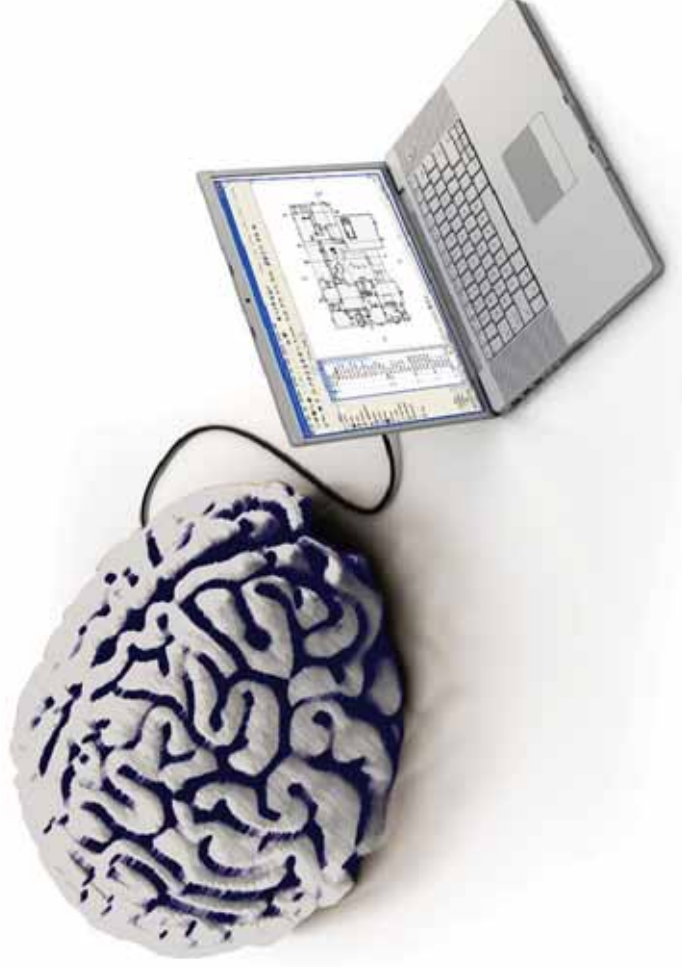


Neuro-architecture

Enriching healthcare environments for children

part I. research



Master thesis by Cagil Kayan Examiner: Peter Fröst , Chalmers Architecture, MPARC
Presented at May 24th, 2011



Master thesis project of **Cagil Kayan**
Chalmers .VT2011

Neuro-architecture: Enriching healthcare environments for Children
Examiner: **Peter Fröst**



I would like to thank to :

My family for always believing and supporting me making me feel
near

Anders for all his endless professional and emotional support and
especially for his patience during my stressed study periods

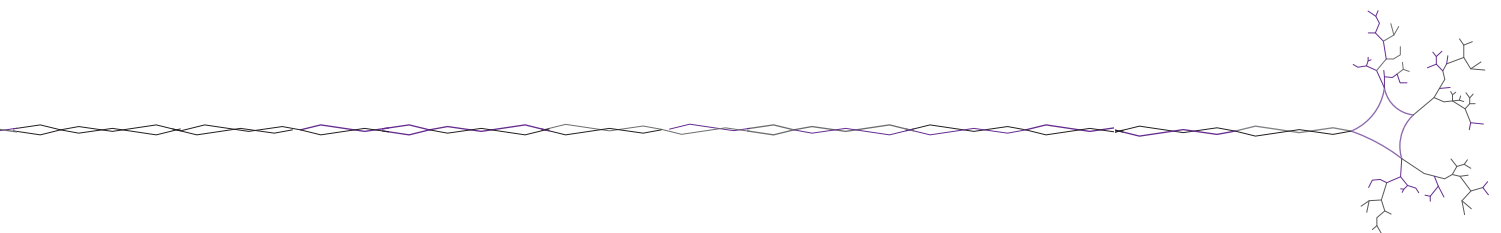
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[5. Design applications with neuroscience & architecture]

Index for 5. chapter follows in the "thesis part 11."

Glossary

Cognitive science:	Study of how information concerning faculties such as perception, language, reasoning and emotion is presented and transformed in a nervous system
Cognitive learning:	Acquisition of knowledge and skill by mental or cognitive processes. Simply product of our perception by listening, watching, touching or experiencing.
Environmental psychology:	Studies relationship between environments and human behavior exploring such dissimilar issues as common property resource management, wayfinding in complex settings. the effect of environmental stress on human performance
Hard wired:	If an ability, approach, or type of activity is hard-wired into the brain, it is a basic one and cannot be changed. Neurologically based factor, the neural connectors primarily formed during gestation, similar to the hard wiring of a computer
Hippocampus:	associated with long term memory- where memory is designed- it doesn't store the memory, but builds it up. declarative memory. memory problems are related with this part
Neuroscience:	studies the nervous system includes brain, spinal cord, sensory nerve cells, advancing the understanding of human thought, emotion, and behaviors.
Post occupancy:	The post occupant research is based on interviews or reports after the building is used to serve its duty. Evidence based design usually studies the post occupancy tests, comparing the numbers and reports of previous condition and the improved one.
Stroke:	Brain damage, rapidly developing loss of brain functions due to the disturbance in the blood supply. Affected area of the brain is unable to function, leading to inability to move one or more limbs on one side of the body, inability to understand or formulate speech, or an inability to see side of the visual field.

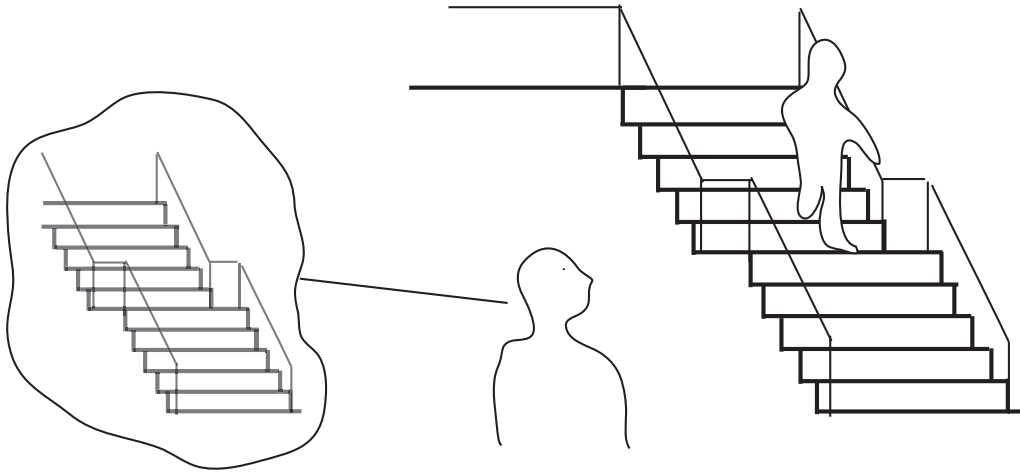
Introduction

...For my thesis project, I wanted to research deeply on a subject that has an interdisciplinary connection to architecture, using the chance of sparing extended time on research while I am still studying, and getting specialized information that can be beneficial for architectural knowledge.

