

Designing tranquillity

A (brief) history of designing stress reducing mental health care facilities



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ABSTRACT

In designing tranquillity, a historical research is conducted into the architectural design of psychiatric institutions from the 19th century in the United States. During the 19th century there was a lot of social change which led to the collaboration between physicians and architects. They tried to positively influence the healing process of patients through architectural design. Many of these design principles are still relevant today, but a number of things have been lost over time as well. Meanwhile there is still a relevant problem in the Netherlands, namely stress among psychiatric patients. This led to the question addressed in this historical research: *How can a striking example of 19th century mental health care architecture be useful to reduce stress among psychiatric patients in contemporary Dutch facilities?*

The historical part of the study focusses on St. Elizabeths Hospital in Washington, D.C. designed on the basis of the design principles of the revolutionary physician Dr. Thomas S. Kirkbride. Furthermore, the research compares this historical research with contemporary scientific research into the influences that architectural interventions have on people's and psychiatric patients' stress. Finally, the research ends in a number of recommended design choices based on historical principles and contemporary scientific research which is substantiated with examples from contemporary innovative Dutch facilities. Thus, recommendations are made to design tranquillity.

Key words: stress-reducing architecture, psychiatric institution, Kirkbride

INTRODUCTION

OBJECTS OF STUDY

The subject of this history thesis is how past design strategies and/or possibilities implemented in mental health architecture were used to reduce stress among psychiatric patients. The historical research focuses on 19th-century mental health care architecture from the United States, namely the Kirkbride plan in which St. Elizabeths Hospital is used as a case study. Furthermore, the book 'On the construction, organization, and general arrangements of hospitals for the insane' by Dr. Thomas S. Kirkbride himself is used to gain an insight into his thinking at the time. At the same time, the book 'The Rise of Mental Health Nursing: A History of Psychiatric Care in Dutch Asylums' is being examined to get an impression of how people thought about Dutch mental health care during this time period. All this together concerns the historical part of the total research, in addition, theoretical sources are also cited about the current knowledge regarding architectural interventions to improve the mental health of psychiatry patients ('Stressed Spaces: Mental Health and Architecture' & 'Start making sense: Applying a salutogenic model to architectural design for psychiatric care'). Finally, a number of innovative contemporary Dutch facilities will be highlighted, in which these innovative architectural interventions can be traced, namely Antes Psychiatrisch Centrum (Spijkenisse), Erasmus MC (Rotterdam), Meander Medisch Centrum (Amersfoort) & Radboudumc psychiatry department (Nijmegen).

INTERPRETIVE IDEAS

The research question addressed in this history thesis is: How can a striking example of 19th century mental health care architecture be useful to reduce stress among psychiatric patients in contemporary Dutch facilities? During this century curing psychiatric patients by means of architectural interventions was a novelty. Mental health care asylums changed from 'prison-like' buildings into a more human architecture in order to reduce stress among the patients. However, still a lot of mental health care facilities in the Netherlands do not have a domestic atmosphere, but rather an institutional character. Re-evaluating historical mental health care theories/design strategies from the United States and comparing them with current knowledge about the impact of architectural interventions on the mental health of psychiatric patients reveals forgotten but useful theories that can be used in contemporary Dutch facilities. By highlighting a number of innovative contemporary Dutch institutions and examining the influence of some of these architectural interventions, the results of this research can be substantiated with successful examples.

ACADEMIC CONTEXT

A fair amount of research has already been done on the influence of architectural interventions on stress among psychiatric patients, for example the research of Connellan et al. and Golembiewski. However, the research done is focused on the current situation in a theoretical way and does not include historical architectural attempts at stress reduction. Therefore, in this research, these existing studies are gathered and used as a point of comparison. Through this research, current theoretical knowledge is used to view and re-evaluate architectural interventions from the past in order to make new recommendations regarding the design of new psychiatric institutions in the Netherlands.

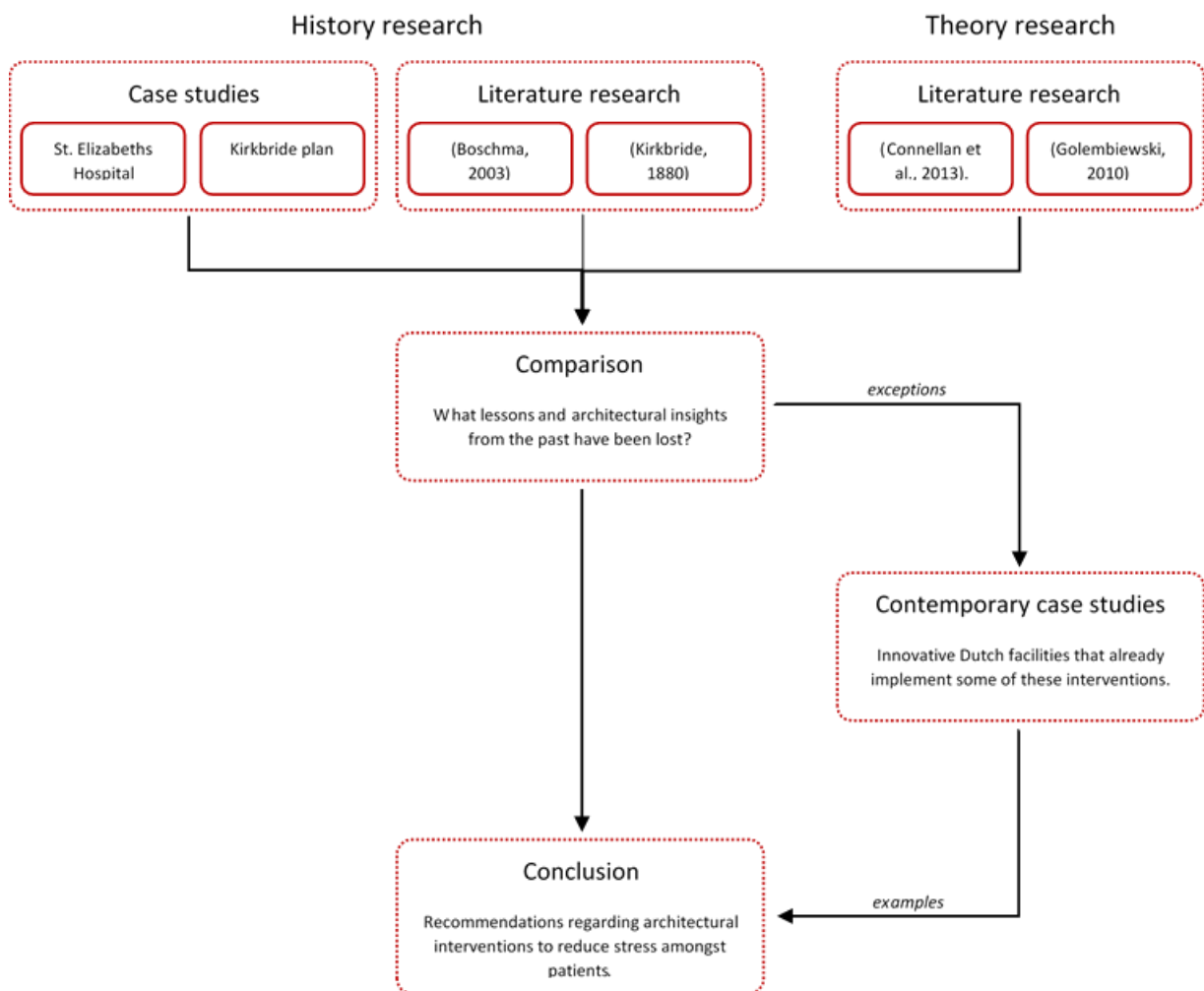
Furthermore, information is available about the architectural interventions that were applied in mental health care institutions from the 19th century as well, but not about the influence of these on the mental health of the patients. By comparing this with current knowledge, new insights can be obtained and thus an addition to existing research.

METHODOLOGY

The research is a comparative study that compares theoretical knowledge with historical design strategies with the aim of making recommendations for the design of psychiatric institutions in the Netherlands. This makes the research useful for architects in the field that design mental health care facilities. The research consists of various literature reviews (historical and theoretical) and the investigation of historical and contemporary innovative case studies (floor plans, facades, perspective, etc.).

THESIS STRUCTURE

The thesis first deals with historical research and then theoretical research. After this, by means of the knowledge obtained from this theoretical research, it is studied which historical theories/ architectural interventions have stuck and/or improved and which have been forgotten. Finally, the knowledge acquired is summarized in the conclusion in a list of recommendations supported by examples from innovative Dutch facilities.



1.1 INTRODUCTION

In the past, people with psychiatric conditions were seen as a burden. This started for example, in the ancient Greek civilizations, but continued into the Middle Ages. These people were often considered weak and were therefore discriminated against. As a result, people with psychiatric conditions were often hidden by their family, locked up or even put to death and therefore were not treated for their illnesses (Corrigan, 2002). It took no less than the early 18th century for the first mental asylums (or psychiatric wards in hospitals) to be built. These are the first examples of governments and communities attempting to treat psychiatric patients. That both the government and communities played an active role in the development of these asylums becomes clear from the two examples given by Mens (2003). In France the construction and establishment of the 'Hôpital Général', in which people with mental illnesses were treated, became an important part of the policy of the state. In England, however, it was private societies and their economic influence that made it possible to build such hospitals, because they realized that taking care of several patients in one place brought an economic advantage. This seems positive in theory, however, it should be noted that at the time these institutions were used more as a socially accepted prison to lock up people who did not contribute to society than as psychiatric institutions where the sick were treated.

Psychiatric care changed significantly in the 19th century. In the 18th century, physicians did not have as much standing in society as today and psychiatric institutions were seen as a place to send psychiatric family members to, so one did not have to take care of them. However, in the 19th century physicians gained reputation in society and the idea arose that people with psychiatric illnesses could be cured. Due to the high esteem that physicians had received, the government created the opportunity to build large asylum complexes. As a result, physicians started designing these asylums in collaboration with architects, trying to make the environment as pleasant as possible for the patients by means of architectural interventions. Architecture was used to stimulate the healing process. This phenomenon has manifested itself in many places around the world during the 19th century (Yanni, 2013). This chapter examines a historical asylum in which this has been attempted, namely the St. Elizabeths Hospital in the United States and also shows how historical asylums like this one were organised.

1.2 ST. ELIZABETHS HOSPITAL

The St. Elisabeth Hospital in Washington, D.C. is the first government-operated psychiatric hospital in the United States and is still a well-respected institution. The hospital opened its doors in 1855 under the name Government Hospital for the Insane and sought to provide mental patients with a better life than they had in the prisons or alms houses where they used to live in. Furthermore, the hospital was designed by Thomas U. Walter according to the revolutionary principles of physician Dr. Thomas S. Kirkbride, which makes it one of the psychiatric hospitals part of the so-called Kirkbride plan. Kirkbride was a quintessential enlightenment thinker, founder of the Association of Medical Superintendents of American Institutions for the Insane (AMSAI) and one of the foremost physicians who have brought mental health care to the scientific level it has today. In addition, he has collected his thoughts on how a psychiatric institution should be designed and arranged in order to positively influence the health of the patients (and therefore also reduce the stress of the patients through design) in a book, namely: *On the construction, organization, and general arrangements of hospitals for the insane*. Kirkbride describes these essential architectural design principles in detail, which can be roughly divided into four main themes: site, form, materiality and building technology. Through these themes and the drawings of St. Elizabeths Hospital, various architectural interventions are analysed and categorized that were used to achieve this positive influence.

