological and social aspects of the environment

Several studies have reviewed the research literature on healing environment and evidence-based design (e.g. Ulrich et al., 2008; Huisman et al., 2012; Herweijer-van Gelder; 2016). In these reviews, it becomes clear that the physical, social and psychological aspects of healing environment need to be taken in account. They also show that physical aspects or the application of several physical aspects together may contribute to the psychological and social aspects. For example, the aspect of privacy

can be achieved through single-patient rooms and sanitary and ensuring the appropriate acoustics (Herweijer-van Gelder, 2016). The following psychological and social aspects are explained: control, privacy, safety and social support. These aspects are all explained in several literature reviews (e.g. Ulrich et al., 2008; Huisman et al., 2012; Herweijer-van Gelder, 2016). For every aspect, it is made clear what physical aspects contribute.

- Control

Control is the opportunity to decide what to do or what others do with us (Herweijer-van Gelder, 2016). A lack of control is often associated with depression, passivity, reduced immune system functioning, elevated blood pressure and these situations are often stressful (Ulrich, 1991). In addition, the feeling of control is often associated with the feeling of well-being (Bell et al., 2001 in: Herweijer-van Gelder, 2016, p. 92). According to Ulrich (1991), patients in healthcare facilities have a low sense of control through noisy environments wherein their privacy is invaded and have no control over lighting and temperature. Through psychologically supportive design that increases control and thereby reduces stress, this can be mitigated (Ulrich, 1991). Huisman et al. (2012) describes self-supporting systems such as control over the position of the bed, temperature, lights, sound and natural light. The availability of facilities such as food and beverages and furniture also impact the level of control (Williams et al., 2008). In addition, single patient rooms enhance the level of control of patients (Devlin and Arneill, 2003); they feel more secure and have more control over social encounters (Firestone et al., 1980 in: Huisman et al., 2012, p. 74). Thereby, there is less uncontrollable noise of other patients in single patient rooms (Ulrich et al., 2006).

Patients stress reduces when patients have an increased feeling of control. The feeling of control can be increased by enhancing control over the bed, lighting, sound, temperature and air quality. In addition, the provision of food and beverages and providing single patient rooms also influences patients feeling of control.

- Privacy

Privacy is having the opportunity and choice to be alone or with other people, the possibility to withdraw from an unwanted situation visually and audibly and the possibility to not share information (Herweijer-van Gelder, 2016). Privacy is very important for patients when talking to staff, but also in conversations with family and friends. In a study on patients in emergency departments, patients indicated that a lack of privacy was the reason that they withheld personal information or refused part of their physical examination (Barlas et al., 2001). A study on patients in haemodialysis units showed that a lack of privacy led to additional stress (Steptoe and Appels, 1989 according to Devlin and Arneill, 2003). Physical aspects that can enhance privacy are: single patient rooms (Devlin and Arneill, 2003), high-performance sound-absorbing ceiling tiles (Ulrich et al., 2008) and private discussion rooms or spaces (Ulrich et al., 2008).

Privacy may reduce patients stress and can be ensured through sound absorbing materials and single patient rooms or other private rooms or spaces.

- Safety

Safety means feeling or knowing that we are protected against danger or negative influences and has a physical or psychological component (Prevosth and Van der Voordt, 2011). Physical safety concerns an environment that is designed in such a way that it can be used safely,

whereas psychological safety is about feeling protected against intruders and knowing that help will be there if necessary. Physical safety concerns healing environment aspects that are related to physical health, e.g. the prevention of infections and the prevention of patient falls (Huisman et al., 2012). As explained in the introduction, these are not taken into account in this study. Psychological safety however is relevant. In several studies, the hierarchy of needs of Maslow is related to what is important to patients (Liberakis, 1971 in: Devlin and Arneill, 2003, p. 671; Cortvriend, 2005). According to Maslow, feeling safe is one of the basic physiological needs that are required to function effectively. Being able to see the nursing station or seeing nursing staff walking down the hallway, gives patients a feeling of safety (Vos, 2004 in: Herweijer-van Gelder, 2016, p. 83). In addition, the cleanliness of a room (Harris et al., 2002; Herweijer-van Gelder, 2016) and the presence of lockers to store personal belongings (Vos, 2004 in: Herweijer-van Gelder, 2016, p. 84) can also enhance feelings of safety.

Feeling safe is important for patients to function effectively and this can be enhanced through a visible hygienic room, the presence of lockers and visible nursing staff.

- Social support

Social support is the emotional, informational and tangible support that a patient receives and which is normally received from family and people in the social network (Ulrich et al., 2008). When an individual is hospitalised and therefore is in an unexpected situation or stressful event, the need for social support increases; however, when in a hospital, the contacts with one's social network are limited (Ulrich et al., 2008). According to Herweijer-van Gelder (2016), the recovery process of patients is promoted by social support in three ways: emotional components (warmth, support), practical components (time, capacity) and informative components (advice and assistance). In addition, patients experience less fear and anxiety when they have a lot of social support, patients are more relaxed and distracted by social communication and it reduces the effects of a stressful situation (Herweijer-van Gelder, 2016). The communication between family, patients and the care team can be ensured by offering space for family wherein privacy is maintained and noise is minimised (Sadler et al., 2009). In the physical environment, several arrangements in the design and layout can be made to enhance social support. First of all, single-bed rooms can increase the social support because they offer privacy, often have a larger area for family and make it possible for family and friends to stay longer (Ulrich et al., 2008). In the case of multi-bed rooms, offering private areas for patients and families can increase social support, for example through lounges and rooms for group consultation (Herweijer-van Gelder, 2016). Also, comfortable and movable furniture can facilitate social interaction and the use of carpet can increase the length of family stays; however the latter can have a negative impact on infection control and cleaning and therefore should be applied with comprehensive consideration (Ulrich et al., 2008). Besides the design of the physical environment, the provision of additional services should be considered to foster family support, for example the opportunity for family to use the phone and the internet and offering them facilities such as the provision of decent meals and the opportunity to stay overnight (Vos, 2004 in: Herweijer-van Gelder, 2016, p. 104).

Social support has an effect on patient's emotions and stress and can be increased through single patient rooms, private areas, comfortable and moveable furniture and the provision of additional services.

Conclusion

Literature provides many physical, psychological and social aspects that positively affect patients' well-being. Table 2 and 3 give an overview of all the aspects found and discussed. Literature is not clear about the extent to which these aspects relate to patients' well-being or the strength of the relationship between a healing environment and patients' well-being. Although considering healing environment as a holistic entity, literature is not conclusive about which aspects should be included or what different combinations of environmental aspects have a synergistic effect.

Table 2: overview of physical aspects

Physical aspects	Authors
Spatial layout: single patient rooms, private bathroom and windows	Devlin and Arneill (2003); Herweijer-van Gelder (2016); Mobach (2009); Ulrich et al. (2006); Ulrich et al. (2008); Van de Glind et al. (2007); Van den Berg and Van Winsum-Westra (2006)
Lighting: artificial, day- and sunlight	Beauchemin and Hays (1996); Buchanan et al. (1991); Devlin and Arneill (2003); Rubin et al. (1998); Ulrich et al. (2008); Walch et al. (2005)
Scent	Herweijer-van Gelder (2016)
Nature: view of nature, presence of plants in the room and presence of images of nature in the room	Herweijer-van Gelder (2016); Park and Mattson (2009); Smith (2007); Ulrich (1984); Ulrich (1991); Ulrich et al. (2006); Ulrich et al. (2008); Van den Berg (2005)
Art	Devlin and Arneill (2003); Dilani (2001); Hathorn and Nanda (2008); Herweijer- van Gelder (2016); Huisman et al. (2012)
Colours used in the interior	Dalke et al. (2006); Herweijer-van Gelder (2016)
Acoustic comfort	Bell et al. (2001); Blomkvist et al. (2005); Devlin and Arneill (2003); Herweijer-van Gelder (2016); Rubin et al. (1998); Ulrich et al. (2008)
Aesthetics: ambience, cleanliness, positive attitude and multimedia	Attree (2001); Harris et al. (2002); Herweijer-van Gelder (2016); Swan et al. (2003)
Ambient conditions: temperature and ventilation	Harris et al. (2002); Prevosth and Van der Voordt (2011); Ulrich et al. (2008)

Table 3: overview of psychological and social aspects

Psychological and social aspects	Authors
Control over ambient conditions, lighting, sound and bed and food provision	Devlin and Arneill (2003); Herweijer-van Gelder (2016); Huisman et al. (2012); Ulrich (1991); Ulrich et al. (2006); Williams et al. (2008)
Privacy	Barlas et al. (2001); Devlin and Arneill (2003); Herweijer-van Gelder (2016); Ulrich et al. (2008)
Safety: presence of lockers and view on the nursing staff	Cortvriend (2005); Devlin and Arneill, (2003); Harris et al. (2002); Herweijer-van Gelder (2016); Prevosth and Van der Voordt (2011)
Social support: the extent to which the room facilitates this, e.g. through single bed rooms, movable furniture and additional services such as internet and the provision of decent meals	Herweijer-van Gelder (2016); Sadler et al. (2009); Ulrich et al. (2008)

2.2.3 Measurement of healing environment

The literature study described several aspects of the healing environment. These environmental aspects have an effect on its' users, for example on their well-being (Zube et al., 1982). It is however unclear how perceiving the environment works and how this can be measured. This paragraph explains this.

Perceived environment

Although an environment is experienced holistically, different environmental aspects can be perceived on their own (Mattila and Wirtz, 2001). According to Jacobs (2006), perceiving is one of the modes of experience and an environment is often experienced perceptually. Ittelson (1973) draws three general conclusions concerning perceiving: (1) "Perceiving is relatively free from direct control of the stimulus"; (2) "It is inseparably linked to, and indeed indistinguishable from, other aspects of psychological functioning" and (3) "Perceiving is relevant and appropriate to the environmental context in which it occurs" (Ittelson, 1973 in: Zube et al., 1982, p. 22). Thus, an environment is perceived through multiple senses and simultaneously processed but also provides more information than can be used (Zube et al., 1982). According to Jacobs (2006), perception is "*the process of experiencing organized and interpreted information extracted from sensations*" (p. 122). Following Jacobs, perceiving the environment starts with sensation; the physical environment is sensed through sight, sound, taste, smell and touch. This raw information is interpreted with use of mental concepts, which are pre-existing concepts in our minds through which stimuli (environmental aspects) can be sorted into categories (Jacobs, 2006). The raw information that is sensed in the environment is processed in our mind. With use of mental concepts that exist in our minds, an environmental aspect is recognised in a certain category (Howard, 1987). This creates the perception of the environment; for example, colours, tastes and smells which are constructions of our mind instead of properties of objects we perceive (Jacobs, 2006).