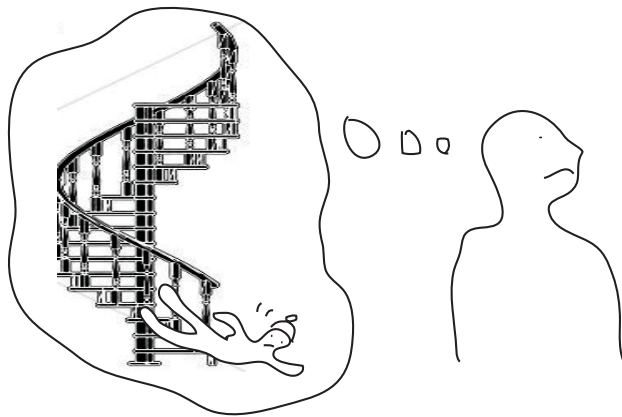
I was interested on how architecture affects on us, and Peter Fröst, my examiner, suggested me about the new emerging field in architecture, called "Neuroarchitecture". It is rather a new subject, which means that I will be researching and also connecting relevant information from neuroscience to apply on architecture and filter then for healthcare environments for children.

During my research I thought the thesis can be more interesting, -concrete- if I can show some applications. After I met Stefan Lundin, and he offered me to study on new children's hospital, being designed by White architects. Being part of a real project, gave a more realistic approach to my thesis. I learnt a lot during the process, and I tried to sum up what I gained in this thesis report.

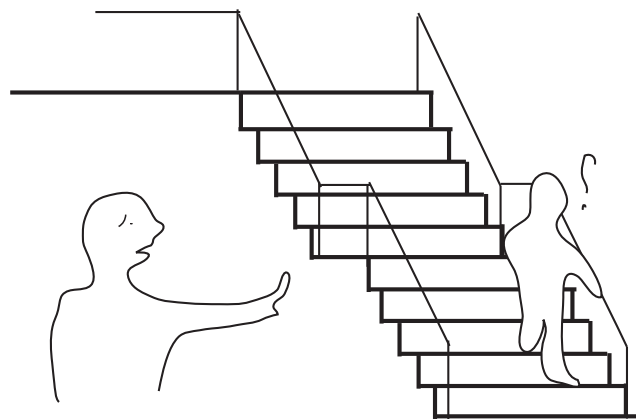
1.Introduction



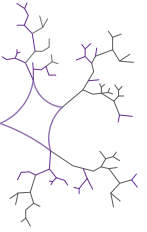
.Perceiving image



.Recalling memory



.Behavior



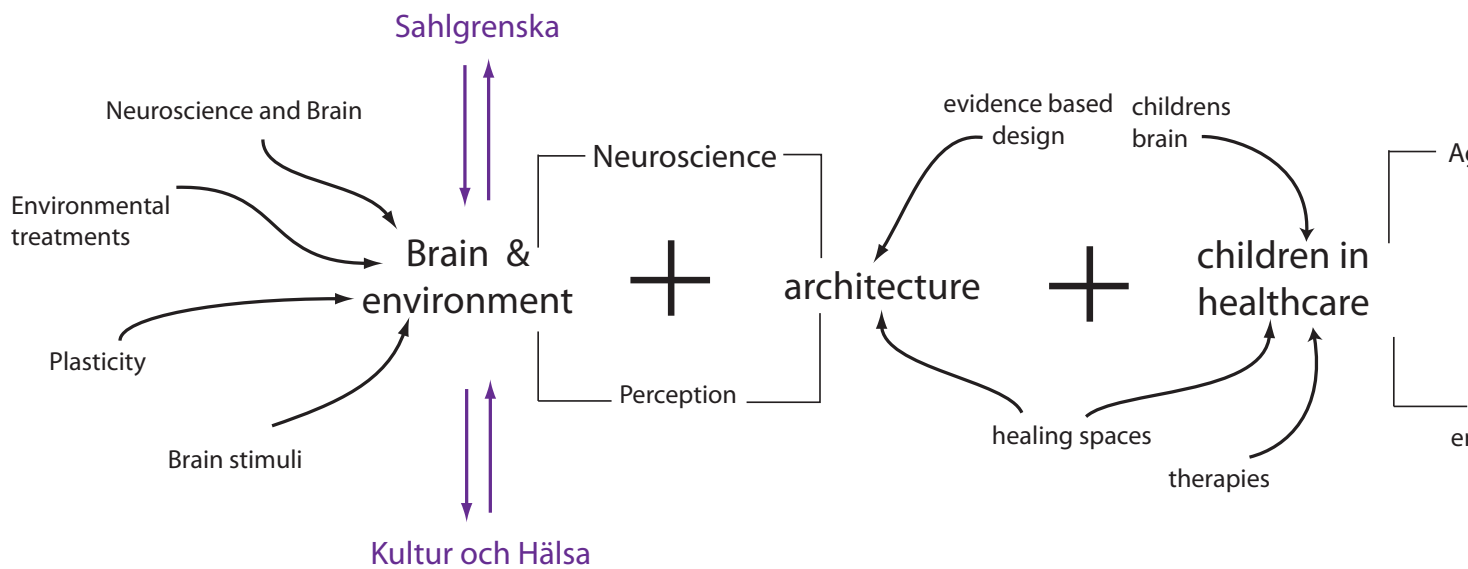
We live with perception: Perceiving our surroundings with our senses we learn the environment. Not only we form an image, we form memories with them, we sense dimensions with echoes, we feel the dampness with smell, we see light/shadow... In other words, we learn with memories, we recall them, we behave with them.

What we come across in our environments eventually affect our behaviors. Perception stimulates the brain with every image stored in our memories. Architects are aware of, how the built environments affect our behaviors and senses and they take this cause-effect relationship into consideration when they are designing. However the question “how?” is something which architects need other professions help to answer.

Architecture and neuroscience were two disparate disciplines until it was found that brain was continuously remodeled by the environments we are living in. The collaboration finds a platform on health care, study and work environments. Focusing on healing environments, a well designed built environment with principles of neuroscience, reduces patient stay, and even plays a part in treatment such as retrieving old memory or brain stimuli. These principles gets specialized when the target group is children. Children differ from adults in many ways, for memories, dimensions, concentration, learning abilities... Brain related situations requires more attention, therefore design is modelled considering desired or undesired behaviors.