According to Kirkbride, sites should be no more than 3.2 kilometres (2 miles) from a major city for practical reasons, such as being accessible to mechanics and the like. This was also the case for St. Elizabeths Hospital, the White House could be seen from the complex. On the other hand, the building had to be located outside the city in a varied, natural, but also fertile and healthy environment. As can be seen in [figure 1](#), St. Elizabeths Hospital met these requirements at the time, although today, due to the growth of Washington, D.C., it is currently no longer outside the city. Moreover, the grounds must have private gardens for both sexes so that they could play sports and / or take a break without being distracted / disturbed by the other. Finally, the site of the building had to be at least 0.4 square kilometres (100 acres) in size and closed off from the rest of the world, so the patients were not constantly agitated (Kirkbride, 1880). The St. Elizabeths Hospital is closed off by a wall on the north, east and south sides and on the west side by the Anacostia River. In summary, the sites of the hospitals from the Kirkbride plan had to be in the country, accessible, large, variable and natural where the patients had plenty to do, but were not disturbed by residents of the nearby city. In the past, St. Elizabeths Hospitals site met all of these conditions and was in this way optimised for stress reduction among its patients.

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1.2.2 FORM

Kirkbride also had many points of view about the form, routing and other architectural features of a psychiatric institution. For example, they always had to be designed in collaboration with a physician, in which knowledge acquired through past experience is reused. Furthermore, the establishments did not have extravagant detailing, with the exception of the main entrance (see figure 3). The building was a maximum of 3 storeys high with a basement. The main building contained all the amenities, the wings the sleeping quarters and the two outbuildings further on the property had sleeping quarters as well (Kirkbride, 1880). The main design of the building is linear so that all rooms have a lot of daylight and a view of the surrounding nature. However, the linear set-up has been trampled so that the patients have a clear landmark by means of the routing at which a certain section of a wing ends (see figure 4). Kirkbride was conservative in terms of integration in the design, separating people from different classes, men from women and coloured people from white people. Most important, however, is his view of the inhumane, prison like architecture of psychiatric institutions of the 18th century and earlier. He did not want to repeat this in designs based on his principles, as can clearly be traced back in his book. "Everything repulsive and prison-like should be carefully avoided, and even the means of effecting the proper degree of security should be masked, as far as possible, by arrangements of a pleasant and attractive description." (Kirkbride, 1880, p. 52)

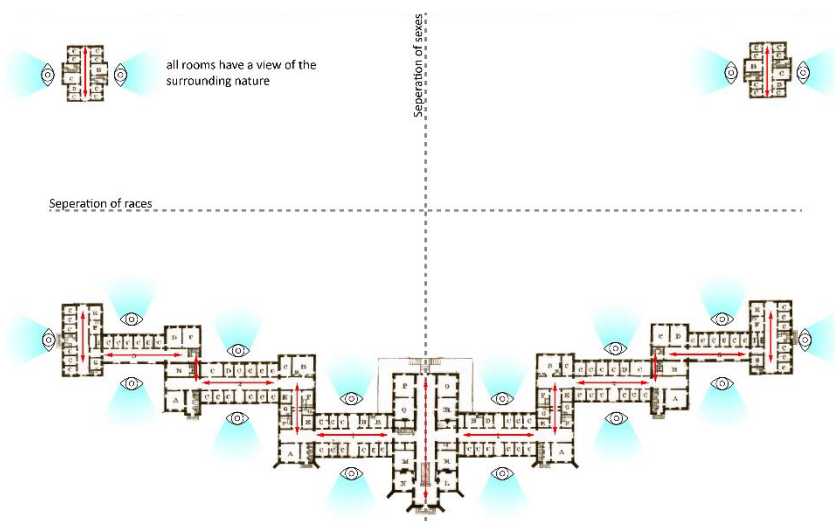
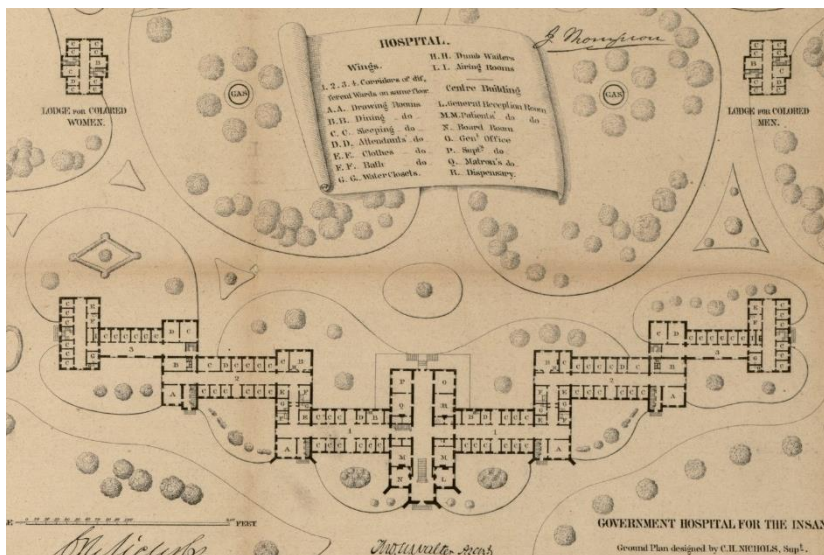


Figure 2: Floor plan of St. Elizabeths Hospital (Otto, 2013).

Figure 3: Façade of the main entrance of the St. Elizabeths Hospital (National Building Museum, 2021).

Figure 4: Analysis of the floor plan of St. Elizabeths Hospital (Rik Sijbrandij).

1.2.3 MATERIALITY

In the materialization of psychiatric institutions in accordance with the principles of Kirkbride, a clear theme is recognizable and that is the prevention of violence. For example, the stone walls had to be plastered tightly and the wooden floors had to be nailed down invisibly. The doors and windows had to be fitted with wired glass and the frame had to be firmly attached to the wall. The windows were equipped with window-guards and the doors got a window above the door, so the patients could not reach them (see figure 5 & 6). This was of course necessary to protect the patients from harming themselves and to prevent suicide (Kirkbride, 1880).

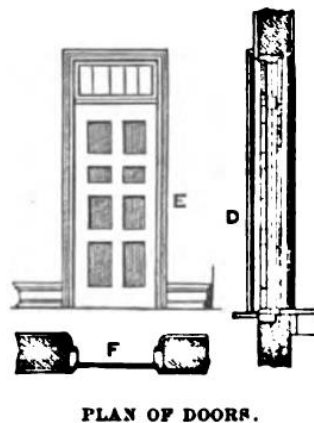
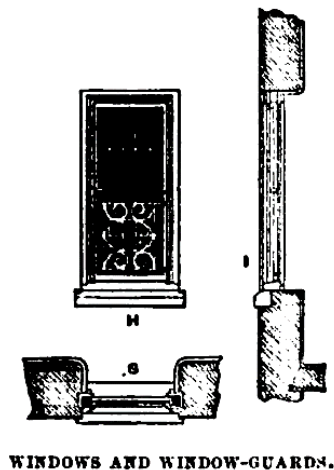


Figure 5: Windows of the St. Elizabeths Hospital (Kirkbride, 1880).

Figure 6: Doors of the St. Elizabeths Hospital (Kirkbride, 1880).

The windows also received sun protection in the form of shutters or awnings. Cavity walls were also used so the walls did not become damp. The floors and roof were designed with thick wood so the acoustics in the room were pleasant. In addition, these floors were not scrubbed often, because too much moisture would be released into the room, which would make the patients becoming agitated. Finally, even though it is not explicitly mentioned by Kirkbride, the different rooms and other rooms took on a domestic (almost cosy) atmosphere, as can be seen in figures 7 & 8.



Figure 7: One of the bedrooms in the hospital (Otto, 2013).



Figure 8: Reception of St. Elizabeths Hospital (Otto, 2013).

1.2.4 BUILDING TECHNOLOGY

Kirkbride had also thought about the building technology. Patients had to feel comfortable in the rooms at all times. For example, he understood that mechanical ventilation was necessary, but he was also aware of the positive effects of natural ventilation. As a result, every room at St. Elizabeths Hospital had both. Of course, the building needed to have water and light, but central heating was still something new at the time and was not widely used (Bruegmann, 1978). At St. Elizabeths Hospital, the thermal comfort of the patients was guaranteed with such a new system. The climate system has three pipes that could each be switched on separate from each other, allowing strong heating in winter and mild heating in summer nights (see figure 9). In addition, the psychiatric institution was lit by means of gas. This lighting was very important, because a well-lit space was seen as remedial (Kirkbride, 1880).

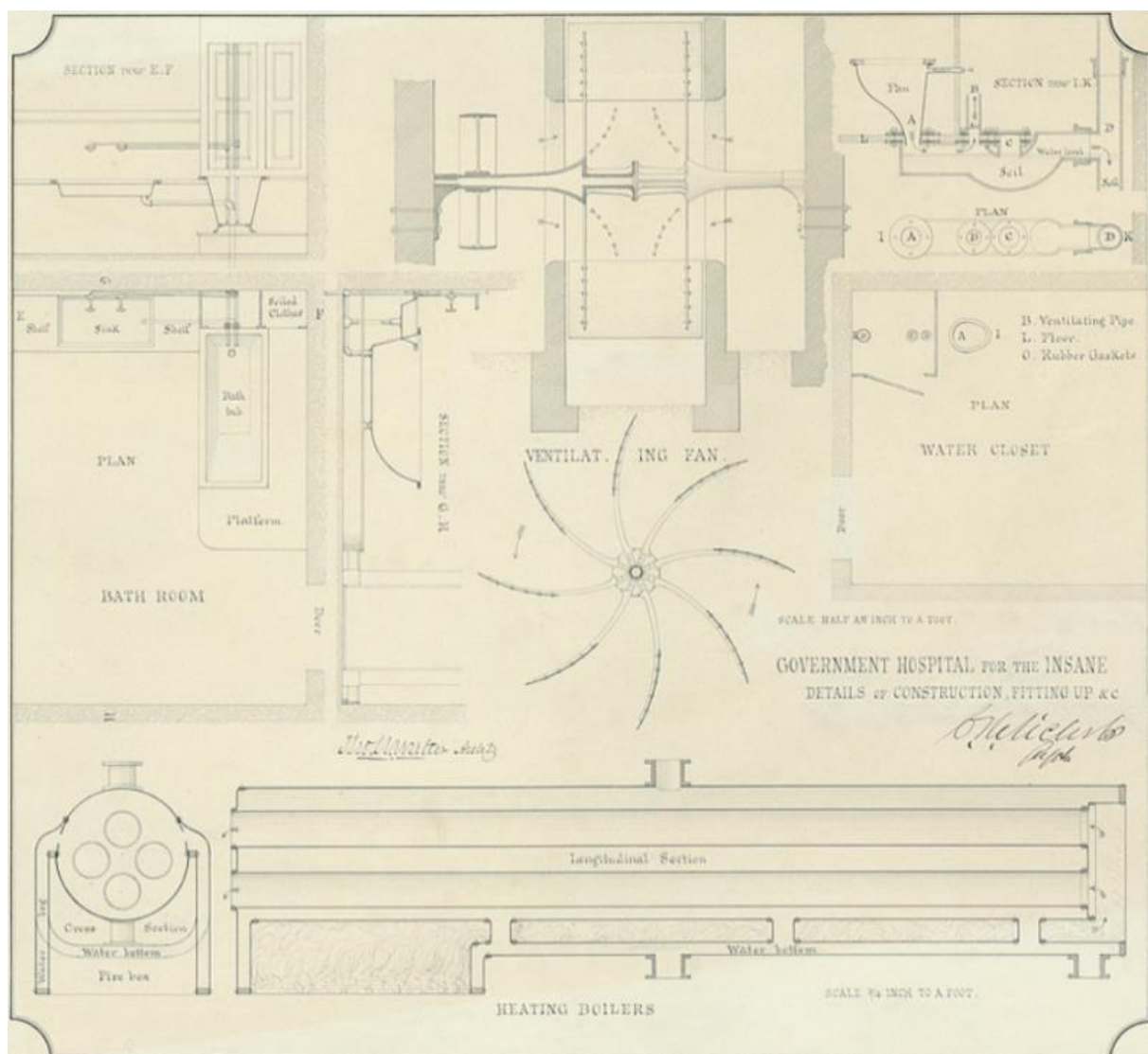


Figure 9: Technical drawing of the installation systems in St. Elizabeths Hospital (Walter, Blueprint of Saint Elizabeths Hospital for the Mentally Ill, ca. 1853, 1853)