According to Fottler et al. (2000), not every aspect of a healthcare facility is synthesized by the individual. The facility is experienced on physiological, cognitive and emotional level. These experiences are combined and selected consciously and subconsciously through which a perception of a certain aspect is created (Fottler et al., 2000). Because every person perceives an environment using its own mental concepts, patients should evaluate every aspect on its own. These aspects should be made clear extensively in order to prevent indistinctness over the meaning of the concept.

Measurement of healing environment

How people assess the environment is often measured by means of scales measuring the perceived environmental quality (Fornara et al., 2006). According to Ittelson (1978) perceived environmental quality shows the complexity and richness of environmental perception. Through perceived environmental quality, the environment can be monitored in order to make environmental decisions (Ittelson, 1978). Attitude scales, for example Likert scales are often used to measure perceived environmental quality (e.g. Fornara et al., 2006; Andrade et al., 2012; De Giuli et al., 2013). Brown (2010) gives examples of Likert scales that measure quality ranging from "very good" to "very poor" or "excellent" to "very poor".

To conclude, every person perceives an environment differently, with use of its own mental concepts. In order to measure how patients perceive the healing environment aspects, the different aspects should be distinguished and made clear in order for patients to understand them. However, due to one's own mental concepts, environmental aspects are perceived differently by every

individual. By measuring the perceived environmental quality through a Likert scale, it can be found how patients perceive the different healing environment aspects.

2.2.4 Moderating variables

As explained above, people perceive the environment differently. Literature is studied to find out what additional variables may influence how the different healing environment aspects are perceived. Only moderating variables in relation to social support were found.

Social support

Different moderating variables on social support are found. According to Antonucci and Akiyama (1987), women have a larger network and experience more social support than men. Also social class may influence the amount of social support received (Matthews et al., 1999).

To conclude, age and social class may influence the relationship between healing environment aspects and patients' well-being.

2.2.5 Conclusion

In a healing environment, physical, psychological and social aspects contribute to the well-being, recovery and healing of a client and can reduce patient stress and stimulates the self-recovering ability of the patient. Although concerning different environmental aspects, a healing environment is experienced holistically. The physical and psychological and social aspects are interrelated and all have a relation with well-being. Age and social class may influence the relationship between healing environment aspects and patients' well-being. By explaining the different aspects to patients and measuring the perceived environmental quality, the perceived healing environment can be measured.

2.3 Conceptual framework

The theoretical framework is conceptualised in figure 2. The figure shows two distinct concepts: healing environment and well-being. The healing environment consists out of the physical and the psychological and social aspects. The literature study showed nine physical aspects that may influence the level of well-being of patients: spatial layout, lighting, scent, nature, art, colours, acoustic comfort, aesthetics and ambient conditions. Four psychological and social aspects are distinguished: control over several environmental factors, privacy, safety and social support. As explained in the literature study, these aspects are interrelated and influence each other. The literature study shows that they are related to well-being individually but also holistically. In this study, only the individual relationship of the healing environment aspects with well-being is taken into account. The healing environment aspects can be assessed by patients in order to find out how they perceive these different aspects. Five subjects of well-being are distinguished, following the WHO-5 questionnaire. The relationship between the healing environment aspects and patients' well-being is assumed to be positive: e.g. the more positive one perceives the healing environment aspects, the higher one's level of well-being. However the strength of the relationship may differ per aspect.

The relationship between healing environment and well-being is influenced by demographic and socioeconomic factors. These characteristics are visible in figure 2 as moderating variables, these are: gender, age, marital status, education level and unemployment. In addition, several other moderating variables related to patients in hospitals are added, assuming that these aspects might influence the relationship; these are: earlier hospitalized, length of stay, type of ward and room type. The length of stay may influence patients' well-being because they may experience the environment more thoroughly when they are longer in the hospital and thereby perceive the environment differently. The same might apply for patients that have been hospitalized in the same hospital previously. The literature study showed that patients in a single-patient room experience more privacy compared to multi-bed rooms. Therefore, the type of room patients are staying in is inventoried. Also, the type of ward the patient is staying in, may influence their well-being because diseases on one ward may be worse compared to other wards.

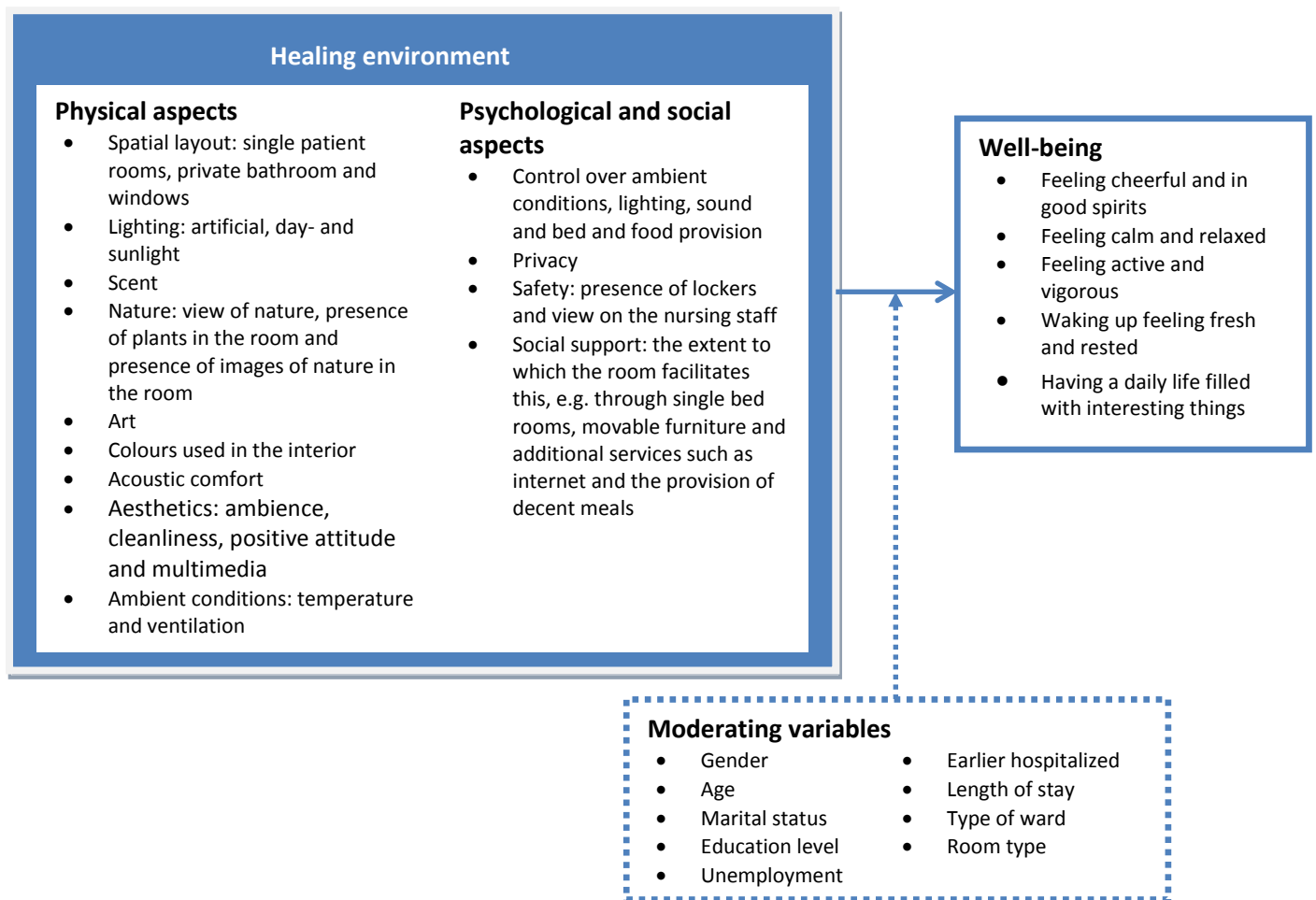


Figure 2: Conceptual framework of the relation between healing environment and well-being

This conceptual framework is used to develop the questionnaire that is used to measure how patients perceive the healing environment aspects, how patients assess their well-being and to measure the moderating variables.

3. Methodology

The empirical research concerns a questionnaire and analysis of the data. The questionnaire is used to find out what the level of well-being is of patients and how they perceive the different environmental aspects. The statistical analysis makes clear whether the relation between healing environment aspects and well-being of patients can be found in practice.

3.1 Construction of the questionnaire

The questionnaire was divided into three parts, following the theoretical framework. First the well-being of patients was measured; hereafter patients were asked how they perceive the different healing environment aspects. Lastly the moderating variables were covered in the questionnaire. The final questionnaire is given in Annex B.

3.1.1 Measurement of well-being (dependent variable)

Because the well-being of patients should not be influenced by other questions in the questionnaire, the questionnaire started with the measurement of well-being. As shown in the literature study, the WHO-5 well-being scale is an appropriate scale to use in this study. Table 4 shows the WHO-5 questionnaire in English. The following explanation was given to participants: Please indicate for each of the five statements which is closest to how you have been feeling over the last two weeks. Notice that higher numbers mean better well-being. Example: If you have felt cheerful and in good spirits more than half of the time during the last two weeks, tick the circle at the height of the first line, under “more than half of the time”.

Table 4: The WHO-5 Well-being scale as used in the questionnaire

Over the last two weeks	All of the time	Most of the time	More than half of the time	Less than half of the time	Some of the time	At no time
1. I have felt cheerful and in good spirits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I have felt calm and relaxed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I have felt active and vigorous	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I woke up feeling fresh and rested	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. My daily life has been filled with things that interest me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

For every answer a score between zero (at no time) and five (all of the time) is given. The scores of all questions are added and multiplied by four. This results in a percentage score between zero and one hundred. Zero reflects the lowest level of well-being whereas one hundred reflects the highest level of well-being.

3.1.2 Measurement of healing environment (independent variables)

In the literature study healing environment aspects that influence patients' well-being were found. These aspects are summarised in the conceptual framework and were translated to one or more

questions in the questionnaire. Table 5 shows the questions concerning the physical aspects and table 6 shows the questions in the questionnaire concerning psychological and social aspects.