Neuroscientist studies behaviors and brain, and architects should use the inputs in design. Learning how our brain works with perception will lead to new developments on behalf of users in design. New treatments combined with architectural approaches gives children a pleasant stay, shortens the healing process, and even can be involved with environmental treatment. ■

keywords: neuroscience, children, brain, healthcare, environmental treatment, enrichment, perception



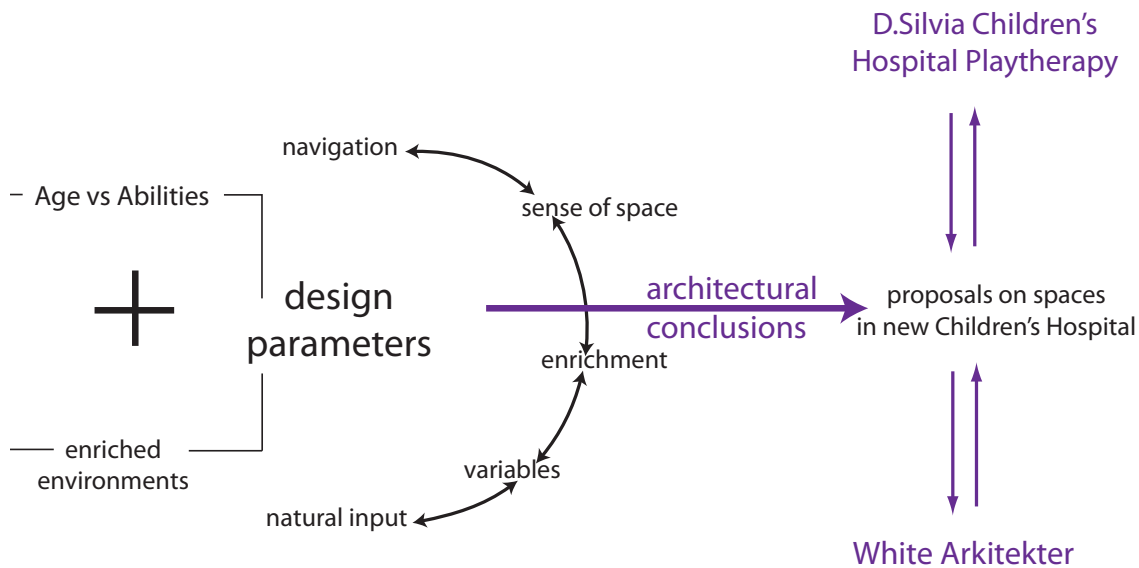
.Phase 1

- .Based on literature search
- .Searching and reviewing books and internet sites about neuroscience and brain stimuli to find relevant parts concerning perception and impact of environments
- .Interviewing with experts on field of brain stimuli, visiting Culture and Health

.Phase 2

- .Studies on mental states and environments.
- .Reviewing data about which qualities of environments affect our behaviors in which ways. Study visit to Östra Psychiatry, information on spaces
- .Relation with perception and behavior
- .Tables to visualize research

1.2 Thesis Formulation



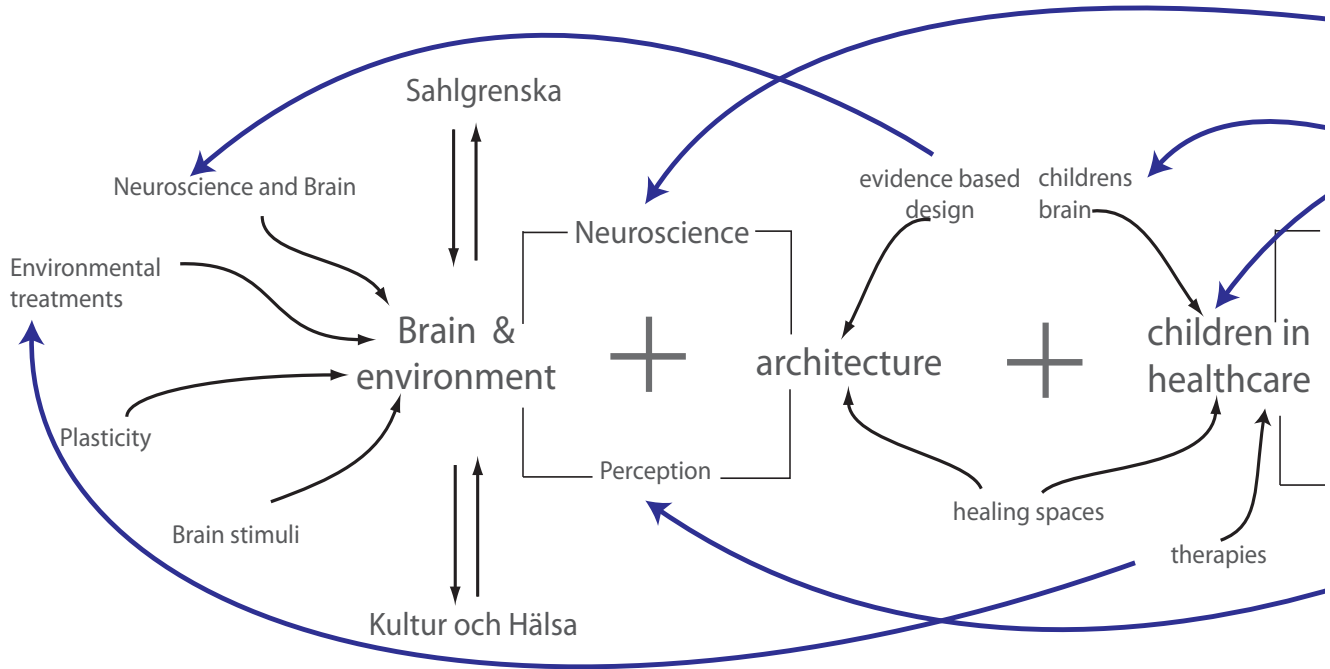
.Phase 3

.Connecting to architectural solutions
.Environment and mental state, how should it be designed to achieve desired behavior, or to avoid undesired mental state. Formulating design parameters for enriched environments. Architectural methods to improve treatments in healthcare.