1.3 ORGANIZATION

Mental health care has undergone major changes in recent centuries, of course not only in the architectural design of psychiatric institutions, but mainly in the way in which the patients were treated and the hospital was operated and organized as well. Until the 17th century, patients were locked up in prisons, as previously mentioned. However, from the 18th century onwards, society became increasingly interested in curing psychiatric people (back then people called them lunatics). Numerous so-called mad-houses, also known as private asylums, arose during this period. In 1796, The York Retreat opened its doors to people with psychiatric conditions and set the tone for the 19th century. At the time, this was a revolutionary institution in which society went from medical to moral treatment (Parry-Jones, 1988). The building contained many elements that are also reflected in St. Elizabeth, for example the peaceful natural environment. Here a real effort was made to create a comfortable and family atmosphere for patients with a community life. That all patients lived and were treated in one place, the institution, was really characteristic of this time period. In the 19th century, the number of public psychiatric institutions increased sharply, as a result of psychiatry becoming a medical specialism.

The psychiatric institutions had a strict, non-negotiable organizational structure as described in Kirkbride's book (see figure 10). This organizational structure can also be seen in Dutch psychiatric institutions from the same era, taking the American ones as an example (Boschma, 2003). A critical importance in this organization of mental hospitals is the fact that the staff had to live on the premises of the institution, with the exception of the board of trustees and the treasurer. In this way, by letting staff and the patients live at the same place, the institution was somehow organized as a family. The separation of the sexes (see figure 4) was also of great importance, because they could over-stimulate each other. The same applies to different classes, meaning the different intensities of psychiatric illnesses patients had and not the socio-economic classes (Kirkbride, 1880). Incidentally, women were considered very suitable for this work, because it was assumed that they had more empathy. The development of mental hospitals in the late 19th century coincided with the women's movement, resulting in a significant increase in the number of women in this field of work (Boschma, 2003).

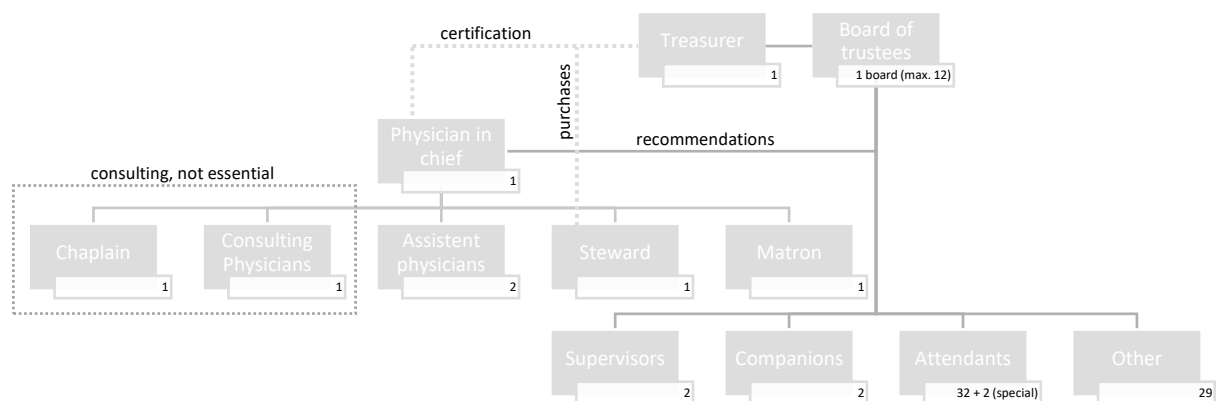


Figure 10: organization of a mental asylum, a family, of 250 to 300 people (like St. Elizabeths) according to Kirkbride (Rik Sijbrandij)

However, it is important to note that the way mental asylums were organized was criticized in a later stadium. Philosopher Michel Foucault, for example, points out in his book *Madness and Civilization* that placing the insane in these institutions was simply another way of excluding these people from society after the enlightenment began. He argues that the institutionalized complexes where moral treatment was used were a great 'moral imprisonment' (Foucault, 1961). However, these bad intentions of mental hospitals are debunked by historian Gerald N. Grob who shows that no attempt was made to imprison and/or control the insane. He indicates an important cause for the failure of these institutions, namely the overcrowding of hospitals (Grob, 1983). Similarly, sociologists like Andrew Scull argue that the growth of the psychologist's field of work led to exponentially more diagnoses of mental illness. Resulting in overcrowded institutions, which greatly reduced the quality of care. This ever-expanding field of work was the result of psychologists' desire to establish their expertise (Boschma, 2003).

1.4 CONCLUSION

In conclusion, the 19th century St. Elizabeth Hospital in Washington, D.C. has applied several architectural interventions to reduce patient stress and positively influence care in an innovative way. The hospital was situated in a natural environment with sufficient distraction, due to the natural elements that do not over-stimulate. Furthermore, it used to be easily accessible and close to the city, but not too close so that residents could agitate patients. In addition, the hospital was easy to read, the routing was linear with landmarks and the main entrance was accentuated. Also, all the rooms had a nice view of the surrounding green area and the rooms were well lit, both by day and sunlight or lighting by gas in case it was dark. The building had to have a humane appearance (interior and exterior), all security measures had to be hidden. Nevertheless, the building had to protect the patients against themselves and other patients, this is particularly reflected in the choice of materialization. The indoor climate had to be pleasant at all times so that the patients were not irritated as well. This comfortable indoor climate was ensured by various installations, such as heating, natural and mechanical ventilation, but also by architectural elements such as cavity walls to prevent moisture formation in the rooms.

Additionally, the hospital had a clear organizational structure, like many others, designed according to the principles of Kirkbride at this time. The building had to function as a family in which moral treatment was paramount, instead of a place where one was medically treated and/or locked up. Although this has been criticized later, this is mainly due to the fact that the Kirkbride prescription regarding the number of patients per institution has been deviated from, with overcrowding as a result. Therefore, creating a patient community in a hospital does not have to be written off immediately.

2.1 INTRODUCTION

Knowledge of mental health care in the scientific domain has increased considerably over the years, compared to the still novice and emerging science of the 19th century. As a result, of course, knowledge about the extent to which architectural interventions affect patients (and their stress) and care personnel has also increased. One of the more recent design strategies widely used and praised in the field is the so-called evidence-based design. Here, design choices are always made in consultation with a professional and are based on design principles from the past. The effects of the design on people and other things have been scientifically investigated (Hamilton & Watkins, 2008). Applied to mental health care, this means that design must always be in consultation with a physician and the effects of design on patients / staff have been scientifically researched. In a way, Kirkbride also used this design strategy, as he agreed (as mentioned in [chapter 1.2.2](#)) that past experience should be used to design new institutions and these should always be designed in collaboration with a physician. Although this personal experience of Kirkbride obviously does not meet the demands of scientific research today.

This chapter deals with the, in a scientific way collected theory of architectural interventions and their effects on the stress of patients in which evidence-based design is the most dominant form of research. However, it also introduces a different way of thinking. This different theory is addressed through Golembiewski's research into the salutogenic model in which disease and mental health are seen from the perspective of "two points on the same continuum" (Golembiewski, 2010). Golembiewski argues, based on salutogenic theory, that the ability of people / patients to adapt to their (new) environment is great and that an overly controlled (designed) environment can actually cause stress. First, the design aspects related to evidence-based design are explained and then the design principles from the salutogenic model are discussed.

2.2 EVIDENCE-BASED DESIGN

Connellan et al. (2013) conducted an extensive collection of literature research into the influence of architecture on humans and in particular on psychiatric patients. This research resulted in a number of themes with starting points for architectural design, which are briefly discussed in this section in order to gain insight into the current knowledge on this subject.

First of all, the architecture must guarantee the safety of patients, staff and visitors. This can be achieved by not allowing the hospital to get overcrowded so that the patients do not lose control over their environment and their privacy (single bedrooms). It is also recommended to visually and functionally differentiate rooms considerably, so that patients do not become confused. This can easily be achieved by giving a maximum of one function to a room and to distinguish this room by means of colour, material or lighting (Connellan, et al., 2013).

Moreover, the patients should have sufficient daylight, sunlight and artificial (?) lighting, because a lack of light can lead to an increase of stress for patients (Joseph, 2006). By optimally orienting the hospital to the sun, the stress among patients can be reduced. In the study by Connellan et al. (2003) it is emphasized that the morning sun has the largest impact on patients, because it strongly influences the circadian system of people.

Furthermore, it is strongly recommended that there are private gardens for both patients and staff. These gardens often guarantee safety, improve the social structure and have a therapeutic effect on all users. In addition, a view of a green environment from the patient rooms themselves is also recommended so that the patients are slightly stimulated by the surrounding nature, which in turn reduces stress (see figure 11). Art can play a supporting role in this, according to research by Daykin et al. (2008). No stimulation or too much stimulation is seen as very agitating for the patients and a view of nature would stimulate the patients at the right level (Connellan, et al., 2013).

Additionally, all senses should not be wrongly stimulated, such as smell and sound, but also temperature, for example. Wrong smells should be masked by means of fine aromatic scents. Rooms should not be disturbed by noise, that is to say, they have adequate sound insulation (contact and air) and be at room temperature. Furthermore, plants can be used to keep the humidity pleasant and they also have a positive visual influence (stimuli) on the patients (Ulrich & Parsons, 1992).

Furthermore, the interior of the institution must be anything but institutional, but preferably domestic. The patients, but also the visitors, must be able to find their way easily through the complex. This means that the routing is not too complex, but above all that signs are easy to recognize and legible (for wheelchair users as well). On top of that, clear landmarks should be used in the hospital, so patients can easily orientate themselves (Connellan, et al., 2013).

Finally, the stationing of the nurses often causes disruption in psychiatric institutions. Because of the closed nature of these stations, they would often alienate the nurse from the patients. This is bad for patient-nurse relationships, but nevertheless the nurse must also be able to retreat herself from the patients and vice versa. That is why it is strongly recommended to make a distinction between three different areas, namely: patient areas, nurse areas and communal areas (Andes & Shattell, 2006).

2.3 THE SALUTOGENIC MODEL

In addition to the evidence-based research of the previous chapter, there is an alternative theory about influences on (mental) health, namely the salutogenic theory. This theory was developed by sociologist Aaron Antonovsky and is based on the principle that people become healthier when they have a reinforced sense of cohesion (Antonovsky, 1987). Golembiewski uses this theory to look at the impact of architectural design on health through the salutogenic effect (see figure 12). Moreover, he realizes that the architectural environment influences stress and argues that an environment should not cause too little or too much stimulation. So it is important to note that an environment that provides no stimulus at all is also seen as harmful and thus a small amount of stress is not necessarily bad. In order to arrive at a reinforced sense of coherence and better health as a consequence, three categories are distinguished, namely comprehensibility, manageability and meaningfulness (Golembiewski, 2010). In this chapter, these three categories and the associated design (strategies) recommendations are discussed.