Table 5: Physical healing environment aspects translated to the questionnaire

Aspects	Translation to the questionnaire
Spatial lay-out (single patient rooms, private bathroom and windows)	The spatial lay-out of the room (e.g. single- or multi-patient room, personal bathroom/toilet, windows, view on outside)
Lighting (daylight, artificial light and sunlight)	The amount of daylight in the room The artificial light in the room The extent to which the sun shines in the room
Scent	The scent in your room (e.g. pleasant, calming)
Nature (view of nature, presence of plants in the room and presence of images of nature in the room)	The view of nature (e.g. garden, trees, bushes) The presence of plants in your room The presence of images of nature in your room
Art	The art in your room (e.g. appropriateness, positive distracting, drawing attention)
Colours used	The colours used in the interior of your room
Acoustic comfort	The sound comfort in your room (e.g. sounds in the background, reverberation time)
Aesthetics (ambience, cleanliness, positive attitude and multimedia)	The ambience in your room (e.g. comfort, homeliness) The cleanliness of the room (e.g. hygienic, fresh, tidiness) The treatment by the healthcare staff (e.g. respectful, friendly, understanding, attentively) The treatment by the facility (e.g. food provision, cleaning staff (e.g. respectful, friendly, understanding, attentively) The provision of multimedia (e.g. internet, television, telephone) in your room
Ambient conditions	The indoor climate of your room (e.g. temperature, ventilation, fresh air)

As visible in table 5, the physical healing environment aspects are translated to seventeen questions in the questionnaire. Because the research is executed out of a facility management perspective, the positive attitude of the staff was split into two questions distinguishing the healthcare staff and the facility staff.

Table 6: Psychological and social healing environment aspects translated to the questionnaire

Aspects	Translation to the questionnaire
Control (control over the light, bed, sound and ambient conditions and food provision)	The possibility to control the light in the room The possibility to control the lying position of the bed The extent to which you have influence on the sound comfort The possibility to control the indoor climate in your room The food provision (e.g. choice possibilities, taste, temperature, presentation)

Privacy	The feeling of privacy in your room The extent to which your room facilitates privacy (e.g. single-patient room, soundproof walls, curtains)
Safety (presence of lockers and view on the nursing staff)	The feeling of safety in your room The physical safety in your room (e.g. lockers, view on the nursing station, alarm button)
Social support (the extent to which the room facilitates this, e.g. through single bed rooms, movable furniture and additional services such as internet and the provision of decent meals)	The extent to which you experience social support (e.g. warmth, attention, help) from family and friends in your room The extent to which your room facilitates social support (e.g. through a place to sit and talk undisturbed, movable furniture)

In order to make the questionnaire clear and easy to handle, the questions were clustered into blocks consisting out of 1 to 5 questions. This was for example done by clustering control over the light with the other questions concerning light and by clustering art, use of colours and ambiance into a block called interior design. Cleanliness, the treatment by the staff, the provision of multimedia and the food provision were clustered in a block called service because they all concern the offering of services and often people are involved.

In addition to the healing environment questions, two other questions were asked in the questionnaire (see table 7). This concerned an overall assessment of the room in order to find the overall opinion of the room. Secondly, patients could indicate which of the covered healing environment aspects should be improved with a maximum of three answers. Through this question the most important subjects that need to be improved, according to patients, become clear.

Table 7: Other questions

Subject	Translation to the questionnaire
Overall assessment	Your overall assessment of your room
Subjects for improvement	Which subjects should be improved? (maximum of three answers possible) <ul style="list-style-type: none"> • Presence of nature • Art • Sound comfort • Ambient conditions • Multimedia • Ambiance • Control (over the light, ambient conditions, position of the bed and sound) • Colour • Privacy • The food provision • Social support • Physical safety • Spatial lay-out • Light • Scent • Cleanliness • Treatment by the healthcare staff • Treatment by the facility staff • Nothing needs to be improved

As shown in the literature study, how patients perceive the healing environment aspects can be found by measuring the perceived environmental quality by means of a Likert scale. A 7-point Likert scale is chosen because several studies found that it is the most reliable number of response items in comparison with 5- and 10-point scales (Cox, 1980; Preston and Colman, 2000; Dawes, 2008). The

scale ranges from ‘very bad’ to ‘very good’. In the questionnaire patients can assess how they perceive the different aspects, in order to obtain their perception of the different healing environment aspects.

Before the start of the empirical research, several persons of different ages completed the questionnaire in order to find out whether there were ambiguities in the questions. As a result, several items were adjusted to make them clearer, for example acoustic comfort and the treatment by the healthcare staff.

3.1.3 General questions (moderating variables)

Thirdly, general questions are asked in the questionnaire, based on the moderating variables as found in the literature study. In addition, the length of stay, the type of ward the patient is on, previously hospitalized and the room type are added to the questionnaire. Lastly, patients are asked for comments and/or suggestions. The translation of these items into questions with response options is given in table 8. When testing the questionnaire, small adjustments were done, for example adding the response option “houseman/housewife” to the work situation.

Table 8: General questions translated to the questionnaire

Aspects	Translation to the questionnaire
Age	What is your age? Open question
Gender	What is your gender? <ul style="list-style-type: none"> • Male • Female
Marital status	What is your marital status? <ul style="list-style-type: none"> • Unmarried • Legally married • Registered partnership • Widowed after legal marriage • Widowed after partnership • Divorced after legal marriage • Divorced after partnership
Level of education	What is your highest level of completed education? <ul style="list-style-type: none"> • No education • Primary education • Lower vocational education • Secondary vocational education • Higher professional education • University education
Work situation	What is your current work situation? <ul style="list-style-type: none"> • Paid work full- or part time • Unemployed/social assistance • Incapacitated • Houseman/housewife • Student • (Early) retirement

Aspects	Translation to the questionnaire
Previously hospitalised in current hospital	Were you previously hospitalised in the current hospital? <ul style="list-style-type: none"> • Yes • No
Current length of stay	How many days are you currently staying in the hospital? <ul style="list-style-type: none"> • 1 day • 2 days • 3 days • 4 days • 5 days • Longer than 5 days
Room size	Are you staying in a single-patient room, a double room or a quadruple room? <ul style="list-style-type: none"> • Single-patient room • Double room • Quadruple bedroom
Departments	For what department are you admitted to het hospital? <ul style="list-style-type: none"> • Surgery • Lung diseases • Neurology

3.2 Sampling and data collection

In total nineteen hospitals were asked to participate in the research by contacting the facility management department, communication department, the science office or the Planetree coordinator. Through phone calls and e-mails the objectives of the research were explained to get approval on participation. There were various reasons for the hospitals for not participating in the study: too busy for the departments, not wanting to burden their wards with the study, not wanting to burden their patients with the study, not relevant because a moving is planned in the near future or no reason was given. Finally, three hospitals agreed to participate in the study. At one of the hospitals, an official research request needed to be submitted at the science office to get permission for the study. The consent form is given in Annex A.

In every hospital the same wards were studied. Three different hospital wards were chosen: surgery, neurology and pulmonary medicine. These wards were chosen because patients of these wards on average stay longer in the hospital compared to patients of other wards and therefore experience the environment more thoroughly. Thereby are most patients of these wards able to answer questions, despite their sickness. The research was announced to the patients through a letter which was distributed by the nursing staff. In this letter the research was explained and announced. On the days of conducting the research, the researcher asks the patients whether they wanted to participate in the research. The patients that were able and willing to participate were asked to participate in the research by filling in the questionnaire. When patients needed help filling in the questions, the researcher offered to help. When the patients had completed the questionnaire, they handed it over to the researcher. The researcher gathered all the completed questionnaires. Participants could leave the study at any time for any reason if they wished to do so without any consequences. The privacy of the patients was ensured because the questionnaires were anonymous and the caretakers did not know whether a patient participated in the study.

The data collection found place from the 9th until the 31st of January 2017. Hospital 1 and 3 were visited five times, with intervals of two or three days. In these hospitals, patients of the neurology, surgery and lung diseases departments were asked to participate. In hospital 2 only patients of the neurology and surgery departments were studied because there was no department for lung-diseases. The number of hospital beds that were visited each day was as follow per hospital: hospital 1: 70 beds; hospital 2: 52 beds; and hospital 3: 71 beds. Because the study population of hospital 2 was smaller, this hospital was visited six times, also with intervals of two or three days.

3.3 Sample size and analysis of the data

The questionnaire consists of 28 variables. Five to ten respondents per variable are necessary for a proper factor solution. Therefore, the aim of the research was to gather between 140 and 280 respondents. In total, 230 patients participated in the research by completing the questionnaire. The results of the questionnaire were entered into SPSS and different statistical analyses were conducted. First of all, descriptives and mean scores per hospital were studied. Hereafter a Mann-Whitney U test was conducted to compare the well-being and healing environment aspects of the different hospitals with each other. Through factor analysis the set of variables (the physical aspects as well as the social and psychological aspects) was reduced into a smaller set of dimensions. These factors are used in a multiple regression analyses to find out what relationship exists between these factors and patients' well-being.

3.4 Reliability, validity and ethical accountability

Different measures were taken to ensure the quality of the research. This paragraph describes the reliability, internal and external validity and the ethical accountability.

3.4.1 Reliability

The reliability of the questionnaire was ensured by aiming for a large sample; more than 200 respondents. There is also aimed for an equal distribution of respondents among the hospitals and the departments. The questionnaire was tested among different people to find out if the formulation of the questions was clear and interpreted in a uniform way. Gathering the results was done in the same way at every hospital and department; first the nurses were asked which patients were able to participate in the study and met the criteria as stated above. Hereafter these patients were approached and asked for their consent to participate in the research.

3.4.2 Validity

In the literature study, key concepts were defined to avoid confusion about the meaning of these concepts in order to ensure internal validity. Through the large sample and by involving surgical and diagnostic departments, the external validity is tried to ensure. Therefore, it is possible to make general statements about the perceived healing environment aspects of every hospital.

3.4.3 Ethical accountability

Before starting the empirical research, an ethical review of the study was requested from the Social Sciences Ethics Committee of the WUR. The ethical clearance is given in Annex C. All patients participated in the study on voluntary basis. Before answering the questions, patients were informed about the goals of the research, the anonymity of their answers and patients were drawn to the fact that they could stop filling in the questionnaire at any time they wanted, without giving a reason.

4. Results

This chapter contains the results of the empirical study. In this chapter, the following research questions are answered:

- How do patients perceive the healing environment aspects present in their vicinity?
- How do patients assess their well-being?
- What relationship exists between the perceived healing environment aspects and patients' well-being within the different hospitals?