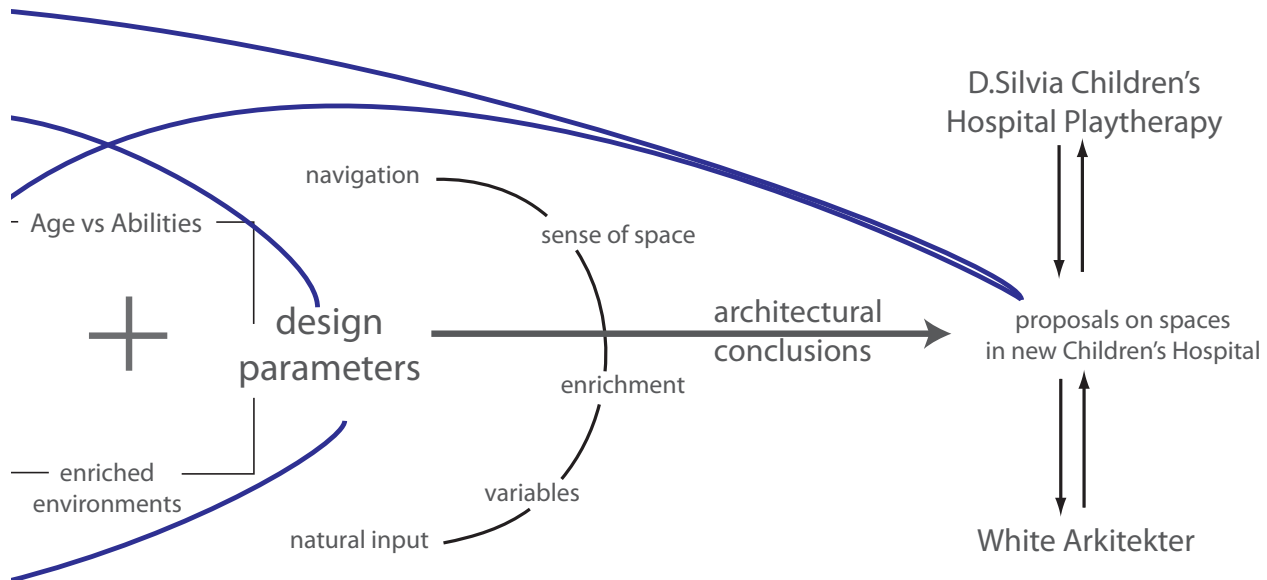
.Phase 4

.Architectural applications
.Interviewing therapist from Östra .observing children's behaviors in healthcare environments and therapies. .Applying the design parameters to new children's hospital, proposals on common spaces, therapy rooms, and connections.

1.2 Thesis Formulation



1.2.1 Loops



As always, research and application in design cannot have a successive order. Putting the research into application made me go back and forth to my previous researches, go deeper more, or change, or add to the information to be used in the design phase. Meeting the client (hospital) and working with architects (real project) brought other aspects, such as regulations, medical situation of patients or demands from staff. It was a challenge to adapt the research into program, to show how information from neuroscience can be applied to architecture in practice.

"As neuroscientists, we believe that the brain is the organ that controls behavior, that genes control the blueprint, but the environment can modulate the function of the genes, and ultimately the structure of our brain, but the environment can modulate the function of the genes, and ultimately the structure of our brain. Changes in the environment change the brain and therefore they change our behavior.

Architectural design changes our brain and our behavior."

Fred 'Rusty' Cage, neuroscientist, Salk Institute. AIA Convention 2003.

2.

Neuroscience and Architecture



2. Neuroscience and Architecture

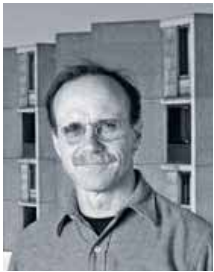


Peter Eriksson (1959-2007)

He was born in Gothenburg, and got his degree in medicine from University of Gothenburg with his parallel studies and researches on brain cells and nervous system. He got his specialization degree in Sahlgrenska university hospital on neurology in 1999 and became a professor of neurobiology and specialized in stem cells in 2001.

During 1990s with his interest on stem cells, he teamed up with Fred Gage in University of California to study with enriched environments and stem cells. In 1998 he established his breakthrough discovery showing that the human brain contains stem cells that can form new neurons. (which brings us to the topic of connection between enrichment environment and brain stimuli)

"We continue to identify stem cells and their genetic machinery of the human brain to understand better the mechanisms governing the recovery of stroke, Parkinson's disease, depression and multiple sclerosis," said Peter Eriksson.



Fred Gage

Fred H. Gage, Ph.D. is a professor in the Laboratory of Genetics at the Salk Institute in La Jolla, CA. Gage studies degeneration and regeneration in the central nervous system, with an eye on possible future treatments for devastating neurological damages resulting from disease or injury. He achieved national renown in 1998 for his groundbreaking experiments demonstrating that neurons are constantly being born in the adult brain, a process called neurogenesis.

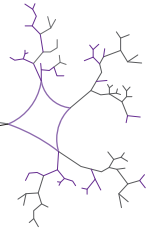
The study forced a paradigm shift in beliefs about how the brain functions. His data removed many barriers in neuroscience research, creating, virtually overnight, the possibility of brain repair. Gage is currently working to understand how new brain cells can be induced to become mature functioning nerve cells in the adult brain and spinal cord. He has shown that environmental enrichment and physical exercise can enhance the growth of these cells.

He is a fellow of the National Academy of Sciences, American Association for the Advancement of Science, American Academy of Arts and Sciences and the Institute of Medicine and has been president of the Society for Neuroscience.

1. <http://rsrt.org>

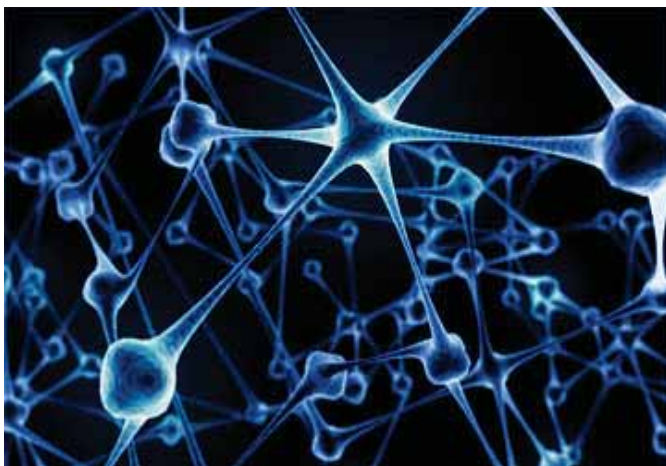
2. <http://www.sahlgrenska.gu.se>

3. <http://www.petererikssonstiftelsen.se/peter.html>



Earlier it was believed that our brain stops developing new neurons when we are early in our twenties. In 1998, Fred H. Gage (Salk Institute for Biological Studies) and Peter Eriksson (Sahlgrenska University Hospital) discovered and announced that the human brain produces new nerve cells in adulthood. Our brain is formed in the 3rd month of pregnancy, and after that grows remodeled by environments we are surrounded with.

Neuroscience explains the connection between environment and behaviors; from perception to impulse transportation and how neurons built up and store information in our brains.¹ When we learn all we ‘think’ and ‘feel’ are formed by our brain and nervous system, we realize the importance of our unique perception and impact of environments.