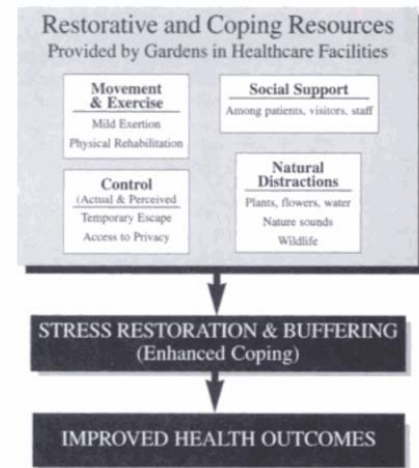


Figure 11: Positive effect of gardens on mental health (Marcus & Barnes, 1999)

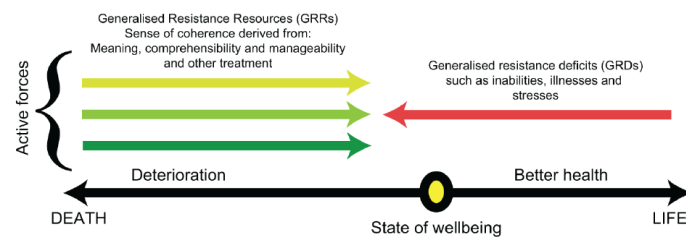


Figure 12: The salutogenic model (Golembiewski, 2010)

First of all, the environment of the patients must be comprehensible. By means of architectural design, the readability of spaces (an environment) can be increased or deteriorated. For example, hallucinations experienced by schizophrenic patients can be amplified by a poorly designed space (Searles, 1960). These hallucinations cause stress and thus reduce the health of the patient in accordance with the salutogenic model. It is important to keep this in mind when designing psychiatric facilities. Therefore, Golembiewski has mapped out a number of design principles by means of literature research in order to keep a space as comprehensible as possible. He states that spaces should be kept relatively small and they should have harmonious proportions with textured surfaces so that it is easy to distinguish between floor, wall and ceiling. Furthermore, he argues for the use of natural materials such as wood and stone. He also claims that modernistic clean white surfaces are confusing for the patients. Moreover, a psychiatric institution must be based on a clearly recognizable grid structure. In addition, he highlights the importance of a natural environment and the use of furniture, because these give the patients a sense of scale. Extremely stimulating influences, such as the noise of a busy road, should be avoided. He also emphasizes that spaces and objects in an interior should not contain ambiguity, which is extremely confusing for the patients. Giving the example of a sliding glass door, he argues that for the patients this is at the same time a door, wall and window. Finally, like Kirkbride, he insists that institutions should not look institutional, but rather domestic (Golembiewski, 2010).

Second, a patient must have as much control over the spaces and environment in which he is located (Osmond, 1958). Here too, it is recommended to keep mainly living spaces, but also other spaces small. This is to prevent patients from interacting with too many other individuals / patients at the same time, as they would lose control of the space as a consequence. As can be seen in figure 13, the number of interactions increases exponentially faster than the number of people in the room. It is therefore recommended to keep the interaction numbers small by not making the spaces too large. As in Grob's study (see chapter 1.3), this study concludes the overcrowding of psychiatric institutions as a major problem. It is also recommended, if this can be done safely, to give patients their own kitchenette. It is actually a constant trade-off between safety and freedom. Patients should be given as much freedom as possible, as long as the safety of their fellow patients and their own can be guaranteed. For example, it is also possible to opt for opening windows and self-regulating heating in the patient rooms (Golembiewski, 2010).

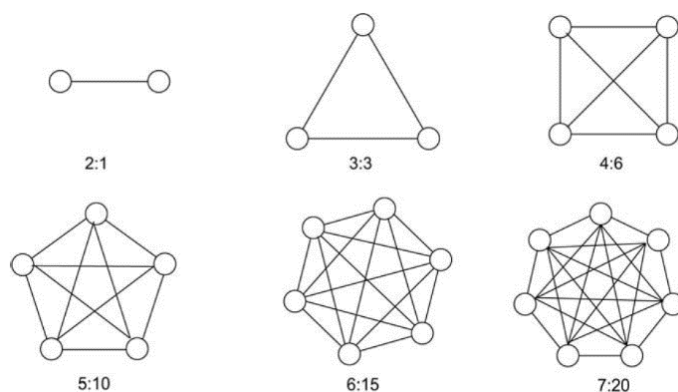


Figure 13: The amount of patients and interactions (Golembiewski, 2010)

Finally, the patients must be given a purpose in life (meaningfulness), which in itself is of course difficult to achieve through architecture. Nevertheless, choices can be made in the design process that can help with this. Obviously providing a space in which patients can meet friends and family in a psychiatric institution is a prerequisite, but the use of gardens is recommended as well. Although gardens do not have the same positive effect for every patient, some patients will be able to gain a lot of value from a garden. It can even become 'their project'. Furthermore, a natural environment in this respect is also seen as a positive stimulus (Golembiewski, 2010).

2.4 CONCLUSION

To conclude, two concepts of stress-reducing healthcare architecture (based on different theories) have been analysed, in order to arrive at a number of principles that can be used to design a psychiatric institution in which the design plays an active role in reducing stress. Of course, these studies contain similarities, but there are also points highlighted in both studies that are not mentioned in the other. The results of both studies are summarized in table 1, which can be used as a starting point when designing a psychiatric institution.

	EVIDENCE-BASED DESIGN	SALUTOGENIC MODEL
Safety	don't let the hospital get overcrowded	don't let the hospital get overcrowded
Privacy	use single bedrooms	-
Control	don't let the hospital get overcrowded + separate people based on gender	avoid ambiguity, things should be one thing + give patients as much control over their environment as safety allows for (i.e. a kitchenette)
Environment	the building is in a natural environment and all rooms have a view of this	the building is in a natural environment, so the patients have a clear perception of scale
Sunlight	orient the hospital optimally to the (morning) sun for the benefit of the circadian system	-
Daylight	all rooms should have excess to daylight	-
Lighting	all rooms should have significant lighting	-
Materiality	-	use different textured/materialised surfaces to clearly distinguish objects (wall, door, etc.) + make use of natural materials (wood, stone, etc.), avoid modernistic sterile white spaces
Functions	one distinct function per room, visually different through colour, material or lighting	avoid ambiguity + provide a space for social meetings with family/friends
Routing	clear, readable routing + use landmarks for recognition + make use of recognisable signs (wheelchair users eye level)	based on a clear and structured grid (readable)
Proportions	-	spaces should be kept relatively small with comfortable proportions + based on a clear and structured grid
Comfort	mask bad smells + rooms have nice (quiet, but not completely silent) acoustics + rooms are at room temperature + planting in rooms is recommended	extremely stimulating influences should be avoided (i.e. traffic noise)
Adaptability	-	patient rooms, if safe, could have opening windows and self-regulating heating
Interactions	-	keep the number of interactions patients have at the same time low (i.e. by making spaces small)
Interior	the interior should be domestic + use of art is recommended	the interior should be domestic + use of different size furniture so the patients have a clear perception of scale
Gardens	implement (therapeutical) gardens	gardens can give patients meaning

Table 1: Starting points for stress reducing mental health care architecture per theme and theory (Rik Sijbrandij)

CHAPTER 3: LEARNING FROM HISTORY

3.1 INTRODUCTION

In the previous chapters I have discussed a brief architectural history of mental health care and two theories on the influence of architecture on the mental health of patients. Physician Dr. Thomas S. Kirkbride had an innovative way of thinking about how the architecture of mental health institutions should be, although based on personal experience rather than scientific research. Incidentally, that does not take away from the fact that Kirkbride was an expert in the field of mental health care. Further contemporary research shows that many of his ideas about mental health architecture are also supported by scientific research, something he was not aware of at the time. Nevertheless, there are discrepancies and forgotten matters, but also similarities between contemporary scientific research and the innovative ways of thinking of the 19th century. This chapter compares the design principles that Kirkbride prescribed ([chapter 1](#)) with the design principles recommended by today's scientific research ([chapter 2](#)). In this way it can be determined whether design principles / strategies have been lost over time, but also if and where there are similarities and / or differences between the 19th century and now.

3.2 PROGRESSIVE HISTORY

When the principles of Kirkbride are compared with the design principles recommended by scientific research (as done in [table 2](#) in the appendix) there are a lot of similarities. For instance, with his organizational structure, as can be seen in [figure 10](#), he had tried to prevent the overcrowding of hospitals, which later has been pointed out by scientific research as one of the most important causes of unrest among patients. Furthermore, he identified the need to place the institutions in a natural environment that the patients could see from their room. In addition, all rooms had to have sufficient sunlight and daylight, but also sufficient lighting, things which were all seen as remedial at the time and is nowadays backed up by scientific research. Kirkbride was also a forerunner in separating functions. By positioning all amenities in the main building and sleeping quarters in the wings he created a logical distinction between private and public (see [figure 14](#)). While this is still a fairly simple way to combat ambiguity, it was a start. The physician also had a strong opinion about the routing of the institutions, supported by research today, namely that it should be clear, linear, easy to read and made use of

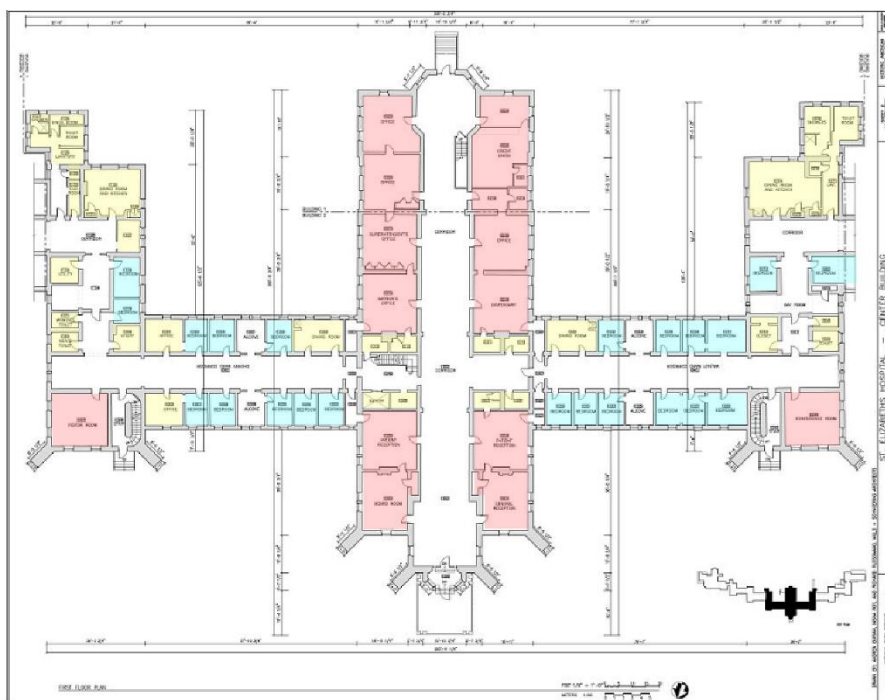


Figure 14: The main building and first wings, amenities – bedrooms – utility (Walter & Nichols, St. Elizabeths Hospital, Center Building, 2700 Martin Luther King Jr. Avenue, Southeast / 539-559 Cedar Drive, Southeast, Washington, District of Columbia, DC, 1933)

landmarks so that patients always knew where they were. Moreover, research shows that the patient rooms always had to be comfortable (think of heating, ventilation, acoustics, etc.) and that over-stimulation of the patients in one of these areas can cause a lot of stress. Although climate control was still fairly limited in the 19th century, Kirkbride nevertheless suggested using the most innovative techniques at the time. In fact, he was in favour of a system that was as adaptive as possible, so that patients had as much control as possible over their own environment. Furthermore, Kirkbride stated that these institutions should be located outside of the city. He tried to minimize interaction with neighbouring residents, something that also can be seen as beneficial in Golembiewski's research (see figure 13). Additionally, Kirkbride was in favor of private gardens on the property (see figure 15), which is also recommended by research, as it can give patients a purpose. Most important, he advocated for domestic institutions (see figures 7 & 8), which was definitely not the norm at the time, but nowadays a widely accepted and acclaimed way of designing psychiatric facilities.