The results of the questionnaire show how patients rate the healing environment aspects present in their vicinity and their level of well-being. Through factor analysis and regression a relationship between the perceived healing environment aspects and patients' well-being is found.

4.1 Description of the data

230 patients participated in the research by completing the questionnaire. This is divided over three hospitals, as visible in table 9. Characteristics of the respondents of every hospital are given in table 10.

Table 9: Number of respondents

Hospital	Respondents	Percentage
Hospital 1	82	35.7
Hospital 2	70	30.4
Hospital 3	78	33.9
Total	230	100.0

Table 10: Description of the general questions

	Hospital 1 (N=82)	Hospital 2 (N=70)	Hospital 3 (N=78)
Mean age	(N=78) 67.14 ± SD = 14.72	(N=64) 69.64 ± SD = 14.60	(N=74) 64.32 ± SD = 14.72
Gender	(N=79)	(N=68)	(N=75)
Male	36 (45.6%)	36 (52.9%)	36 (48.0%)
Female	43 (54.4%)	32 (47.1%)	39 (52.0%)
Departments	(N=82)	(N=70)	(N=78)
Surgery	24 (29.3%)	48 (68.6%)	33 (42.3%)
Lung diseases	37 (45.1%)	0 (0.0%)	25 (32.1%)
Neurology	21 (25.6%)	22 (31.4%)	20 (25.6%)
Marital status	(N=79)	(N=68)	(N=75)
Unmarried	9 (11.4%)	8 (11.8%)	11 (14.7%)
Legally married	50 (63.3%)	33 (48.5%)	43 (57.3%)
Registered partnership	1 (1.3%)	3 (4.4%)	8 (10.7%)
Widowed after legal marriage	16 (20.3%)	18 (26.5%)	9 (12.0%)
Widowed after partnership	0 (0.0%)	0 (0.0%)	0 (0.0%)
Divorced after legal marriage	3 (3.8%)	5 (7.4%)	4 (5.3%)
Divorced after partnership	0 (0.0%)	1 (1.5%)	0 (0.0%)

	Hospital 1 (N=82)	Hospital 2 (N=70)	Hospital 3 (N=78)
Level of education	(N=78)	(N=66)	(N=75)
No education	3 (3.8%)	4 (6.1%)	1 (1.3%)
Primary education	5 (6.4%)	10 (15.2%)	6 (8.0%)
Lower vocational education	19 (24.4%)	17 (25.8%)	13 (17.3%)
Secondary vocational education	31 (39.7%)	24 (36.4%)	35 (46.7%)
Higher professional education	13 (16.7%)	10 (15.2%)	15 (20.0%)
University education	7 (9.0%)	1 (1.5%)	5 (6.7%)
Work situation	(N=78)	(N=67)	(N=75)
Paid work full- or part time	13 (16.7%)	13 (19.4%)	22 (29.3%)
Unemployed/social assistance	5 (6.4%)	1 (1.5%)	3 (4.0%)
Incapacitated	7 (9.0%)	6 (9.0%)	7 (9.3%)
Houseman/housewife	10 (12.8%)	10 (14.9%)	8 (10.7%)
Student	1 (1.3%)	1 (1.5%)	0 (0.0%)
(Early) retirement	42 (53.8%)	36 (53.7%)	35 (46.7%)
Previously hospitalised in current hospital	(N=78)	(N=68)	(N=73)
Yes	52 (66.7%)	49 (72.1%)	60 (82.2%)
No	26 (33.3%)	19 (27.9%)	13 (17.8%)
Current length of stay	(N=78)	(N=68)	(N=75)
1 day	3 (3.8%)	2 (2.9%)	11 (14.7%)
2 days	6 (7.7%)	9 (13.2%)	15 (20.0%)
3 days	13 (16.7%)	8 (11.8%)	12 (16.0%)
4 days	12 (15.4%)	10 (14.7%)	7 (9.3%)
5 days	10 (12.8%)	8 (11.8%)	12 (16.0%)
Longer than 5 days	34 (43.6%)	31 (45.6%)	18 (24.0%)
Room size	(N=79)	(N=68)	(N=75)
Single-patient room	79 (100.0%)	38 (55.9%)	6 (8.0%)
Double room	0 (0.0%)	7 (10.3%)	15 (20.0%)
Quadruple bedroom	0 (0.0%)	23 (33.8%)	54 (72.0%)

Table 10 shows that the mean age of patients that completed the questionnaire was very high, between 64 and 70. This corresponds with the high rate of retired patients. Most patients are married, followed by widowed and unmarried. In every hospital about the same percentage of patients of neurology departments participated. The number of patients that participated of the other departments differs per hospital, with more patients from the lung diseases department at hospital 1 and more patients from the surgery department at hospital 2 and 3. The level of education of patients is about the same in every hospital, with most patients indicating to have had lower or secondary vocational education or higher professional education. Most patients were previously hospitalised in the hospital they were staying in, ranging from 66.7 percent in hospital 1 to 82.2 percent in hospital 3. The length of stay of patients was longer in hospital 1 and 2: 43.6 and 45.6 percent of the patients were staying longer than five days in the hospitals, compared to 24.0 percent in hospital 3. As visible in the data, the hospitals differ when it comes to room size. Hospital 3 has the most double and quadruple rooms. This is also the hospital that has the oldest buildings which is in use for over more than twenty years. Hospitals 1 and 2 have newer buildings, both officially opened in 2013. Both hospitals have more or even only single-patient rooms.

Also, the mean score of every item of the questionnaire is described for every hospital. Tables 11 and 12 show the mean score, standard deviation and the number of respondents (N) of the well-being score and of every item in the questionnaire concerning the environment. The well-being score concerns a score on the WHO-5 well-being scale between 0 and 100. Patients are asked how they experience the different healing environment aspects on a 7-point scale ranging from 1 (very bad) to 7 (very good). Overall reliability of the data was very good: Cronbach's $\alpha = .931$, with scores varying from .882 to .960 for the different hospitals (table 12).

Table 11: Well-being scores (score between 0 and 100)

	Hospital 1 (N=75)	Hospital 2 (N=64)	Hospital 3 (N=72)	Item mean (N=211)
	Mean \pm Std. Dev.	Mean \pm Std. Dev.	Mean \pm Std. Dev.	Mean \pm Std. Dev.
Well-being score	<i>46.08^b</i> \pm 24.41	53.75^a \pm 24.74	52.11 \pm 26.15	50.64 \pm 25.25

^aThe highest score appears in bold

^bThe lowest score appears in italic

Table 11 shows that the level of well-being is low in every hospital. The standard deviation is very high for every hospital, between 24.41 and 26.15. This shows that there were a lot of differences in the level of well-being of patients, with both very low and high scores. It is striking to see that the hospital with only single-patient rooms has the lowest mean score on well-being. As mentioned in the literature study, single-patient rooms should bring many benefits, for example privacy, control and safety.

Table 12: Mean scores per item (7-point scale)

	Hospital 1 (N=82)	Hospital 2 (N=70)	Hospital 3 (N=78)	Item mean (N=230)
	Mean \pm Std. Dev. (N)	Mean \pm Std. Dev. (N)	Mean \pm Std. Dev. (N)	Mean \pm Std. Dev. (N)
Spatial lay-out	6.10 \pm .95 (82)	6.17^b \pm .94 (69)	5.57 ^a \pm 1.08 (76)	5.94 \pm 1.02 (227)
Lighting				
Daylight	5.85 \pm 1.03 (81)	5.99 \pm 1.09 (68)	6.08 \pm .82 (74)	5.97 \pm .98 (223)
Artificial light	5.93 \pm .88 (76)	5.85 \pm .87 (65)	5.78 \pm .96 (73)	5.86 \pm .91 (214)
Sunlight	5.26 \pm 1.33 (53)	5.60 \pm 1.44 (45)	5.78 \pm 1.04 (67)	5.56 \pm 1.27 (165)
Scent	5.48 \pm .92 (79)	5.62 \pm 1.12 (66)	5.17 \pm 1.18 (72)	5.42 \pm 1.08 (217)
Nature				
View of nature	3.18 \pm 1.70 (72)	4.81 \pm 1.63 (64)	4.25 \pm 1.46 (71)	4.05 \pm 1.73 (207)
Plants present	3.00 \pm 1.59 (44)	4.00 \pm 1.61 (31)	3.49 \pm 1.59 (47)	3.44 \pm 1.63 (122)
Images of nature	2.56 \pm 1.39 (43)	3.71 \pm 1.51 (28)	2.77 \pm 1.60 (44)	2.92 \pm 1.56 (115)
Design				
Art	3.63 \pm 1.79 (43)	4.24 \pm 1.48 (25)	3.32 \pm 1.47 (41)	3.65 \pm 1.63 (109)
Colour	5.32 \pm 1.24 (80)	5.65 \pm 1.22 (68)	4.95 \pm 1.43 (73)	5.30 \pm 1.33 (221)
Ambiance	5.33 \pm 1.29 (78)	5.74 \pm 1.00 (68)	4.89 \pm 1.31 (75)	5.31 \pm 1.26 (221)
Ambient conditions	5.23 \pm 1.28 (82)	5.62 \pm 1.17 (68)	4.91 \pm 1.39 (75)	5.24 \pm 1.31 (225)
Sound comfort	5.17 \pm 1.40 (76)	5.39 \pm 1.33 (67)	4.68 \pm 1.47 (76)	5.07 \pm 1.43 (219)