In order to understand the relation between neuroscience and architecture, we can start with our basic activities that we use our five senses to perceive the environments. Perception also involves with our navigation in space, and neuroscience explains on how physical environment affects our cognition, problem solving ability and moods. Understanding these principles can guide architects to design built environment serving better spatial orientation, reinforcing cognitive abilities and minimizing negative effect in emotions and motivation.

Neuro.architecture can be defined as built environment designed with principles of neuroscience, which establishes spaces that encourage memory, improve cognitive abilities, avoid stress and/or stimulate brain.

.1 Seeking common ground, Esther M. Sternberg, Mathew A. Wilson, Cell 127

.2 Brain Landscape, J.Eberhard,

.3 Introduction to Neuroscience, J.F. Stein with C.J. Stoodley, Wiley,

2.1 Emerging Field, merging fields



Engaging Architecture and Neuroscience

A section from the interview from Society for Neuroscience¹, 2003Fall, issue:

Why are architects and neuroscientists beginning to work together?

Eberhard: **Architecture has the most impact when the ideas used in building design reflect our understanding of how the brain reacts in different environments. Neuroscientists can help architects understand scientifically what have historically been intuitive observations.**

Gage: **Neuroscience has reached a point in its understanding of the brain and how it is influenced by the environment that neuroscientists can work with architects in their designs for environments that enable people to function at their fullest within those environments.**

2.1.1 Developments

John Eberhard is the director of research planning at the American Institute of Architects, and Fred Cage is professor of neuroscience in Salk Institute; basing on impact of built environment they found a platform to discuss and invest in develop architecture further.

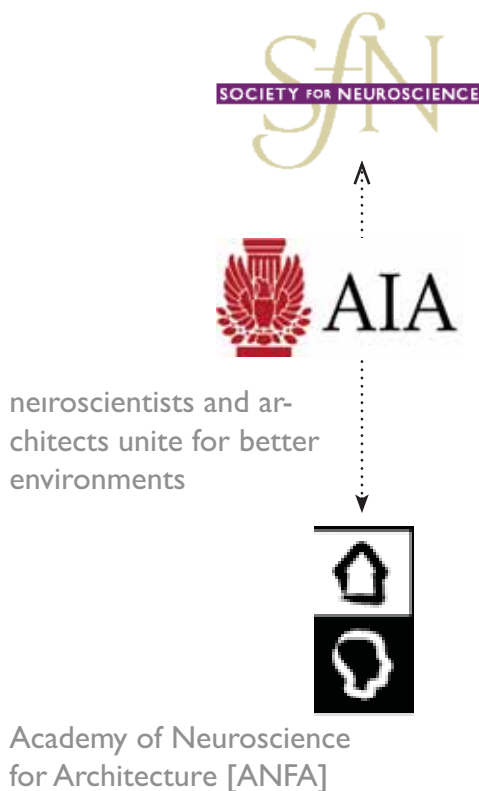
There are many examples that we no longer notice how innovations in other sciences have developed architecture. For example after steel was founded, we managed to build high rise buildings, design of theaters are getting more flexible with developments in acoustics. As for neuroscience, it is no longer a separate discipline for architecture after the discoveries of F.Cage and Peter Eriksson proving that our brain responds stimuli, therefore how built environment affects us.

2.2.1.1 ANFA

Academy of Neuroscience for Architecture was founded by San Diego chapter of American Institute of Architects in 2003, to establish the research to connect neuroscience and architecture.

The academy is supported by various architect unions, neuroscience laboratories and University of California. The academy runs education programs based on workshops for different environments, relating neuroscience and working on hypothesis. Education programs are engaged with researches on fundamental subjects in neuroscience such as way finding and enriched environments.

The academy runs education programs based on workshops for different environments, relating neuroscience and working on hypothesis. Education programs are engaged with researches on fundamental subjects in neuroscience such as way finding and enriched environments.



2.1 Merging Field

Role of architecture in our daily life sometimes surprises with its impact. Not only in healthcare, neuro. architecture is involved to any built environment used by humans. Especially spaces where use of brain activity is important, architects gain more responsibility with awareness of neuroscience.



Learning and School Environments

The field of application fields of neuroscience to architecture is extensive, from education to work environments and healthcare spaces. The discussion upon distraction and concentration in schools is a topic involving neuroscience. The methods used in research are based on hypothesis, testing the parameters in different school, seeing the effects of changing parameters keeping the other values stable.

As earlier it was assumed that having large windows we distracting children's attention, later after comparing the grades of students in schools with similar properties differing in window sizes, the perspective changed into as nature can stimulate learning abilities.¹

1. Academy of Neuroscience for architecture www.anfarch.org

2. Inquiry by Design, J. Zeisel

2.1.2 Application areas



Memory and Alzheimer, Elderly

Connection of architecture and stimulating memory brought new design approaches to environments of people with Alzheimer disease. The tendency of lose way with weak memory in the disease is caused by the damage in hippocampus (see: glossary).

Studying the common problems of the patients, architectural designs are suggested to form easily recognizable destinations. John Zeisel who is an architect studying sociology and researching on neuroscience-architecture, came up with another treatment approach of therapy gardens. Involving with plants aims to strengthen the memory of the patients making them suggest the time/seasons with environmental modifications.¹