Figure 15: Patients gardening in the private gardens at St. Elizabeths (Otto, 2013)

However, while there are many similarities between Kirkbride's design principles and scientifically supported principles, there are also some minor discrepancies. The most obvious is that Kirkbride advocates tightly plastered walls (Kirkbride, 1880), but scientific research has shown that natural materials work better psychologically and therefore it is not recommended to work with modernist white surfaces (Golembiewski, 2010). Although Kirkbride recommends this design choice for safety reasons (patients can't just demolish the wall or get parts of it loose) other finishing's of walls are still considered better. Yet the underlying idea of Kirkbride cannot be completely excluded, so it may be a wall of natural materials, provided it is safe. Furthermore, there is the fact that the scientific domain recommends that the spaces need to be kept relatively small and that the proportional change between spaces should be kept comfortable. Although Kirkbride does not necessarily say anything about proportional changes in his book, he does mention the desired measurements of certain spaces. When this is set side by side, one can speak of a pleasant change of proportions, that is to say not from

very large to very small (or vice versa) in one step (see figure 16). It can therefore be suggested that he was unconsciously occupied with this, yet never wrote it down. Finally, Kirkbride argues that the sexes, races and classes (not financial, but clinical range) should be separated from each other for a better recovery. Although scientific research certainly does not advocate racial segregation, yet it does advocate segregation on the basis of the severity of the mental illness (class). However, there is still much debate about gender segregation. According to evidence-based design principles, this separation would also be a better solution, but other research has shown that for many of the patients it would have a positive effect on health outcome to mix patients. The problem is that the negative / positive effect is very person- and illness-dependant, for example, it would be very disadvantageous for psychotic patients (Averbuch & Lichtenberg, 1992).

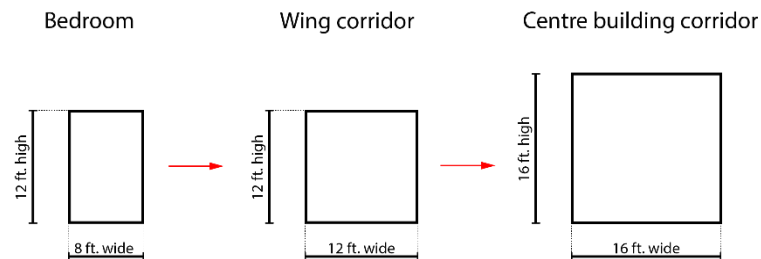


Figure 16: Measurements of the rooms according to Kirkbride (Rik Sijbrandij)

In addition to the similarities and differences between Kirkbride and scientific research, there are also a number of things that Kirkbride mentioned that did not come up in advance in scientific research: the lost design principles. For example, Kirkbride had devised to hide the security measures that were taken as much as possible, especially in the materialization. By nailing the floors invisibly, for instance, the patients were protected from themselves and others and of course also the staff and visitors. Although safety regulations have of course been drawn up for the sake of safety, it is nowhere recommended to mask them. Yet, in this way the patients are less confronted with the fact that they could be a danger which can cause stress. Furthermore, Kirkbride recommends placing the institutes close to a city, but not in the city. However, many of these institutions, like St. Elizabeths Hospital, are in the city (and not a natural environment) as a result of urban growth nowadays. As a consequence making the immediate environment of an institution much more active can lead to overstimulation of the patients. Actually, this was made even worse by the fact that the institutions also continued to expand, which made it much busier on the site of the institutions as well as can be seen in figure 17. In addition, Kirkbride advises to place all facilities in the main building and to accentuate this main buildings entrance, as is done in St.

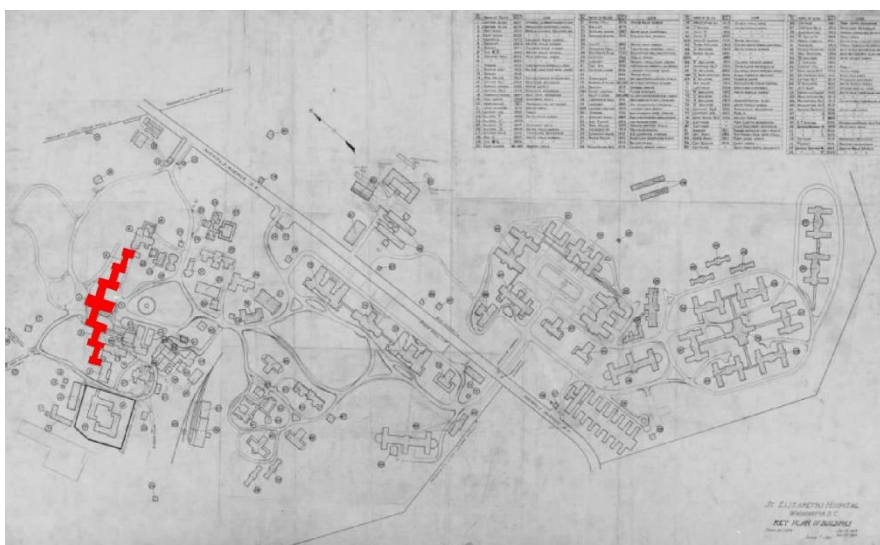


Figure 17: Site of St. Elizabeths Hospital – 1944 (Otto, 2013). If this situation is compared with the one in 1860 (figure 1), it is no wonder that the psychiatric institution and its premises were seen as overcrowded.

Elizabeths hospital (figure 3). Research does endorse the visual differentiation between functions, but focuses on the interior. In scientific research, like the differentiation between functions, the domestic atmosphere is only applied to the interior of the building, while Kirkbride also recommends designing the exterior domestic (see figure 18). Moreover, Kirkbride describes the adverse effects of an atmosphere with too low or high humidity. Something that was not reflected in the scientific research, although comfort is highly emphasized by both theories. Finally, Kirkbride favours a community, family-like life in the institutions. This could be achieved, for example, by keeping the wards relatively small, which in turn helps to limit the number of interactions between too many patients.



Figure 18: The exterior of St. Elizabeths Hospital, it looks like an ordinary apartment building (Ford, Itle, & Penich, 1933)

3.3 CONCLUSION

In summary, it can be said that Dr. Thomas S. Kirkbride's innovative views on architectural design of mental hospitals are still very relevant today. Many of his ideas have been backed up by recent scientific research, and just a few of the claims he made more than a century and a half ago turn out to be incorrect. Yet some of his revolutionary ideas have been lost. They could be re-implemented to make the architecture of psychiatric institutions more stress-reducing, namely:

- Hide security measurements as much as possible to reassure patients and make them feel at home.
- Make sure that the mental institutions are not located in a city, but close to it. Take into account urban growth and the like, that is to say that this is also an urban development issue.
- Use smart and safe materialization, materials must be joined in an inseparable and hidden way.
- Use a main volume to accommodate all communal amenities (clear functional enclave).
- Visually accentuate this main volume in both the exterior and interior.
- Give not only the interior, but also the exterior a domestic appearance.
- Keep the indoor climate at a pleasant humidity level.
- Create small communities in the psychiatric facilities (family life).

In addition to these, forgotten matters, table 2 (appendix) can be used as a convenient design tool when designing a psychiatric institution, as the findings from recent scientific research have also been added. The only point of discussion here is whether separating the sexes in these facilities is a beneficial action, because several studies give conflicting results and this subject should therefore be investigated further.

CHAPTER 4: INNOVATIVE DUTCH FACILITIES

4.1 INTRODUCTION

In this thesis insights into the progressive and innovative way in which Kirkbride attempts to reduce stress in psychiatric patients through architectural design have been compared to contemporary science-based knowledge in the previous chapters. Subsequently, in this chapter three innovative Dutch psychiatric institutions are analysed to investigate whether the principles of Kirkbride and the scientific theories are also successfully applied in practice. The three innovative psychiatric hospitals are the Antes Psychiatrisch Centrum in Spijkenisse, the Meander Medisch Centrum's psychiatry department in Amersfoort and the Radboudumc's psychiatry department in Nijmegen. Thereafter, the findings of the analyses can serve as examples of 'good' and / or 'bad' translations of Kirkbride's principles / scientific research. In this way, an attempt is made to back up the historical and theoretical research with clarifying successful practical examples, so that the recommendations in the conclusion can be substantiated more clearly as well.

4.2 INNOVATIVE DUTCH FACILITIES

For each case study, a brief explanation is given about the psychiatric institution itself. Subsequently, the facilities are analysed in view of floor plans, sections, site plans and architectural features and finally compared with the findings from previous chapters, which are shown in table 2.

4.2.1 ANTES PSYCHIATRISCH CENTRUM

The Antes Psychiatrisch Centrum (previously called Delta) is located in the middle of Spijkenisse in South Holland, the Netherlands. The complex was designed by EGM architects, an architectural office that has designed several healthcare institutions in the Netherlands since decades. According to the architects, when designing this complex, a conscious choice was made to separate the living quarters (figure 19) from the treatment building (figure 20), which can be seen in the site analysis in figure 21 as well. They argue that this separation of functions prevents the complex from acquiring an institutional character (EGM architecten, n.d.). This clear segregation of functions and of course the rejection of an institutional character is something that is also reflected in the recommendations in table 2 and is therefore in correspondence with Kirkbride and scientific theories. In addition, the residential building is divided into three different living groups (see figure 21), which in turn consist of two groups of twelve residents. By dividing these groups, the number of interactions is kept to a minimum which reduces stress among patients. Furthermore, the architectural office claims that the design (orientation) of the complex contributes to the treatment of the patients by stimulating the circadian system (EGM architecten, n.d.). Although this is claimed, it appears from the analysis that this is not entirely true, for example, the sun does not reach most of the living areas until the evening, while the morning sun is perceived as the most important for the circadian system (Golembiewski, 2010). The complex is also located in the middle of the city, which is not recommended, because local residents as well as the surrounding busy roads can now agitate the patients. On the other hand, the building occupies a reasonably green part of the city, which in turn reduces stress.



Figure 19: Residential building (EGM architecten, n.d.)



Figure 20: Treatment building (EGM architecten, n.d.)