	Hospital 1 (N=82)	Hospital 2 (N=70)	Hospital 3 (N=78)	Item mean (N=230)
Control				
Light	5.93 ± .85 (74)	5.74 ± 1.12 (61)	5.58 ± 1.08 (72)	5.75 ± 1.03 (207)
Ambient conditions	4.74 ± 1.61 (61)	4.51 ± 1.89 (49)	4.14 ± 1.62 (50)	4.48 ± 1.71 (160)
Bed	6.17 ± .95 (81)	6.19 ± .96 (67)	6.05 ± .94 (74)	6.14 ± .94 (222)
Sound	5.08 ± 1.33 (72)	4.96 ± 1.49 (56)	4.18 ± 1.65 (68)	4.73 ± 1.54 (196)
Privacy				
Feeling of privacy	5.89 ± .91 (80)	5.76 ± 1.01 (70)	4.96 ± 1.44 (76)	5.53 ± 1.22 (226)
Privacy facilities	5.84 ± 1.08 (80)	5.88 ± .99 (66)	4.93 ± 1.36 (70)	5.56 ± 1.23 (216)
Safety				
Feeling safe	6.14 ± .69 (81)	6.04 ± .82 (68)	5.49 ± 1.13 (71)	5.90 ± .93 (220)
Physical safety	6.07 ± .79 (81)	5.91 ± .99 (66)	5.22 ± 1.16 (73)	5.74 ± 1.05 (220)
Social support				
Feeling social support	6.16 ± .83 (80)	6.09 ± .83 (67)	5.74 ± 1.08 (76)	6.00 ± .94 (223)
Social support facilities	6.05 ± .74 (81)	5.81 ± 1.09 (67)	5.08 ± 1.30 (72)	5.66 ± 1.13 (220)
Service				
Cleanliness	6.04 ± .87 (81)	6.10 ± .79 (69)	5.62 ± 1.07 (76)	5.92 ± .94 (226)
Multimedia	5.41 ± 1.43 (75)	5.81 ± 1.24 (62)	5.35 ± 1.24 (75)	5.50 ± 1.32 (212)
Treatment by healthcare staff	6.53 ± .57 (81)	6.58 ± .53 (67)	6.38 ± .78 (78)	6.50 ± .64 (226)
Treatment by facility staff	6.40 ± .61 (81)	6.39 ± .63 (66)	6.19 ± .95 (78)	6.32 ± .75 (225)
Food provision	5.83 ± 1.13 (81)	6.52 ± .62 (62)	6.19 ± .76 (72)	6.15 ± .93 (215)
Overall assessment	6.21 ± .67 (81)	6.20 ± .86 (66)	5.82 ± 1.09 (77)	6.07 ± .90 (224)
Cronbach's α	.882	.921	.960	.931

^aThe lowest score per item appears in italic

^bThe highest score per item appears in bold

The overall mean of the well-being score is 50.64 on a scale of 0 to 100. The overall assessment of the room has a mean of 6.07 on a scale of 0 to 7. The items vary from 2.92 for the presence of images of nature to 6.50 for treatment by the healthcare staff. Overall the physical environment of hospital 2 is valued most positively and scores the highest on sixteen items, followed by hospital 1 with eleven times the highest score and six times the lowest score. The environment of hospital 3 is valued most negatively with two times the highest score (sunlight and daylight) and the lowest score on 23 items. The privacy is valued markedly lower at hospital 3 which seems logic considering it has the most quadruple rooms. Overall, there are low scores for every hospital on the nature aspects and art. Also control over ambient conditions and sound has low scores. Remarkably the human factor, for example the treatment by the healthcare staff, is valued very high in all three hospitals.

For some items a relatively large number of participants answered 'not applicable'. This was the case for plants present in the hospital room, images of nature and art. Also, the extent to which the sun was shining in the room was often answered with 'not applicable' because patients were not sure whether the sun had shined while they were in the hospital. Lastly, control over the ambient conditions was often answered with 'not applicable' because patients did not know whether they could control the ambient conditions. Most of the standard deviations have a score above 1 which is relatively high considering the used seven-point scale. This may indicate that there were differences in the perception of the healing environment aspects in the hospital rooms.

4.2 Non-parametric tests

In order to find out whether there are significant differences in the perceived healing environment aspects between hospitals, a non-parametric test is executed. When conducting a Kolmogorov-Smirnov test, the distribution of the data showed to be non-normal ($p < 0.05$ for every variable). The scores of the different hospitals on the items in the questionnaire are compared to each other using a Mann-Whitney U test. Table 13 shows the calculated effect sizes of the significant items. A positive score means that the respective aspects of healing environment at the first mentioned hospital was evaluated higher whereas a negative score means that these aspect at the second mentioned hospital was evaluated higher. The empty spaces represent non-significant scores meaning that no significant difference was found between the hospitals on that item.

Table 13: Gaps of the significant items in the Mann-Whitney U test

	Hospital 1 – Hospital 2	Hospital 1 – Hospital 3	Hospital 2 – Hospital 3
Well-being score	-7.67*		
Spatial lay-out		0.53***	0.60***
Lighting			
Daylight			
Artificial light			
Sunlight		-0.52*	
Scent			0.45**
Nature			
View of nature	-1.63***	-1.07***	0.56*
Plants present	-1.00**		
Images of nature	-1.15***		0.94**
Design			
Art			0.92*
Colour			0.70***
Ambiance		0.44*	0.85***
Ambient conditions	-0.39*		0.71***
Sound comfort		0.18*	0.27***
Control			
Light			
Ambient conditions			
Bed			
Sound		0.90***	0.78**
Privacy			
Feeling of privacy		0.93***	0.80***
Privacy facilities		0.91***	0.95***
Safety			
Feeling safe		0.65***	0.55***
Physical safety		0.85***	0.69***
Social support			
Feeling of social support		0.42***	0.35*
Social support facilities		0.97***	0.73***

	Hospital 1 – Hospital 2	Hospital 1 – Hospital 3	Hospital 2 – Hospital 3
Service			
Cleanliness		0.42***	0.48***
Multimedia			0.46**
Treatment by healthcare staff			
Treatment by facility staff			
Food provision	-0.69***	-0.36*	0.33**
Overall assessment		0.39*	0.38**

*P ≤ 0.05

**P ≤ 0.01

***P ≤ 0.001

When comparing hospital 1 with hospital 2, six out of the 30 ratings show to be significantly different. In all six cases, hospital 2 had higher evaluations with differences on the items concerning nature, ambient conditions and food provision. Also the well-being score of hospital 2 was significantly higher. When comparing hospital 1 with hospital 3, hospital 1 scores higher on most items that are significant with the largest differences on the items concerning privacy, safety and social support. For the items sunlight, view of nature and food provision, hospital 3 had higher evaluations. The third comparison between hospital 2 and hospital 3 showed that twenty items were significantly different rated by patients and on every single one of these items, hospital 2 had higher evaluations. The largest differences are on the items spatial lay-out, images of nature, ambience, privacy, safety and social support. Overall, hospital 1 and 2 had higher scores in comparison to hospital 3. Hospital 1 and 2 are also the most comparable because these hospitals were both recently build.

4.3 Factor analysis and regression

The 28 items out of the questionnaire are reduced into a smaller set of dimensions through factor analysis with varimax (orthogonal) rotation and pairwise exclusion of missing values. The variables are adequate for factor analysis when examining the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO = .842). Also Bartlett's test of sphericity was significant (p = .000). Six factors are extracted with an eigenvalue of Kaiser's criterion of 1. The total variance explained of the six factors is 65.64%. Only those items that loaded .51 or more on a factor were included. The scale reliability of the factors was measured by calculating Cronbach's alpha. This showed that the overall reliability was good, as visible in table 14.

Table 14: Factors obtained from the factor analyses (loadings >.51)

Factor	Cronbach's α	Item	Loading	VAF ^a
1. Personal and social privacy	.889	Social support facilities	.771	14.50%
		Feeling of social support	.770	
		Feeling of privacy	.672	
		Feeling safe	.623	
		Physical safety	.608	
		Spatial lay-out	.604	
		Privacy facilities	.580	
2. Sound control	.848	Privacy facilities	.551	12.74%
		Control over sound	.790	
		Sound comfort	.747	

3. <i>Positive distractions</i>	.882	Images of nature	.921	12.38%
		Plants present	.900	
		View of nature	.731	
		Art	.639	
4. <i>Staff interaction</i>	.702	Treatment by facility staff	.807	9.07%
		Treatment by healthcare staff	.758	
		Food provision	.643	
5. <i>Light</i>	.747	Daylight	.777	8.70%
		Sunlight	.768	
		Artificial light	.680	
6. <i>Physical comfort</i>	.696	Control over the bed	.691	8.26%
		Control over ambient conditions	.666	
		Ambient conditions	.599	
<i>Cumulative</i>				65.63%

^aVAF = Variance accounted for.

Seven variables loaded onto the first factor. All variables have to do with the absence and presence of other people and their safety. Therefore this factor is labelled 'personal and social privacy'. The second factor concerns factors related to sounds of people and objects in the environment and is therefore labelled 'sound control'. All four variables that loaded on the third factor concern positive distractions (Ulrich et al., 1991) and therefore the factor is labelled accordingly. The variables that loaded on the fourth factor all involve a human factor, for example the treatment by the staff and the staff that provides the food. Therefore this factor is labelled 'staff interaction'. The variables that loaded on the fifth factor all concern light and therefore the factor is labelled accordingly. Ambient conditions, the control over it and controlling the bed all concern personal comfort of the body and therefore the factor is labelled 'physical comfort'.

To find out whether a relationship can be found between the well-being of patients and different healing environment aspects, these factors are used in a regression analysis. No significant relationships were found between the well-being of patients and healing environment aspects at individual hospitals. However, when looking at the entire dataset of all three hospitals, significant relationships were found, as shown in table 15.

Table 15: Linear regression of the three hospitals together (N=230) of healing environment aspects and contribution to patients' well-being

Predictors	B	Std. error	P
Step 1			
(Constant)	65.094	8.687	
Length of stay ^a	-3.443	1.899	.068*
R²	.055		
Adjusted R²	.038		.075*
Step 2			
(Constant)	65.964	8.504	
Length of stay	-3.548	1.878	.065*
1. Personal and social privacy	4.080	3.074	.190
2. Sound control	3.610	3.280	.276
3. Positive distractions	5.192	3.070	.097*
4. Staff interaction	-2.351	3.216	.468
5. Light	-3.994	3.008	.190
6. Physical comfort	5.715	3.088	.070*
R²	.234		
Adjusted R²	.129		.084*

*p < .10.

^aLength of stay concerns the length of stay in days, ranging from 1 day to more than 5 days

The regression model is significant at a 90% confidence level ($p = 0.084 \leq 0.10$). The model can be used to predict if the factors influence patients' well-being. The adjusted R^2 is .129 which means that 12.9 percent of the total variability in the level of well-being of patients can be explained by the model. 3.8 percent of the total variability is explained by the length of stay whereas 9.1 percent (Adjusted R^2 Step 2 – Adjusted R^2 Step 1) is explained by the perceived healing environment aspects. Table 15 shows that length of stay and the factors 'positive distractions' and 'physical comfort' have a significant value and thereby significantly influence patients' well-being. The B value is the highest for the sixth factor (physical comfort), which indicates that when the factor raises one point on the seven-point scale, the level of well-being increases with 5.715, if all the other factors stay the same. The relationship between well-being and healing environment aspects is moderated by the length of stay of patients. The length of stay has a negative relationship with well-being, with a B value of -3.548, meaning that the longer patients were staying in the hospital, the lower their level of well-being was. The other moderators, as mentioned in the literature study (e.g. gender, age, marital status) were also checked to see if they contribute to the model, but none of them showed significant contributions. When checking the collinearity statistics, it becomes clear that there is no multicollinearity: the VIF values are all well below 10 and the tolerance is above 0.2.