Work environments and Salk Institute

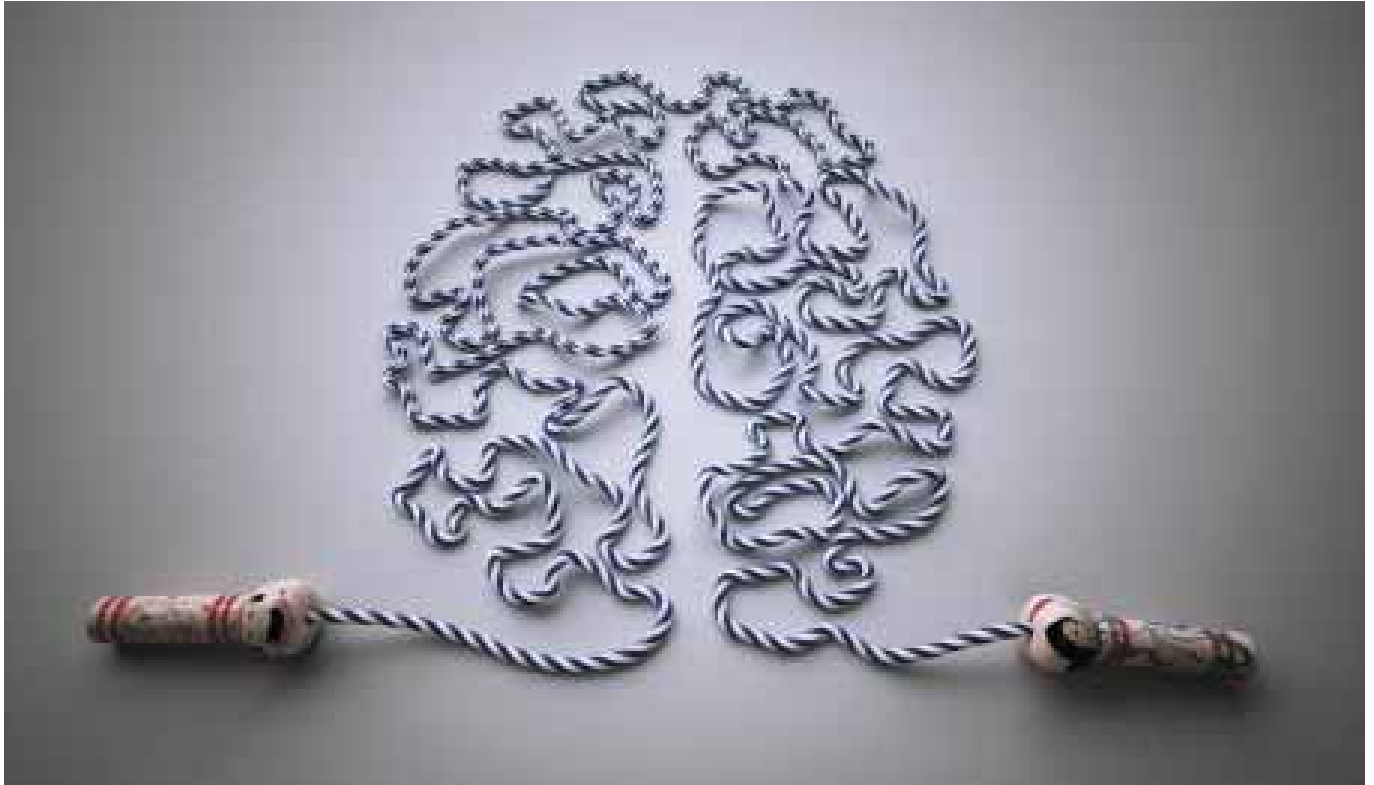
When it comes to work environments, the scope of the work is important to determine the architectural approach, yet it might differ if it needs more concentration or more abstract thinking.

One of the early examples of involving neuroscience in work environments was Salk Institute designed by the architect Louis Kahn.² Brainstorming together with Jonas Salk, they focused on how environmental design can lead to an effective research environment? Questions of aesthetics and functionality brought the solution of ultimate flexibility, where the scientists can decide upon how large space or teams they will work with, and which also encourages collaboration of employees in a unique open space.

1. *Inquiry by Design*, J. Zeisel

2. *Academy of Neuroscience for architecture* www.anfarch.org

2.2 Learning with Neuroscience



Although the very earliest and most basic development of the brain is genetically programmed, from about the third month of pregnancy and throughout the rest of life its structure is continuously remodeled by the environment.³

Brain plasticity:

Our age, spatial properties determines the level of interruption of environment, which is called brain plasticity. Earlier it was known that people were born with a number of brain cells, and the number was showing a decrease, or degrading throughout the life. Today, discovery of “brain plasticity” that brain responds stimulation.

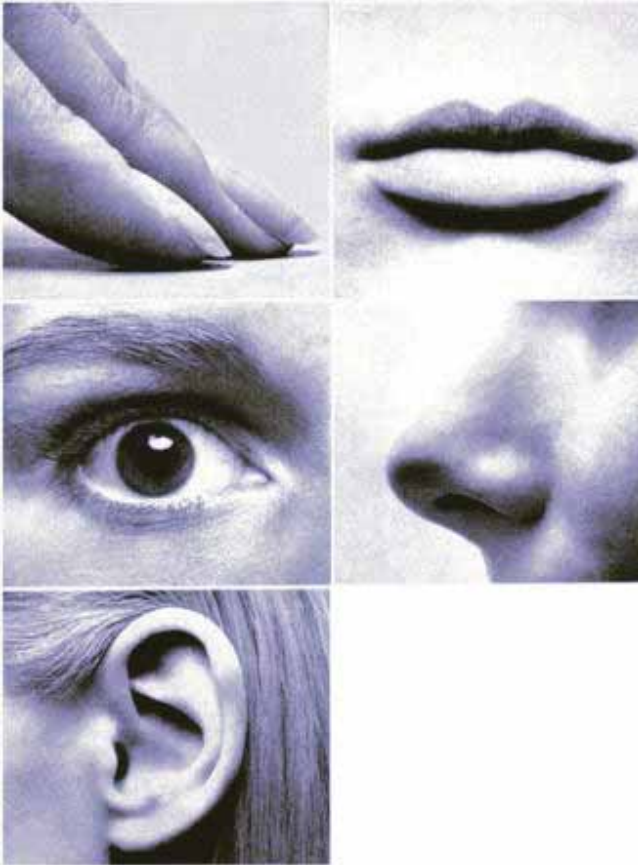
Gunnar Bjursell from Culture and Health describes as: The more you focus, the more your brain produces stem cells that develop into neurons. Plasticity of brain is increased by training of the brain. “Use it or lose it”.

.1 Kultur och Hälsa . University of Gothenburg

.2 Mapping the Mind, Rita Carter

.3 Inquiry by Design John Zeisel

2.2.1 Neuroscience and Perception



.Spatial Perception

Our perception changes while we move between different environments. The individual neurons responding to the sense of the place are more than our sensory organs, but more internally and may be referred as place neurons. As our spatial perception depends on strong sense of orientation, different environments relate to different pattern of neural activity¹.

Our understanding of the neural basis of spatial perception and memory has been advanced by recordings of neural activity within the hippocampus as rats explore an environment. Such studies reveal that individual neurons respond when the animals move to certain locations in that environment, with different patterns of neural activity corresponding to different locations.