When one takes a closer look at the building, more similarities can be discerned between design choices made for this institution and the recommended design choices from table 2. For example, the residential building (see figure 19) is distinguished even more from the treatment building (see figure 20) by means of natural materialization (separation of functions). The use of these natural, textured materials is also recommended by scientific research. Furthermore, the entrance to the treatment building is clearly accentuated, as can be seen in St. Elizabeths Hospital as well. In addition, clear similarities with table 2 can also be distinguished in the interior. For example, both buildings have a clear routing (see figure 19) and the spaces are well-lit, both by daylight and by lighting as can be seen in figure 22. On top of that, the domestic atmosphere is also emphasized in the interior, something that Kirkbride and scientific theory clearly emphasize as very important. Moreover, the patients have a kitchen that they can use themselves, so in this way they control their own facility. This kitchen space is easy to distinguish due to the different materialization and colour of the space compared to the common living space. On the other hand, the corridors are very sterile, and the floor, wall and ceiling are difficult to distinguish from each other (see figure 23). In view of Kirkbride and later research, some aspects do not yet meet the best insights.

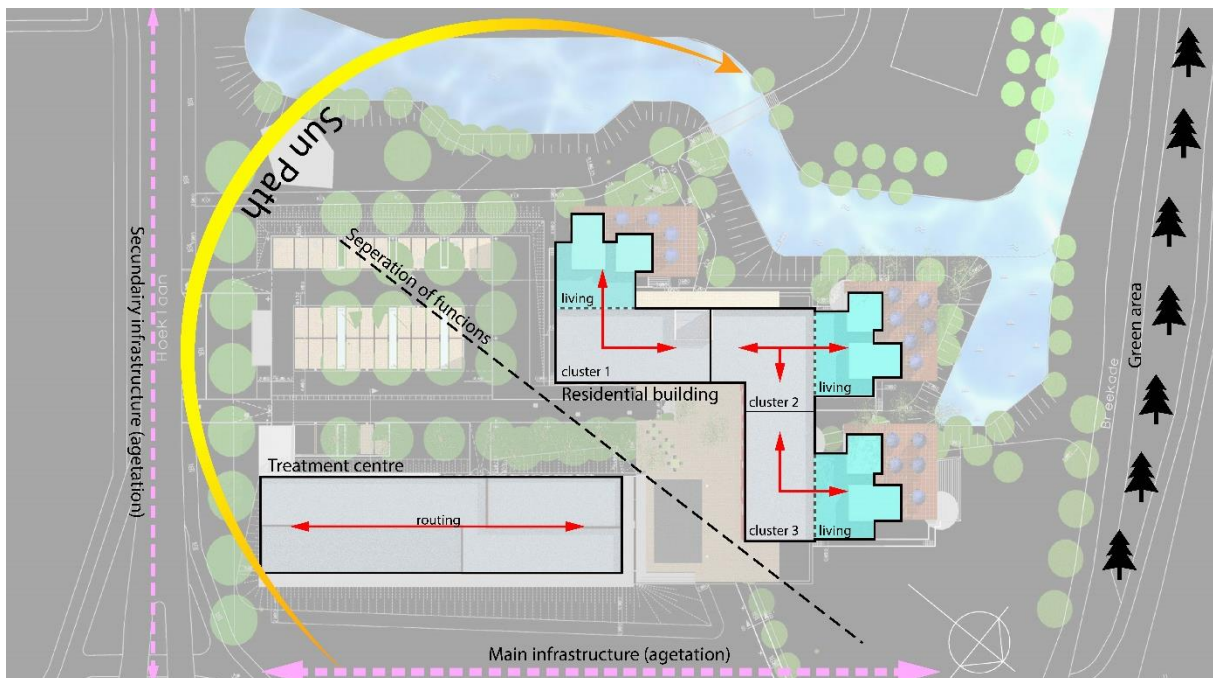


Figure 21: Site analysis of the Antes Psychiatrisch Centrum, underlying site plan (EGM architecten, n.d.) - analysis (Sijbrandij)



Figure 22: The common living space (EGM architecten, n.d.)



Figure 23: Corridor (EGM architecten, sd)

4.2.2 MEANDER MEDISCH CENTRUM

The Meander Medisch Centrum is located in Amersfoort in the east of the province of Utrecht, the Netherlands and was completed in 2013. It is situated in the outskirts of the city in a very natural environment as can be seen in figure 24, something that Kirkbride also classified as a suitable location. The entire hospital is designed by architectural office AtelierPRO, but here the focus is laid on the psychiatric department of the hospital. This psychiatric department has been kept separate from the rest of the hospital (see figures 25 & 26), which ensures a clear division of functions and, as a result, reduces the stress of the patients. Moreover, the department is divided into two separate units (Teunissen & Beek, 2020), which reduces the interactions and therefore stress that patients have. Additionally, a distinction is made according to class of disease, the extent to which patients are ill and violent, just as Kirkbride recommended. This distinction is reflected in the building, for example in the courtyards, the more violent patients get a closed courtyard, and the calmer patients have access to courtyards that are in open connection with the environment. These recesses in the volumes (the courtyards) give the department the appearance of separate pavilions, but also provide the rooms with plenty of daylight. In fact, because these have been given a white colour (see figure 27), the light is reflected so that more light enters the building. Because the sun starts to reach the rooms in the afternoon, fixed blinds have been applied to the upper part of the windows and although this makes a positive contribution to the indoor climate, an adaptive option would have been better here, so that the patients have more control over their own environment. Unfortunately, there are no images of the interior, but it is described that there is a clear separation between floor, wall and ceiling by means of colour, texture and material as a result of research into the influence of this on behaviour (Teunissen & Beek, 2020). The rooms are also completely different from the general spaces, avoiding ambiguity.



Figure 24: The hospital at the edge of the city in a natural environment (AtelierPRO, sd)

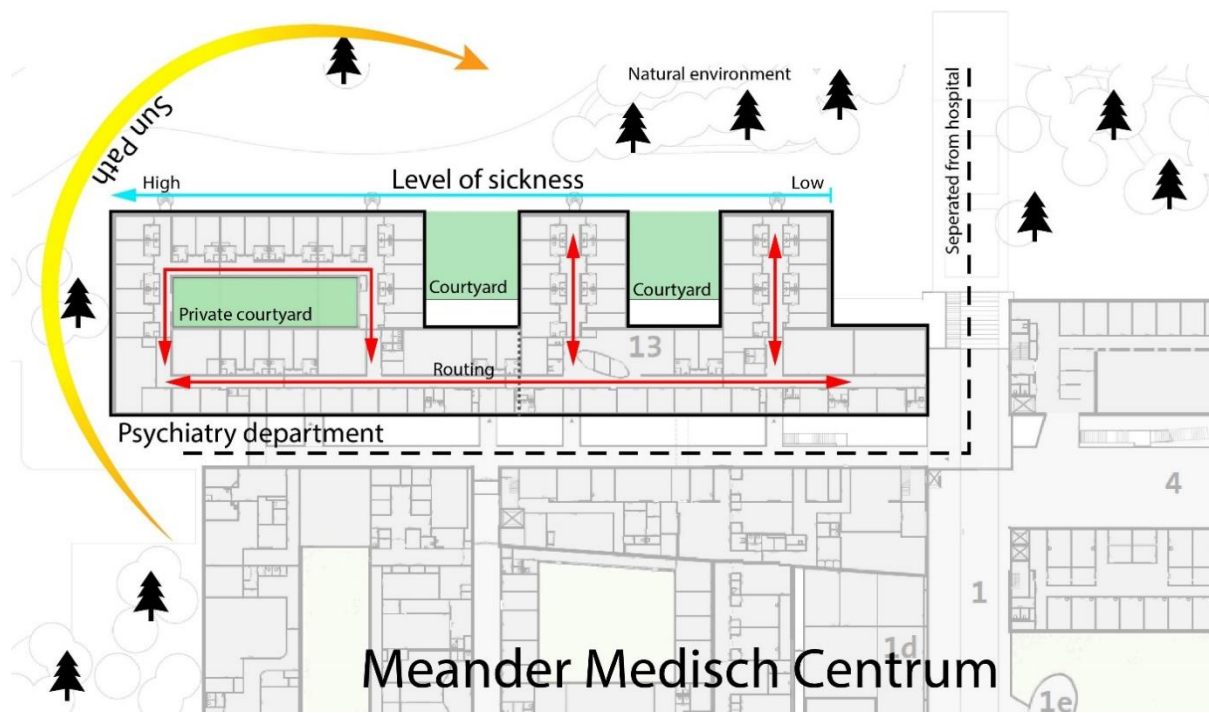


Figure 25: Analysis (Sijbrandij) of the psychiatric department of Meander Medisch Centrum, underlying plan (AtelierPRO, n.d.)

If the analysis (figure 25) is examined in more detail, it can be concluded that, just as in the Antes Psychiatrisch Centrum, the psychiatric department is not optimally oriented with respect to the sun. Here too, the morning sun is not optimally utilized despite its great importance for the patients' circadian system. Although it is easier to reason here because it is part of an entire hospital, it is difficult to optimally orient all building parts. The fact that the hospital is close to the city does not have to be a problem, because the immediate surroundings are natural and the patients have a full view of it (see figure 28). As a result, the patient will stress less, as argued by Kirkbride and confirmed by scientific research (see table 2). However, it is important that the city does not grow around the hospital, so that the hospital would still be located in the middle of the city, so this must be kept in mind in urban development. Incidentally, it is also argued that in the design of the construction of the psychiatry department, a possible additional floor has been taken into account (Teunissen & Beek, 2020). This allows the hospital to expand and prevents the ward from becoming overcrowded, which has often been proven negative. Furthermore, the psychiatry department has a clear linear routing, which prevents patients getting lost and stressed. Moreover, the entrances to the department are summarily accentuated by means of canopies as seen in figure 26, this is also in line with the recommendations of Kirkbride. Finally, the courtyards could be used in a better way. Currently it is a lawn (see figure 27) and although this helps to some extent as well, the patients would benefit more from these courtyards if they had the option to use it as a garden. The fact that a lot of light penetrates the building through these recesses is of course favourable.

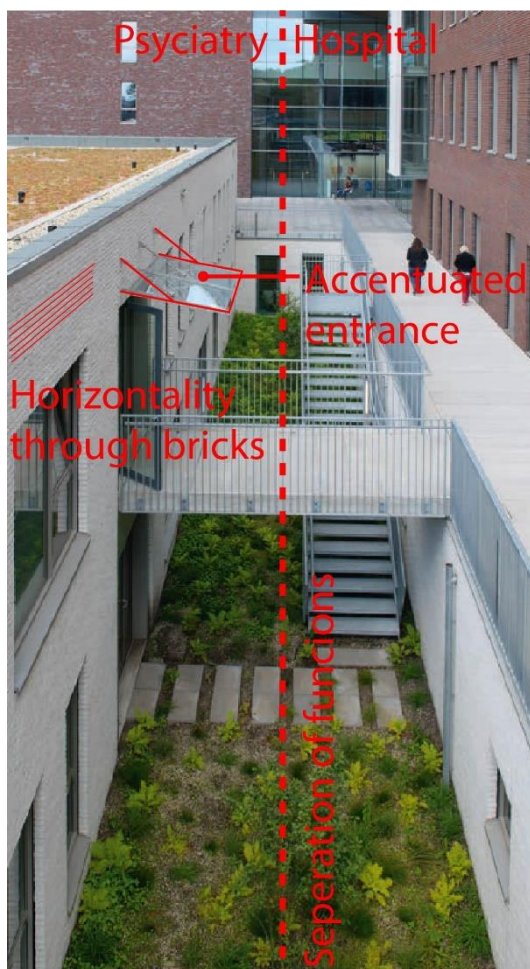


Figure 26: Psychiatric ward next to the hospital (Teunissen & Beek, 2020)