4.4 Subjects for improvement

At the end of the questionnaire, patients could indicate which of the issues discussed in the questionnaire should be improved, by selecting the three most important ones. The results are visible in table 16.

Table 16: Frequency of items that should be improved per hospital

Items for improvement	Frequency	Hospital 1	Hospital 2	Hospital 3
Presence of nature	25 ^a	7	14	
Art	13	6	9	
Sound comfort	8	5	13	
Ambient conditions	6	2	10	
Multimedia	9	3	5	
Ambiance	3	1	9	
Control (over the light, ambient conditions, position of the bed and sound)	4	2	8	
Colour	4	3	7	
Privacy	3	2	7	
The food provision	7	2	2	
Social support	1	1	7	
Physical safety	3	2	5	
Spatial lay-out	3	4	4	
Light	1	5	3	
Scent	2	0	5	
Cleanliness	1	1	2	
Treatment by the healthcare staff	2	1	1	
Treatment by the facility staff	0	0	0	
Nothing needs to be improved	19	36	25	

^aThe three highest frequencies per hospital appear in bold

As visible in table 16, in every hospital the presence of nature is mentioned the most for improvement. In hospital 1, the subject is mentioned 25 times. The second and third most mentioned subjects are art and multimedia. Sound comfort and ambient conditions are mentioned by the patients in hospital 3 the most. Other items that are mentioned several times are multimedia (e.g. television, internet and telephone), ambient conditions, ambience, colour, privacy and the control patients have (over lighting, ambient conditions, position of the bed and sound). The only subject on which hospital 2 has the highest frequency is light.

5. Conclusion, discussion and recommendations

The objective of this study was to find out to what extent well-being of patients relates to their perception of healing environment aspects and what explains for the found differences between hospitals by comparing different hospitals with each other. In this chapter the conclusions of the research are drawn, the research is discussed and recommendations are given.

5.1 Conclusion

The main research question of this research is: to what extent do healing environment aspects, as perceived by patients in different hospital settings, relate to patients' well-being and what explains for possible found differences between hospitals? Well-being scores and perceived healing environment aspects of patients in three different hospitals were analysed in this research and related to each other.

Well-being is seen as a person's cognitive and affective evaluation of his or her life. The measured level of well-being was quite low at every hospital varying greatly, with an overall mean of 50 on a scale from 0 to 100 and a standard deviation of 25. Hospital 1 had the lowest mean well-being score (46) followed by hospital 3 (52) and hospital 2 (54). The literature study showed that a wide range of physical, psychological and social healing environment aspects influence patients' well-being. The three hospitals that participated all designed these aspects differently. When looking at the mean scores of the environmental aspects, most healing environment aspects seem to be perceived as sufficient or neutral. The mean scores showed that these aspects were perceived most positively in hospital 2, with the highest scores on the most items, followed by hospital 1 and 3 respectively. Hospital 3 scores the lowest, for example when it comes to design. This seems logical since the hospital building is the oldest of the three. Second best is hospital 1 with high scores on control, privacy, safety and social support. The high scores on these items seem logical since it is the only hospital with only single patient rooms and the literature study showed that single patient rooms ensure more privacy and higher patient satisfaction. Overall hospital 2 scores the highest with high scores on, among others, design, service and privacy. In all three hospitals, patients rated the treatment by the staff very high; the lowest mean score was 6.19. This shows that patients are very content with both the healthcare and facility staff. The differences between the hospitals were confirmed by the Kolmogorov-Smirnov test showing that hospital 1 and 2 scored significantly higher on several aspects in comparison to hospital 3.

The variables of the healing environment aspects were reduced to a smaller set of dimensions; six factors were extracted through a factor analysis wherein all the healing environment aspects were involved, namely personal and social privacy, sound control, positive distractions, staff interaction, light and physical comfort. These factors were used to find a relationship between the healing environment aspects and patients' well-being. No significant relationship was found between the well-being of patients and these factors at the individual hospitals. The data of the three hospitals together do show a relationship between perceived healing environment aspects and patients' well-being. The results showed that the healing environment aspects explain 12.9 percent of the variance in the level of well-being of patients when controlled for length of stay (see figure 3). Only the factors positive distractions ($B=5.19$) and physical comfort ($B=5.72$) had positive relationships with the well-being of patients. The length of stay had a negative relationship with patients' well-being, with a B value of -3.54 . When looking at the current mean scores on the subjects of the significant factors, it becomes clear that especially in the positive distractions a lot of improvements can be made. The second significant factor, physical comfort, has mean scores between 4.14 and 6.19. Positive distractions, concerning the presence of nature and art, were rated with mean scores between 2.56

and 4.81. These are relatively low scores compared to the other healing environment aspects. As stated in the literature review, the research of Ulrich (1984), studying the positive effects of patients with view on a tree instead of a brick wall, is seen as the start of research in evidence-based design. It is striking to see that, more than 30 years later, the level of nature perceived by patients is still minimal. Both hospital buildings that are recently built are designed to have nature involved in the entire building with statements on the architect's websites such as: "everywhere overlooking a green area" and "views on natural scenery from the patient rooms". This seems contradictory to the findings of this study. In addition, the lack of nature and art at one of these buildings was also found through qualitative research by Herweijer-van Gelder (2016).

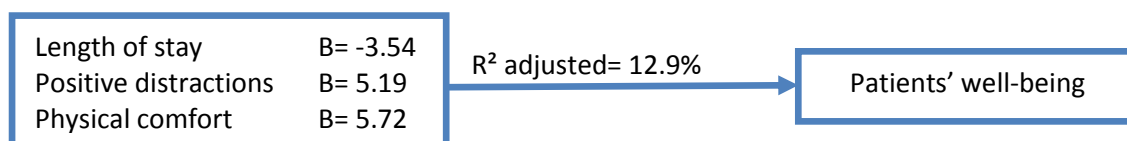


Figure 3: Relationship between factors of healing environment aspects on patients' well-being

5.2 Discussion

In this research, the relationship between healing environment aspects and patients' well-being is studied. Through literature, the concepts of well-being and healing environment were defined and different healing environment aspects were distinguished. In addition several moderating variables were mentioned. These different concepts were translated to a questionnaire. 230 patients of three different hospitals participated in the study by completing the questionnaire. These results were analysed in order to find out whether a relationship between healing environment aspects and well-being of patients could be found in practice. By including different hospitals, this research tried to find different relationships in different hospitals. The found relationships could then be compared to each other to see what healing environment aspects related to patients' well-being in different hospital environments and which healing environment aspects might have a stronger relationship with patients' well-being compared to others.

As shown in the literature study, a healing environment is considered to be a holistic entity. The different aspects of healing environment all play a synergistic role in terms of their contribution to patients' well-being. In the analysis of this research the aspects are considered separate aspects and a synergistic relationship is not taken into account. In order to find out which combinations of healing environment aspects play a synergistic role, experiments could be conducted wherein different healing environment aspects are implemented in different combinations. By measuring the level of well-being of patients and comparing these levels of well-being measured at different environments with each other, an environment can be established that leads to higher level of well-being. This reveals which combinations of healing environment aspects might have synergistic effects on people's well-being.

In the questionnaire a Likert scale is used. By using a Likert scale, it is assumed that every question asked is equally important for patients. However, this is not measured. The presence of nature for example scored relatively low; it is however not clear if patients find the presence of nature as important as for example ambient conditions or scent. It also does not imply that patients were less satisfied with the hospital room because of the lack of nature. The scores on the questions concerning healing environment aspects only showed how patients perceived that particular aspect.

It is therefore not possible to state that the rooms in one hospital are more satisfactory than the rooms in another hospital.

This research measured the perception of patients of different healing environment aspects. It is assumed in this research that when patients perceive the healing environment aspect as good, it also positively relates to their level of well-being. However, for some subjects one might argue that this is not the case, for example colours; as described in the literature study, the colours red and orange makes patients in dermatology departments feel itchier. When asking patients of these departments how they perceive the colours, patients that like the colours red or orange might indicate that they perceive this as good, not knowing this makes them feel more itchy. Therefore, one cannot always state that what patients perceive as good also contributes positively to their level of well-being. Nevertheless, results of this study show that the relationship found between the significant healing environment aspects and patients' well-being in fact is positive.

A relationship was found between healing environment aspects and the level of well-being of patients. However this relationship was not highly significant and only two out of six factors showed a significant relationship. As described previously, no statistically significant relationship was found between the perceived healing environment aspects and patients' well-being when analysing the data of the individual hospitals. No significant relationships were found between the well-being of patients and healing environment aspects at individual hospitals. Therefore, it was not possible to answer the main research question entirely. Reasons for not finding (strong) relationships may vary. First of all, the number of participants might have been too small to find a relationship between the individual hospitals and well-being. A second reason for not finding a relationship or more significant factors might be the large variety in the level of well-being. In addition, there may be not enough variation within one hospital environment compared to the large variation in levels of well-being. If all hospital rooms are approximately perceived in the same way, no (large) variation in rooms is measured and can therefore be related to patients' level of well-being. For example the way in which patients are treated by the staff; literature describes a relationship between the treatment by the staff and patients' well-being. However, in all three hospitals this is consistently experienced as very good whereas the level of well-being highly fluctuates. This may be a reason why there is no relationship found or why the relationship found is not highly significant.

Corresponding with the literature, several patients that stayed in a single patient room commented during the data collection to be very happy with the single patient rooms. It is however notable that during the data collection several patients indicated to prefer a double or quadruple room over a single room. These patients argued that they are more lonely in the single-patient rooms and sometimes feel less safe, because there is not always someone there to help or push the alarm button if patients are unable to do this by themselves. Although the results did not show a relationship between the room type and patients' well-being, it is interesting to see that not all patients experience a single patient room as the most optimal solution. It raises the question whether the advantages of a single-patient room outweigh the disadvantages. In general, the literature study showed that single-patient rooms lead to higher satisfaction of patients. However, hospitals that want to cater to the needs of every single patient may take multi-patient rooms into account. Yet, this asks for a different treatment by the medical staff when assigning rooms to patients.