Our perception changes while we move between different environments. The individual neurons responding to the sense of the place are more than our sensory organs, but more internally and may be referred as place neurons. As our spatial perception depends on strong sense of orientation, different environments relate to different pattern of neural activity. Therefore architectural elements stimulate different activities in our brains, while we perceive environments.²

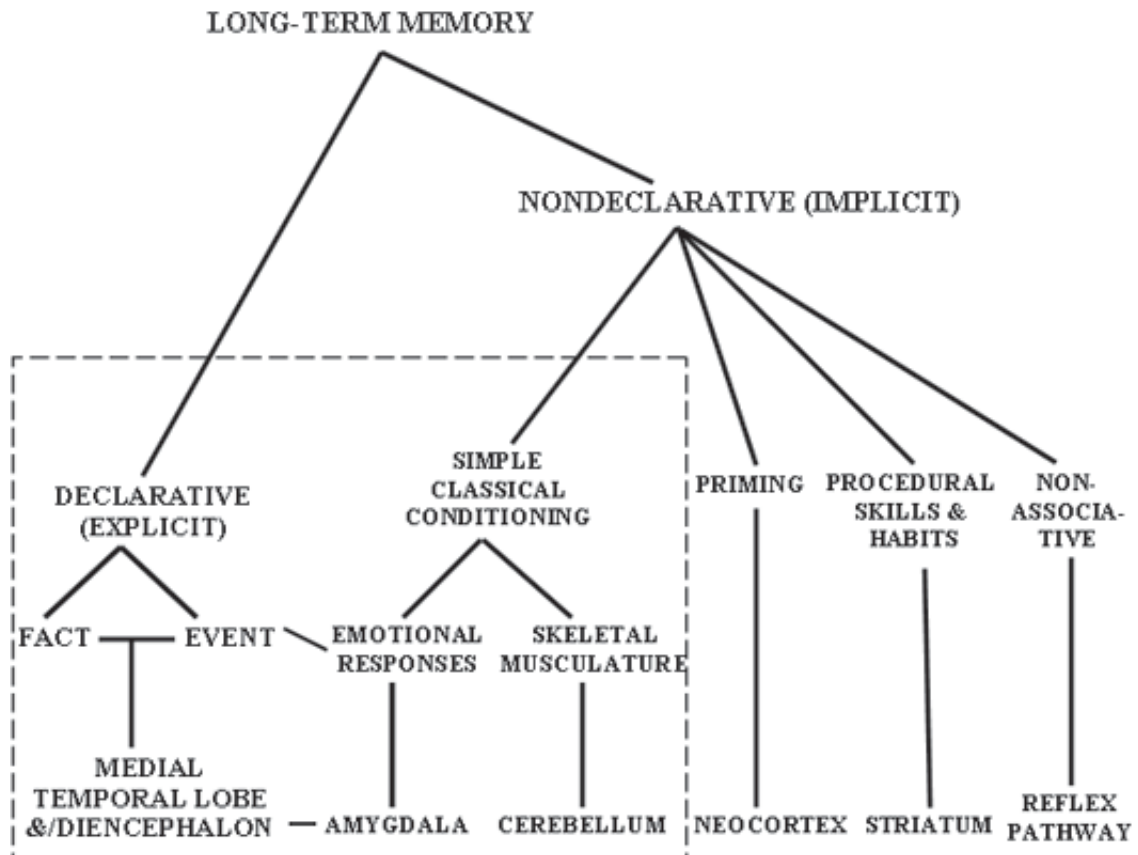
Haptic Sense:

Unlike neurons in sensory areas of the brain, these “place” neurons are not activated by any one type of stimulus, such as a visual feature, or a sound, or a smell, but rather by the combination of features that serve to define the animal’s internal sense of place (Nakazawa et al., 2004)². (Perhaps this is the neuroscience equivalent of what is known in architecture as the “haptic sense,” that is, an awareness of one’s surroundings.)

1. *Inquiry by Design* John Zeisel

2. Ester, Sternberg, *Neuroscience and Architecture: Seeking Common Ground*

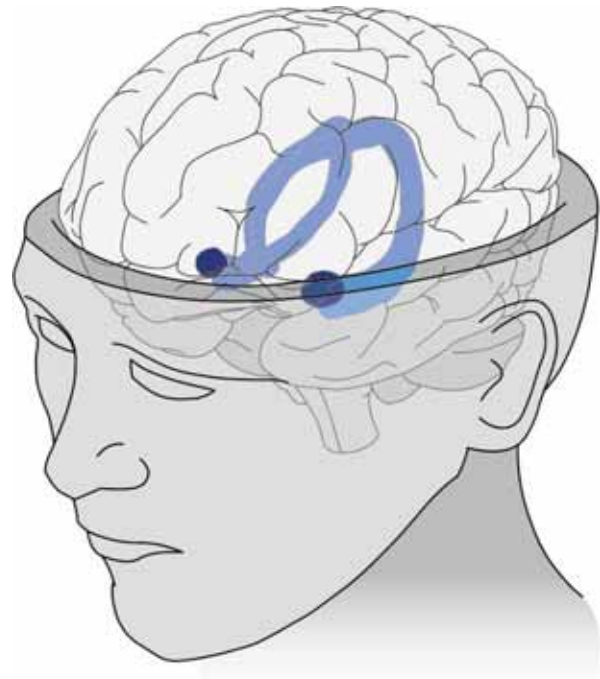
2.2 Learning with Neuroscience



. Hippocampus

Hippocampus is where the long term memory is formed but not stored. Hippocampus is also the same area where new cells are born all the time, and our environments determines the rate of the new cells.

Most of the activities of forming and recalling memories depend on the hippocampus for processing. Hippocampus is involved in laying down and retrieving memories, particularly personal ones and those related to finding your way about.¹ During the storage time which is about 2-3 years, hippocampus replays the experiences back up to the cortex until they are firmly established- so hippocampus is no longer needed for retrieval.



1. *Inquiry by Design* John Zeisel

2. Fuster, Joaquin M. *Memory in the Cerebral Cortex*

3. Squire, L.R.; *Memory systems of the brain: a brief history and current perspective. Neurobiology of Learning and Memory*

2.2.2 Environment and Memory



. How memory connects to architecture?

It all starts with a simple question: How do we use our brain in the buildings? We see them, we enter, we perceive the light and shadow, sound and echo, sense the material, see the geometry. We all perceive them with our sensory organs and note them to our brain, where our hippocampus will work on passing them to long term memory.

With the light of our memories the buildings gives us the “feeling” of what they reveal about their types and affect the way we behave. ¹ For example, we can never make a comment like “This school looks like a prison” if we haven’t seen a prison. From the functions, planning, materials and orientation of buildings, we build up our own database of perceptions.¹ The next step is that anything we perceive from built environment, our brain retrieves a memory, and that’s one way of how it affects our brains.

Memory and brain:

Long term memory is associated with many different areas of the brain including the hippocampus, amygdala, thalamus and hypothalamus, peripheral cortex and temporal cortex. The hippocampus and amygdala have been connected with transference of memory from short term memory to long term memory.² The thalamus is also related to reception of information and transferring the information, in the case of memories, to the cerebral cortex.

Consciousness

Consciousness begins as a feeling of what is happening to us when we see, hear, or touch an object.¹ Why it is important for our brain is that it is connected with memory and perception, since it resolves the interaction between perception and mapping the image, retrieving the earlier information.