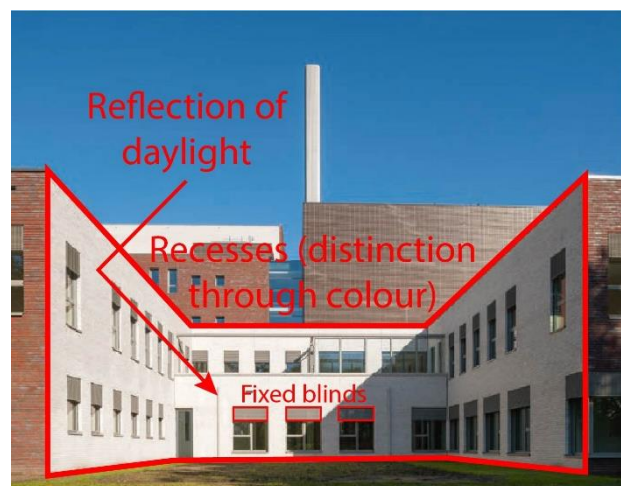


Figure 27: Recesses creating a courtyard and allowing light to enter the building (Teunissen & Beek, 2020)



Figure 28: The psychiatry department has views on a natural environment calming the patients (AtelierPRO, sd)

4.2.3 RADBOUDUMC

The psychiatry department is one of the buildings in the hospital cluster of Radboudumc and is located in the middle of Nijmegen in Gelderland, the Netherlands. In 2012, the hospital management felt that the department was outdated and engaged a design team consisting mainly of EGM architects, Suzanne Holtz Studio (interior) and Copijn (landscape). It was originally perceived as too dark and closed, and EGM architects have changed this in their new design (EGM architecten, sd). For instance, they have placed all patient bedrooms on the outside of the building, so that all rooms have a lot of natural daylight and sunlight, but also a view of their natural surroundings (see figure 29). Furthermore, a green patio was added in the middle of the department, which also brings nature and daylight into the building. 27 people live in the building, divided into three clusters with the most ill patients in their own department, patients do not stimulate each other negatively as a result of too much interactions. Suzanne Holtz Studio's starting point for the interior was a clear and orderly routing, something that can be clearly recognized in figure 29, but extra attention was also paid to the lighting (Suzanne Holtz Studio, 2012). Moreover, the walls were largely materialized in natural stone strips with clear horizontal lines or plastered as can be seen in figure 30. Additionally, the office advocated for self-opening windows in the patient rooms. All elements mentioned here try to use the design of the building itself to heal and reduce stress amongst the patients and are in accordance with Kirkbride's design principles and scientific research. However, landscape office Copijn designed something supplementary here that cannot be seen in the other Dutch institutions, they create all kinds of different therapy gardens around the building (see figure 31). Although the other institutions are also located in a (relatively) green environment, there is also the possibility to use the garden here which was not possible in the other institutions (see figure 33). Patients can get a lot of value from this, as has been proven by previous scientific research (table 2).

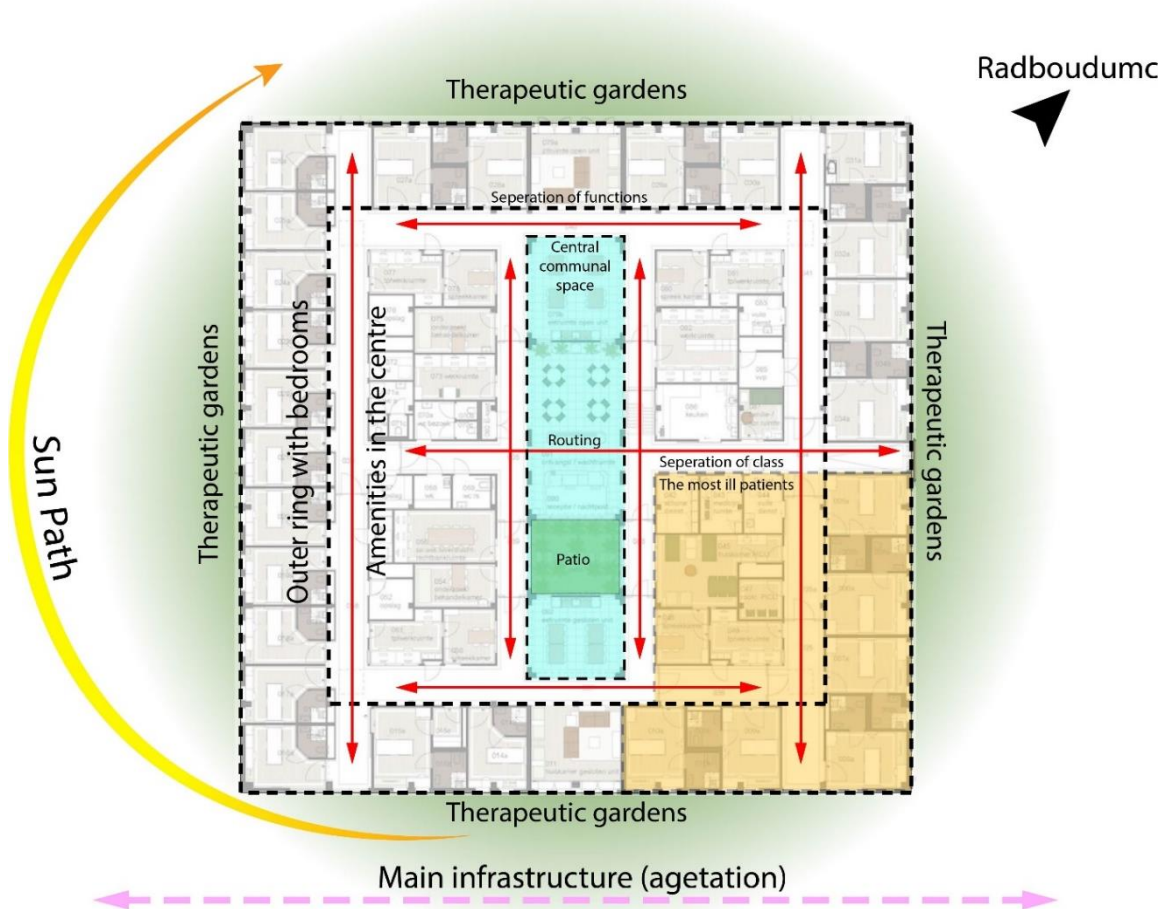


Figure 29: Analysis (Sijbrandij) of the psychiatric department of Radboudumc, underlying plan (Suzanne Holtz Studio, 2012)

Analysing deeper, it can be concluded that not all rooms are optimally oriented towards the sun to benefit the patients' circadian system. However, all rooms have plenty of daylight and a view of a green and a calming environment. Furthermore, the starting points of Suzanne Holtz Studio have also been well translated in design, which in turn also results in a clear separation of functions, namely the private rooms in the outer ring and the public areas in the middle. In addition, the patio by EGM architects fits in well with the clear structure as a clearly recognizable landmark for the patients so that they do not become stressed as a result of getting lost. In the building, a good distinction is generally made between floor, wall and ceiling, as can also be seen in figure 30 & 32. These figures also make it clear that ambiguity is avoided in the furniture, a sofa resembles a sofa, as is also recommended by the salutogenic model. Moreover, the patients also have self-opening windows and their own kitchen, giving them control over their own environment. In addition, floors, walls and the like are fixed visibly so that patients cannot demolish them. Of course, this is also a way to ensure safety without making patients aware of this, as Kirkbride stated that concealing safety measurements is extremely important. However, there are also design aspects that could have been on a more adequate level, for example, the building has a central automatized climate system (EGM architecten, sd). Although this ensures the comfort of the patients, they cannot influence their own environment (temperature) as a consequence. Additionally, the design does not take any possible expansions into account, this is not a problem at the moment, but in the worst-case scenario, this can lead to the psychiatric department becoming overcrowded. Finally, the building is located in the middle of Nijmegen next to a major highway, which can agitate patients. The fact that it is located in the city is not very problematic in this case, because the immediate surroundings are very quiet and there are no direct neighbours.



Figure 30: Hallway next to the central communal space (EGM architecten, sd)

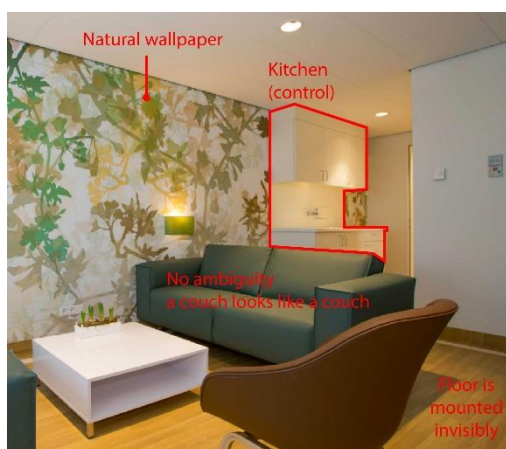


Figure 32: Interior of the living room (Suzanne Holtz Studio, 2012)



Figure 31: Therapeutic gardens design (Copijn, sd)



Figure 33: Exterior view of the building with the therapeutic garden (Copijn, sd)

4.3 CONCLUSION

To summarize, three innovative Dutch hospitals have been analysed on stress-reducing architecture with prior knowledge from the previous chapters (summarized in table 2). As a result, successful examples of architectural implementations of the theory can be given as examples in the conclusion and it is also a comparison between practice and theory. All psychiatric institutes have translated the following historical and theoretical design principles well in their architectural design:

- Clustering of patients so that the number of interactions at the same time does not rise too high.
- Security measurements are hidden in all institutions (no prison feeling).
- Avoid ambiguity, every object is clearly that object and not something else.
- A clear separation of functions and class of illness.
- A clear logical routing that does not confuse patients (and use of landmarks).
- The interior and exterior are domestic, not institutional.

On some design principles, the different psychiatric institutions stand out more than the others:

- Distinction in functions by two different buildings with different materials. *Antes*
- Accentuation of the entrance. *Antes*
- Perfect location close to the city (not in it) in nature. *Meander*
- Lots of daylight through recesses. *Meander*
- The possibility for an additional floor (to prevent overcrowding). *Meander*
- Interior based on research of its influence on patients. *Meander/Radboudumc*
- Daylighting through the positioning of the bedrooms and a skylight and perfectly coordinated lighting. *Radboudumc*
- The implementation of therapeutic gardens and a green patio (landmark). *Radboudumc*

Some institutes have adopted or to some extent applied the following design principles in their design:

- The hospitals are located in a natural environment, this is less the case in Antes Medisch Centrum and Radboudumc. These are located in the city and the environment is only natural directly around it.
- The patients have some degree of control over their own environment (kitchens, etc.), but in Meander, for example, the sun protection is fixed and in the psychiatric department of the Radboudumc they cannot regulate the temperature themselves.
- The floors, walls and ceilings are easily distinguished from each other through materiality, colour and texture in most parts of the psychiatric institutions. However, there are also places where this is not the case, such as the corridor in the Antes Medisch Centrum.

All psychiatric institutions are not yet optimally designed with respect to the sun and do not yet respond conveniently to the patients' circadian system. Therefore, this is a point of concern that should be considered with priority when designing these institutions. Although the cause often lies in the urban development plan or the fact that it is a department of a larger hospital, which makes it difficult to optimally orient all building parts.