The mean level of well-being differed between the hospitals. Hospital 1 had a significant lower level of well-being compared to hospital 2. However, in hospital 2 no data was gathered from patients that

stayed at a lung diseases department because this department did not exist as a separate department. When looking at the well-being scores of the patients of the lung diseases departments from the other hospitals, it shows that the mean well-being score of these patients is lower compared to the other departments. Therefore, comparing the well-being score of hospital 2 with hospital 1 and 3 may not be equal and might reflect a false picture of reality.

The influence of the significant factors (B-values: 5.19 and 5.72) on patients well-being is substantial, especially taking into account the low mean well-being score. The mean well-being score in this study was 50, which is very low: normal individuals (in a Danish population study) have a mean score of 75 on the WHO-5 well-being scale whereas people with current major depression have a mean score of 37.5 (WHO, 1998). Therefore, the WHO has set a cut-off score of 50. When looking at the dataset, it becomes clear that actually 44.5 percent of the participants scores below 50. This shows that patients in hospitals have a low level of well-being and emphasizes the relevance of the healing environment aspects.

As a result of the large amount of respondents and involving different hospital environments within the study, the external validity is ensured. However, every hospital environment is different and its aspects are perceived differently. It is therefore not possible to make statements about other hospital environments.

The data was gathered in a short period of time and at every hospital in the same way. However, not all patients were able to complete the questionnaire by themselves. If this was the case, the researcher would assist by asking the questions verbally. However, during the data collection it became clear that it was painful for some patients to answer the questions concerning their level of well-being. Before completing the questionnaire verbally, the researcher always indicated that patients were free to decide to stop participating in the study, without giving a reason. This resulted in some patients not completing the questionnaire. However, some patients that had to answer these questions verbally might have answered these questions more positively or negatively than the patients that did this anonymously. This effect was later on checked in the data but no significant influence was found. When repeating this research one might consider not to ask the well-being questions verbally and to find out whether other measurement scales of well-being are less painful for patients in hospitals.

The data also showed a significant relationship of the length of stay of patients with their level of well-being. This is a negative relationship which indicates that the patients that stayed longer in the hospital had a lower level of well-being. This relationship may seem weird because patients stay at hospitals to get better. However, patients that have to stay longer in hospitals might also be more sick and therefore have a lower level of well-being. It should also be mentioned that the measurement scale of length of stay ranged from staying 1 day in the hospital to staying more than 5 days in the hospital. When talking to patients it became clear that a lot of patients were staying longer than 5 days in the hospital and several patients indicated that they were staying more than one week or even two weeks in the hospital. The questionnaire did not take this number of days into account. When this study would be repeated, a wider scale should be used in order to find out more about the relationship between length of stay and level of well-being.

Other moderating variables were taken into account, namely: gender, age, marital status, education level, unemployment, earlier hospitalisation and type of ward. The literature study showed that these variables might influence the relationship between healing environment aspects and patients'

well-being. However, these variables did not show to have a significant influence on this relationship. The literature study showed that, although relationships were found between gender, age, and education level, outcomes of studies were divided. This may be a reason why there is no significant contribution of these variables to the model. Another reason for not finding significant influences of the demographic and socioeconomic variables may be that the population studied was not representative. For example the mean age, which was above sixty and the large number of retired participants in the population; this may indicate that there was not enough variety in the population to give a representative picture of characteristics concerning for example unemployment and level of education.

5.3 Recommendations

From the results of the literature study and the empirical study, recommendations can be given for the hospitals. In addition, recommendations for further research are given.

Recommendations for involved hospitals

As visible in the results, all three hospitals could improve the presence of positive distractions concerning nature and art. The presence of nature and art was perceived as minimal. Therefore the hospitals should examine where nature and art can be improved in order to improve patients' level of well-being. The presence of nature could be increased through a better view on nature, installing more nature inside or through images of nature. Implementing art is also a possibility to distract patients positively, however the art should be chosen carefully. Secondly, attention should be paid to the physical comfort of patients concerning (control over) ambient conditions and control over the bed for its positive relation with patients' well-being. On average these aspects are experienced neutral to good. Giving patient control over their bed, the temperature and the ventilation of the room (for example through windows that can be opened) enhances patients feeling of control and gives patients the opportunity to adjust the room to their personal preferences.

As shown in the results, hospital 3 scored significantly lower on design elements and psychological and social aspects such as privacy, control and social support. Literature provides guidelines to improve these aspects. The single patient room is mentioned several times in enhancing patients' privacy, control and social support. This may indicate that the implementation of more single patient rooms is necessary to improve these aspects. The design of the patient rooms of hospital 3 could be improved by reducing the institutional character of the rooms and create a more homelike décor by using more homelike furniture and implementing more colours.

Recommendations for further research

The results show that a relationship between healing environment aspects and patients' well-being can be found in practice. However, only a small part of all the healing environment aspects distinguished in this study, showed a significant relationship. By studying healing environment more thoroughly and by using different methods, more information becomes clear on the effect of healing environment on patients. By finding more evidence on the relevant aspects and the strength of the relationship, evidence-based decisions can be made when designing and maintaining a healthcare facility.

In order to see whether a relationship can be found between other healing environment aspects and patients' well-being the study could be repeated with a larger population. Also, more departments could be involved in order to obtain a more generalizable result. By doing this it becomes clear whether a relationship can be found with more healing environment aspects.

During the empirical study became clear that patients have different opinions concerning the single-bed rooms. By studying the advantages of the different patient rooms and the wishes and needs of patients, it should become clear whether single-patient rooms are always the best option (as literature suggests) or that the optimal solution differs per patient and for some patients a multi-bedroom is more suited.

Although this research did not concern the effects of healing environment aspects on staff outcomes, the literature study showed that there are many design elements that have a positive effect on staff. During the research it seemed that little attention was paid within healthcare practice for a healing environment that also positively affects the healthcare staff. By studying the effects of the environment on staff outcomes, the importance and possibilities of a healing environment for staff can be made clear which can improve staff effectiveness and satisfaction and can reduce staff injuries.

The psychological and social aspects of healing environment were considered independent variables in this research, because of the holistic identity of healing environment. Another way of looking at the literature, is considering the psychological and social aspects as mediating variables in the relationship between physical aspects of the environment and well-being of patients. Executing statistical analysis wherein these aspects are considered mediating variables might show a different perspective of the relationship between healing environment aspects and patients' well-being. However, a larger population is needed to execute such an analysis.

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Annex A: Consent Form of Meander Medical Center



Mw. P.C.M. Pasker-de Jong
Meander Academie/Wetenschapsbureau
Meander Medisch Centrum

Amersfoort, 8 december 2016

Onze ref.: HD/avd/TWO 16-53
doorkiesnummer: 033- 850 2861

Geachte mevrouw Pasker-de Jong,

Naar aanleiding van uw verzoek via de Commissie Toetsing Wetenschappelijk Onderzoek (TWO) met betrekking tot het onderzoek met de titel

'Healing environment and patients' well-being- a hospital comparison',

deel ik u mede dat de Raad van Bestuur een positief advies geeft ten aanzien van het starten van dit onderzoek in Meander Medisch Centrum.

De eventuele extra kosten gemoeid met dit onderzoek zullen worden doorberekend aan de maatschap/vakgroep/afdeling.

Vriendelijk verzoek ik u de Commissie TWO te melden wanneer het onderzoek afgerond is of voortijdig wordt beëindigd. Tevens ontvangen wij graag een onderzoeksverslag.

De commissie heeft het onderzoeksprotocol alleen getoetst i.h.k.v. de zorgvuldigheid ter verkrijging van een verklaring van geen bezwaar. Het toetsingskader voor het onderzoek is daarom niet de WMO, maar de Gedragscode Gezondheidsonderzoek (Code goed gedrag, zie www.federa.org), evenals de Wet Bescherming Persoonsgegevens (WBP). De Gedragscode Gezondheidsonderzoek vormt een uitwerking van m.n. het bepaalde in de Wet op de geneeskundige behandelingsovereenkomst (WGBO) over het gebruik van patiëntengegevens in wetenschappelijk onderzoek. De Raad van Bestuur wenst u veel succes met dit onderzoek!

Met vriendelijke groet,

mw. dr. H.M. Dijkstra
Raad van Bestuur

cc: mw. A.G. van Duin-Outmaijer, secretaris Commissie TWO
dhr. P. Bellini, manager zorg
mw. J. van Nijhuis, stagiaire Facilitair Bedrijf
Financiën & Control
Dhr. M.H.M. Steeghs, ziekenhuisapotheker (voorzitter commissie TWO)

Annex B: Questionnaire

Vragenlijst omgevingsonderzoek

Voor mijn afstudeeronderzoek verneem ik graag uw mening over uw patiëntkamer in dit ziekenhuis. Ik stel het op prijs als u aan dit onderzoek wilt meewerken. Het doel van het onderzoek is om inzicht te verkrijgen in hoe u de patiëntkamer ervaart en hoe deze bijdraagt aan uw patiëntwelzijn.

- De vragenlijst is anoniem.
- Het invullen van de vragenlijst zal ongeveer 5 á 10 minuten duren.
- De vragenlijst begint met een aantal vragen over hoe u zich op dit moment voelt.
- Hierna kunt u de verschillende aspecten van uw patiëntkamer beoordelen.
- Ten slotte wordt er een aantal algemene vragen gesteld.
- Aan het einde van de vragenlijst kunt u opmerkingen of suggesties kwijt.
- Raadpleeg bij twijfel de onderzoekster, zij kan u helpen.

Ter informatie:

- Door deze vragenlijst in te vullen, geeft u toestemming om mee te werken aan dit onderzoek.
- Uw zorgverleners zullen niet te weten komen of u aan het onderzoek heeft meegewerkt en wat uw antwoorden waren.
- U mag op elk moment stoppen met het invullen van de enquête, zonder opgaaf van reden.

Alvast hartelijk dank voor uw medewerking!

Vragen welzijn

U wordt verzocht voor ieder van de vijf uitdrukkingen aan te geven welke het best weergeeft hoe u zich **de laatste twee weken** voelde.

Voorbeeld: Als u zich “gedurende de laatste twee weken voor meer dan de helft van de tijd in een “vrolijke en opperbeste stemming” heeft gevoeld, kruist u ter hoogte van de eerste regel de cirkel onder “meer dan de helft van de tijd” aan.

Gedurende de laatste twee weken	Constant	Meestal	Meer dan de helft van de tijd	Minder dan de helft van de tijd	Soms	Helemaal niet
1. Ik voelde me vrolijk en in een opperbeste stemming	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Ik voelde me rustig en ontspannen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Ik voelde me actief en doelbewust	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Ik voelde me fris en uitgerust wanneer ik wakker werd	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Mijn dagelijkse leven was gevuld met dingen die me interesseren	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Omgevingseigenschappen

Bij de onderstaande vragen verneem ik graag uw mening over hoe u verschillende aspecten van uw patiëntkamer ervaart. U kunt dit aangeven op een 7-puntschaal van zeer slecht, tot zeer goed.

Indeling	Ze er slecht	Slecht	Matig	Neutraal	Voldoende	Goed	Ze er goed	N.v.t.
1. De ruimtelijke indeling van uw kamer (bijv. één- of meerpersoonskamer, eigen badkamer/toilet, ramen, uitzicht op buiten)	O	O	O	O	O	O	O	O
Licht	Ze er slecht	Slecht	Matig	Neutraal	Voldoende	Goed	Ze er goed	N.v.t.
2. De hoeveelheid daglicht in de kamer	O	O	O	O	O	O	O	O
3. De kunstverlichting in de kamer	O	O	O	O	O	O	O	O
4. De mate waarin de zon uw kamer binnen schijnt	O	O	O	O	O	O	O	O
5. De mogelijkheid om het licht in uw kamer zelf te regelen	O	O	O	O	O	O	O	O
Geur	Ze er slecht	Slecht	Matig	Neutraal	Voldoende	Goed	Ze er goed	N.v.t.
6. De geur in uw kamer (bijv. aangenaam, kalmerend)	O	O	O	O	O	O	O	O
Natuur	Ze er slecht	Slecht	Matig	Neutraal	Voldoende	Goed	Ze er goed	N.v.t.
7. Het uitzicht op groen (bijv. tuinen, bomen, struiken)	O	O	O	O	O	O	O	O
8. De aanwezigheid van planten in uw kamer	O	O	O	O	O	O	O	O
9. De aanwezigheid van afbeeldingen van natuur in uw kamer	O	O	O	O	O	O	O	O
Inrichting	Ze er slecht	Slecht	Matig	Neutraal	Voldoende	Goed	Ze er goed	N.v.t.
10. De kunst in uw kamer (bijv. geschiktheid, positief afleidend, aandachttrekkend)	O	O	O	O	O	O	O	O
11. Het kleurgebruik in het interieur van uw kamer	O	O	O	O	O	O	O	O
12. De sfeer van uw kamer (bijv. ambiance, comfort, huiselijkheid)	O	O	O	O	O	O	O	O
Klimaat	Ze er slecht	Slecht	Matig	Neutraal	Voldoende	Goed	Ze er goed	N.v.t.
13. Het binnenklimaat van uw kamer (bijv. temperatuur, ventilatie, frisse lucht)	O	O	O	O	O	O	O	O
14. De mogelijkheid om het binnenklimaat in uw kamer zelf te regelen	O	O	O	O	O	O	O	O
Controle over uw bed	Ze er slecht	Slecht	Matig	Neutraal	Voldoende	Goed	Ze er goed	N.v.t.
15. De mogelijkheid om de ligstand van uw bed zelf in te stellen	O	O	O	O	O	O	O	O

Geluidscomfort

	Zeer slecht	Slecht	Matig	Neutraal	Voldoende	Goed	Zeer goed	N.v.t.
16. Het geluidscomfort in uw kamer (bijv. achtergrondgeluiden van o.a. apparatuur, nagalmtijd)	O	O	O	O	O	O	O	O
17. De mate waarin u invloed hebt op het geluidscomfort	O	O	O	O	O	O	O	O

Privacy en veiligheid

	Zeer slecht	Slecht	Matig	Neutraal	Voldoende	Goed	Zeer goed	N.v.t.
18. Het gevoel van privacy in uw kamer	O	O	O	O	O	O	O	O
19. De mate waarin uw kamer privacy faciliteert (bijv. eigen kamer, geluidsdichte muren, gordijnen)	O	O	O	O	O	O	O	O
20. Het gevoel van veiligheid in uw kamer	O	O	O	O	O	O	O	O
21. De fysieke veiligheid in uw kamer (bijv. kluisjes, zicht op verpleging, alarmknop)	O	O	O	O	O	O	O	O

Sociale steun

	Zeer slecht	Slecht	Matig	Neutraal	Voldoende	Goed	Zeer goed	N.v.t.
22. De mate waarin u sociale steun (warmte, aandacht, hulp) van familie en vrienden ervaart in uw kamer	O	O	O	O	O	O	O	O
23. De mate waarin uw kamer sociale steun van familie en vrienden faciliteert (bijv. door een plek om te zitten en ongestoord te praten, verplaatsbaar interieur)	O	O	O	O	O	O	O	O

Service

	Zeer slecht	Slecht	Matig	Neutraal	Voldoende	Goed	Zeer goed	N.v.t.
24. De reinheid (bijv. hygiëne, fris, opgeruimdheid, netheid) van uw kamer	O	O	O	O	O	O	O	O
25. Het aanbod van multimedia (bijv. internet, televisie, telefonie) op uw kamer	O	O	O	O	O	O	O	O
26. De bejegening door het zorgpersoneel (bijv. respectvol, vriendelijk, begripvol, aandachtig)	O	O	O	O	O	O	O	O
27. De bejegening door het facilitair (bijv. voeding, schoonmaak) personeel (bijv. respectvol, vriendelijk, begripvol, aandachtig)	O	O	O	O	O	O	O	O
28. De aangeboden voeding (bijv. keuzemogelijkheden, smaak, temperatuur, presentatie)	O	O	O	O	O	O	O	O

Algemeen

	Zeer slecht	Slecht	Matig	Neutraal	Voldoende	Goed	Zeer goed	N.v.t.
29. Uw algemene oordeel over uw kamer	O	O	O	O	O	O	O	O

30. Op welke onderwerpen moeten verbeteringen plaatsvinden? (maximaal 3 antwoorden mogelijk)

- | | |
|---|---|
| <ul style="list-style-type: none"> <input type="radio"/> Indeling <input type="radio"/> Licht <input type="radio"/> Geur <input type="radio"/> Aanwezigheid van natuur (buiten, binnen en op afbeeldingen) <input type="radio"/> Kunst <input type="radio"/> Kleurgebruik <input type="radio"/> Sfeer <input type="radio"/> Klimaat <input type="radio"/> Geluidscomfort (achtergrondgeluiden van apparatuur, nagalmtijd) <input type="radio"/> Controle (over het licht, het binnenklimaat, uw bedpositie of het geluidscomfort) | <ul style="list-style-type: none"> <input type="radio"/> Privacy <input type="radio"/> Fysieke veiligheid (kluisjes en zicht op verpleging) <input type="radio"/> Sociale ondersteuning (een plek om te zitten en ongestoord te kunnen praten, verplaatsbaar interieur) <input type="radio"/> Reinheid (hygiëne, opgeruimdheid, netheid) <input type="radio"/> Aanbod van multimedia (internet, televisie, telefonie) <input type="radio"/> Bejegening door zorgpersoneel (respectvol, vriendelijk, begripvol) <input type="radio"/> Bejegening door facilitair (bijv. voeding, schoonmaak) personeel (respectvol, vriendelijk, begripvol) <input type="radio"/> De aangeboden voeding (keuzemogelijkheden, smaak, temperatuur, presentatie) <input type="radio"/> Nergens |
|---|---|

Algemene gegevens

Wat is uw geslacht?

☐ Man

☐ Vrouw

Wat is uw leeftijd?

..... jaar

Wat is uw burgerlijke staat?

☐ Ongehuwd

☐ Wettig gehuwd

☐ Partnerschap

☐ Verweduwd na wettig huwelijk

☐ Verweduwd na partnerschap

☐ Gescheiden na wettig huwelijk

☐ Gescheiden na partnerschap

Wat is uw hoogst voltooide opleidingsniveau?

☐ Geen opleiding

☐ Basisonderwijs

☐ Lager beroepsonderwijs

☐ Middelbaar beroepsonderwijs

☐ Hoger beroepsonderwijs

☐ Wetenschappelijk onderwijs

Wat is uw huidige werksituatie?

☐ Betaald werk fulltime of parttime

☐ Werkloos/bijstandsuitkering

☐ Arbeidsongeschikt

☐ Huisman/huisvrouw

☐ Student

☐ (Vervroegd) pensioen

Bent u al eerder in dit ziekenhuis opgenomen?

☐ Ja

☐ Nee

Hoeveel dagen verblijft u op dit moment in dit ziekenhuis?

☐ 1 dag

☐ 2 dagen

☐ 3 dagen

☐ 4 dagen

☐ 5 dagen

☐ Langer dan 5 dagen

Verblijft u in een 1-, 2- of 4-persoonskamer?

- ☐ 1-persoonskamer
- ☐ 2-persoonskamer
- ☐ 4-persoonskamer

Voor welk specialisme bent u opgenomen in het ziekenhuis?

- ☐ Chirurgie
- ☐ Neurologie
- ☐ Longgeneeskunde

Opmerkingen

Wij horen graag uw mening. Indien u nog opmerkingen of suggesties heeft, kunt u die hier aangeven.

.....
.....

Dit is het einde van de enquête. Hartelijk dank voor uw medewerking!

Heeft u na afloop van het onderzoek nog vragen? Neem dan contact op met de onderzoekster,
Janine van Nijhuis via e-mail: janine.vannijhuis@wur.nl

Annex C: Ethical Clearance of the SEC



6706 kn Hollandsseweg 1 Wageningen | The Netherlands

To whom it may concern

The following project proposal has been reviewed by the Social Sciences Ethics Committee (SEC):

Applicants: Janine van Nijhuis
Title: Healing Environment and Patient's Well-Being: a Hospital
Comparison
Location: Meander Medical Centre, Amersfoort
Funding: Meander Medical Centre
Period: May 2016 – February 2017

The Committee has concluded that the proposal deals with ethical issues in a satisfactory way and that it complies with the Netherlands Code of Conduct for Scientific Practice.

With kind regards,

A handwritten signature in brown ink, appearing to read 'M. Verweij'.

Prof. Dr Marcel Verweij
Chair SEC

DATE
23-11-2016

SUBJECT
Ethical approval of research project

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Wageningen University & Research is specialised in the domain of healthy food and living environment.