CONCLUSION

During the 19th century there were major social changes as a result of the Enlightenment of the previous century. One of these consequences was the significant increase in respect and reputation of physicians in both social and professional fields. Among these physicians the idea that people with a psychiatric disorder could be cured arose, which resulted in the mentally ill no longer being imprisoned but put in a hospital. Subsequently, physicians in collaboration with architects tried innovatively to stimulate the healing process and reduce stress among the patients through architectural design. Consequently, many different mental asylums that were designed by architects in this century switched from a prison-like architecture to a domestic architecture. This was a significant historical change and many of the basic design principles that emerged at the time are still relevant to this day. However, some design principles appear to have been forgotten or neglected over time, yet stress among psychiatric patients is still a relevant problem in the Netherlands. This leads to the central question examined in this research, namely: *How can a striking example of 19th century mental health care architecture be useful to reduce stress among psychiatric patients in contemporary Dutch facilities?* By re-evaluating a striking example of 19th century mental health architecture, along with the architect's design principles, and comparing it with current scientific theories, recommendations are given to design stress reducing architecture. These recommendations have been supplemented with successful examples of innovative Dutch psychiatric institutions.

The particular design principles that have been explored are those of the innovative Enlightened physician Dr. Thomas S. Kirkbride. As a result of his design principles, a large number of hospitals in the United States were designed during the 19th century, also known as the Kirkbride plan. Additionally, from this Kirkbride plan, St. Elizabeths Hospital in Washington, D.C. is further explained and analysed. When this was compared with contemporary scientific theories on evidence-based design and the salutogenic model, a number of forgotten matters were distinguished. With the following forgotten matters, contemporary mental healthcare architecture can be given an impulse to reduce the stress of patients:

- Hide security measurements as much as possible to reassure patients and make them feel at home.
- Make sure that the mental institutions are not located in a city but close to it, which has been done perfectly in the Meander Medisch Centrum for example. Take into account urban growth and the like, that is to say that this is also an urban development issue.
- Make use of a smart and safe materialization, materials must be joined in an inseparable and hidden way.
- Use a main volume to accommodate all communal amenities as is done in Antes Psychiatrisch Centrum.
- Visually accentuate this main volume in both the exterior and interior, which in turn is done in Radboudumc by making the amenities more open for instance.
- Give not only the interior, but also the exterior a domestic appearance which is done in all three contemporary Dutch facilities.
- Create small communities in the psychiatric institutions.
- Keep the indoor climate at a pleasant humidity level, although this is already required today by building regulations.

Besides these forgotten matters, the similarities between Kirkbride and scientific research should not be forgotten when designing a psychiatric institution that reduces stress among patients through architecture. These following similarities show the timelessness of Kirkbride's innovative thinking:

- The possible growth of the psychiatric hospital must be considered to prevent it from becoming overcrowded, for instance by making the construction strong enough for an extra floor, such as done in Meander Medisch Centrum.
- The location of the institute to be in a natural environment like Meander Medisch Centrum is.

- Give extra attention to lighting, but also to the entry of daylight and sunlight should be emphasized. A great example of this can be taken from the Radboudumc.
- Differentiate functions by means of material, colour and texture in both the interior (Meander) and the exterior (Antes).
- Ambiguity must be avoided throughout the psychiatric facility.
- Have a clear structure and routing with landmarks as in the Radboudumc.
- Patients must have the ability to influence the comfort in their rooms, through temperature, shading, lighting and ventilation.
- The number of interactions a patient can have at the same time should be kept low.
- The implementation of therapeutic gardens can help patients to give value to their lives, as in Radboudumc.

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Boschma offers an in-depth insight into the history of mental health care and its development in the late 19th and early 20th century in the Netherlands. Mental health care was changing significantly at this time and this was due to the fact that psychiatry in the Netherlands was increasingly seen as a scientific field. Boschma therefore investigates the relationships between the more scientific attitude towards psychiatry and the changes in mental health care. Although the architecture of mental health care institutions only makes a small contribution to this book, it does provide a good insight into the way people in these periods thought about mental health care and what ideas they had for improving it. By having a good picture of the 'zeitgeist' of the past, certain design choices that were made at the time can be better explained and re-evaluated in order to possibly be reused in contemporary hospitals.

Bruegmann, R. (1978). Central Heating and Forced Ventilation: Origins and Effects on Architectural Design. *Journal of the Society of Architectural Historians*, 37(3), 143-160. doi:10.2307/989206

Connellan, K., Gaardboe, M., Riggs, D., Due, C., Reinschmidt, A., & Mustillo, L. (2013). Stressed Spaces: Mental Health and Architecture. *HERD: Health Environments Research & Design Journal*, 6(4), 127-168.

This literature review has attempted to bring together all contemporary knowledge regarding the positive influence of architecture on patients in mental health care in one clear overview. Because the literature research is based on various (many) scientific studies on this subject, it is also a scientific study itself. Furthermore, the researchers identified 13 different themes (architectural) that could influence mental health care patients in a positive way. With this source, current knowledge from the field can be compared with the design strategies and choices of the case studies from history. In this way, architectural designs from the past can be re-evaluated and possibly add to current knowledge in the form of an example from the past that has been lost sight of. In summary, this source therefore acts as an anchor in the present to compare historical research with and these may perhaps complement each other.

Copijn. (n.d.). *THERAPIETUINEN RADBOUDUMC*. Retrieved April 16, 2021, from Copijn: <https://www.copijn.nl/projecten/therapietuinen-radboudumc/>

Corrigan, P. W. (2002). Empowerment and Serious Mental Illness: Treatment Partnerships and Community Opportunities. *Psychiatric Quarterly*, 217-228. doi:10.1023/a:1016040805432

EGM architecten. (n.d.). *PSYCHIATRISCH CENTRUM, SPIJKENISSE*. Retrieved April 11, 2021, from EGM architecten: <https://egm.nl/architecten/projecten/delta-psychiatrisch-centrum/138>

EGM architecten. (n.d.). *RADBOUDUMC KLINIEK PSYCHIATRIE*. Retrieved April 17, 2021, from EGM architecten: <https://www.egm.nl/architecten/projecten/radboudumc-kliniek-psychiatrie/342>

Ford, M., Itle, K., & Penich, T. (1933). *HHH Collections Management Database v8.0*. Library of Congress. Washington D.C.: HISTORIC AMERICAN BUILDINGS SURVEY . Retrieved from <https://www.loc.gov/item/dc1099/>

Foucault, M. (1961). *Madness and Civilization*. Librairie Plon: Vintage.

Golembiewski, J. (2010, March 2). Start making sense: Applying a salutogenic model to architectural design for psychiatric care. *Facilities*, 100-117. doi:10.1108/02632771011023096

This paper examines the influence an architect can have on the mental health of users through design as well. This influence of architects and their design is examined by means of the salutogenic model, a medical model that aims to stimulate factors that positively influence health and well-being rather than just looking at causes of disease. In this model people are not divided into sick and healthy, but someone's health is placed on a spectrum. By means of a number of concrete examples of architectural interventions it is shown how mental health can be increased in mental health care facilities. This source complements the literature search 'Stressed Spaces' by providing more concrete examples, and the design strategies presented in this source can be compared to the St. Elizabeths Hospital in Washington.

Grob, G. N. (1983). *Mental Illness and American Society, 1875-1940*. Princeton: Princeton University Press. doi:10.2307/j.ctvct00bz

Hamilton, D., & Watkins, D. H. (2008). *Evidence-Based Design for Multiple Building Types*. Hoboken: John Wiley & Sons.

Joseph, A. (2006). *The Impact of Light on Outcomes in Healthcare Settings*. Concord: The Center for Health Design.

Kirkbride, T. S. (1880). *On the construction, organization, and general arrangements of hospitals for the insane* (2e ed.). Philadelphia, United States: J. B. Lippincott & Co. Retrieved January 12, 2021

This book describes the views of Dr. Thomas S. Kirkbride on the treatment of psychiatric patients. Kirkbride was a physician and a great proponent of the principles of enlightenment as well and therefore tried to heal his patients (mental health patients) in a rational way, including through architectural design. In Kirkbride's book he describes in great detail how a mental health facility should be designed and operated. Although the book is not a scientific study, it does present the views of a professional field expert from the past and thus also an insight into the history of mental health care. In addition, the detailed description of Kirkbride provides a clear picture of how mental health institutions (in the United States) were built in the late 19th century. Finally, this book is ideally suited for use in analysing the case study that was part of the Kirkbride Plan (St. Elizabeth's Hospital in Washington).

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APPENDIX

Table 2: Different principles/theories for designing a mental healthcare institution side by side (Rik Sijbrandij)

	KIRKBRIDE'S DESIGN PRINCIPLES	EVIDENCE-BASED DESIGN	SALUTOGENIC MODEL
Safety	don't let the hospital get overcrowded (do not deviate from the prescribed numbers of patients and staff (see figure 10)) + wooden floors should be nailed down invisibly + use window guards and wired glass	don't let the hospital get overcrowded	don't let the hospital get overcrowded
Privacy	neighbouring residents must not be able to agitate the patients + use single bed rooms	use single bed rooms	-
Control	all security measures should be hidden in order to keep a sense of freedom + separate people based on gender, race, and class (stage of disease)	don't let the hospital get overcrowded + separate people based on gender and class (this is a debatable subject although supported by this theory)	avoid ambiguity, things should be one thing + give patients as much control over their environment as safety allows for (i.e. a kitchenette)
Environment	the hospital should be in a natural environment as natural elements stimulate (but not over-stimulate) the patients + all rooms have a view of the natural environment + it should be close to a city for accessibility, but not in the city	the building is in a natural environment and all rooms have a view of this	the building is in a natural environment so the patients have a clear perception of scale
Sunlight	all rooms should have excess to sunlight	orient the hospital optimally to the (morning) sun for the benefit of the circadian system	-
Daylight	all rooms should have excess to daylight	all rooms should have excess to daylight	-
Lighting	a well-lit building is seen as remedial	all rooms should have significant lighting	-
Materiality	the main entrance is accentuated + the exterior should look domestic (humane) + use cavity walls to prevent damp walls + tightly plastered walls	-	use different textured/materialised surfaces to clearly distinguish objects (wall, door, etc.) + make use of natural materials (wood, stone, etc.), avoid modernistic sterile white spaces
Functions	the main entrance is accentuated + the main building contained the amenities and the wings contained the sleeping quarters (clear function separation)	one distinct function per room, visually different through colour, material or lighting	avoid ambiguity + provide a space for social meetings with family/friends
Routing	clear, readable and linear routing + use landmarks for recognition	clear, readable routing + use landmarks for recognition + make use of recognisable signs (wheelchair users eye level)	based on a clear and structured grid (readable)
Proportions	-	-	spaces should be kept relatively small with comfortable proportions + based on a clear and structured grid
Comfort	rooms have nice (quiet, but not completely silent) acoustics + rooms are at room temperature + the humidity is kept at a pleasant level + there must be sufficient (natural & mechanical) ventilation	mask bad smells + rooms have nice (quiet, but not completely silent) acoustics + rooms are at room temperature + planting in rooms is recommended	extremely stimulating influences should be avoided (i.e. traffic noise)
Adaptability	at building level there should be adjustable heating + windows have self-regulating shutters or awnings	-	patient rooms, if safe, could have opening windows and self-regulating heating
Interactions	neighbouring residents must not be able to agitate the patients + the building is organized as a family, a community life	-	keep the number of interactions patients have at the same time low (i.e. by making spaces small)
Interior	the interior should be domestic	the interior should be domestic + use of art is recommended	the interior should be domestic + use of different size furniture so the patients have a clear perception of scale
Gardens	separated gardens per gender for sports / relaxation	implement (therapeutical) gardens	gardens can give patients meaning

Similarities – Discrepancies – Forgotten matters