2.3 Environment, brain and stimuli



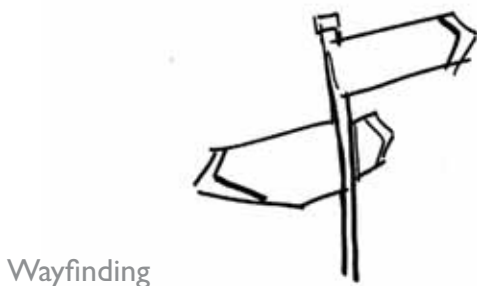
Departing from plasticity of our brain and impact of the environments we are living in, neuroscientists work with experiments on how people vary on responding to certain environments. Perception of environments have different meanings from person to person and depending on their ages, health condition or memories.

While we are responding to perceptions, our brains are continuously stimulated from what we sense. "Suppose an insect lands on your leg. Instantly the touch receptors on the affected leg fire a message that travels through your spinal column and up to your brain. There it crosses into the opposite hemisphere to alert brain cells at a particular spot on a sensory map of the body."¹

Considering the affect of environments on our brain and consequently on our behaviors, it is possible to involve the relationship in design research to achieve desired behaviors or avoiding undesired circumstances.

2.3.1 Environment/Behavior+Neuroscience

While environment-behavior was examined together, with the observation of brain influenced by environment, expanded the scope which now includes the concepts of place, personalization, territory and way finding.¹



.Place:

When space is evaluated to be defined as “place” and when it gains additional meaning for users, the term enters the research field of cognitive neuroscience.

Place neurons are dependent upon a strong sense of orientation within the environment, and different environments are associated with different patterns of neural activity. Because our sense of “place” may be defined by the activity of these neurons, understanding the factors that influence them may help to elucidate how we are impacted by architectural design elements.²

.Personalization:

Engaging oneself to a place, connects to memory cues

.Territory

: extension of familiar zone, where one feel safe. It is hard-wired for the brain.

.Wayfinding:

Mental and physical activities to find our way, linking place and territory. Humans tend to be more aware of the surroundings under eye

2.3 Environment, brain and stimuli



The experiment 1

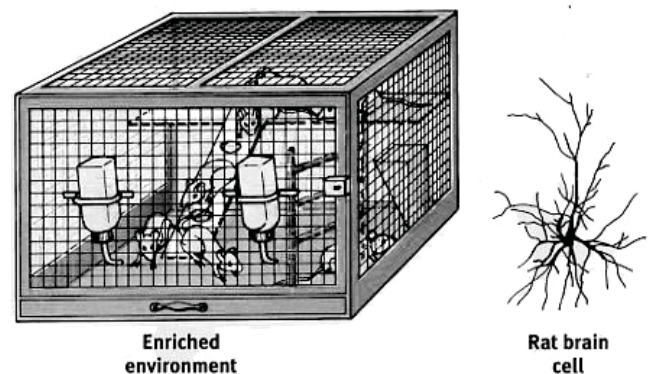
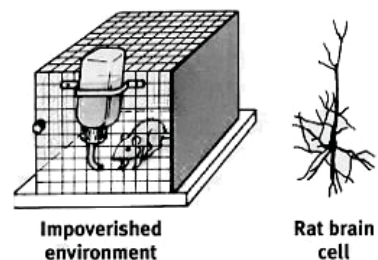
Thirty six rats were sorted into three experimental conditions using 12 animals in each group:

1) enriched 2) standard or 3) impoverished environments. All animals had free access to food and water and similar lighting conditions. For the enriched environment,

they were provided objects to explore and climb upon. The objects

were changed two to three times a week to provide newness and challenge; the frequent replacement of objects is an essential component of the enriched condition. For the standard environment, the animals were housed 3 to a small cage with no exploratory objects.

After 30 days in their respective environments, all animals were anesthetized before the brains were removed for comparison among the three groups. Results indicated clearly that the cortex from the enriched group had increased in thickness compared with that living in standard conditions, whereas, the brains from the impoverished group decreased compared to the standard.



2.3.2 Enriched environments



Long before the rat experiment the development of brain by outer sources was a question of scientists. A scientist called Spurzheim investigating if brain can grow with exercise concluded his question as: because the blood is carried in greater abundance to the parts which are excited and nutrition is performed by the blood.”

Brain stimuli and Environment

Brain stimuli with enriched environments has been proved with an experiment on rats kept in different environments. Changes in brain development (neuron production) between the rat kept in its regular cage and the rat which was taken to a living home of the scientist was measured. The rat which is kept at home, with an enriched environment got more brain cells- more intelligent.

In response to appropriate stimuli the brain creates an urge that demands to be satisfied.² It can be also other way around, a negative stimuli such as departing from territory, will give a feeling of emptiness. Yet in both cases result is the same, it triggers action. Environmental installations stimulates our brain, stimulating it perceive, think, understand and write or connect to memories, which makes the brain vitalize, and develop new neurons.

2.3 Environment, brain and stimuli

The scientific studies proves the link between brain health and stimuli of our senses. As art, music and enriched environments stimulates our brain. It gives inspiration and motivation to move, to hear and stimulates the brain.

Centre for Culture and Health [Kultur och Hälsa]

.Purpose of the center

The aim of Center for Culture and Health is to collect information on new researches about brain stimuli and spread the information to be used in health care. They work with interdisciplinary research groups to develop methodologies involving culture for brain excersices.



2.3.3 Alternative methods for brain stimuli



Culture, brain, and other interactions

.Art and Brain

Pictures and paintings have the similar effect to improve the memory. Museum of modern arts and University of New York works together.

Music reveals emotions and memory which makes people “think”. Music memory is a genetic heritage. Music has a reward system in the brain, and brain releases dopamine, which makes you happy. It is the reason why music is used in therapies.

.Stimuli after stroke

Enriched environment is affective on brain strokes at any level, as long as the person is alive. Brain recovers itself. Even on patients that are diagnoses as brain dead, can respond brain stimuli. Rehabilitation of stroke is generally treated medically than rest is given. However after resting, the exercises are only on improving the healthy part. Although the best approach is to start stimulation from the first day, it is still not spread in practice.

.Stress, stimuli and socialization

Stress until some limit is needed for brain stimuli, because it helps to give snap cells to the neurons. In order to avoid raising the stress, the brain should be periodically rested.

Humans are social animals. If the patient is with someone, his attention is distracted and doesn't feel pain. Music works the same for distraction.

2.4 Research Methods Connected to Neuroscience



Involving [relating to] end user in design

Research methods in design can involve different studies, such as searching through literature, existing buildings, post occupancy observations or interviews with the users. A successful design brings all the research methods together and combines them in design.

Observations may vary upon post occupancy tests of existing buildings, or investigating through building, studying physical traces and observing how the spaces are actually used.

Collaborating with the user is important for evaluating users needs, analyzing the problems of the users from their previous experiences or current status, and questioning the needs for the new progress. In addition to workshops with staff it can be practical if patients and visitors view is also taken into consideration.

For children's healthcare, the negative effect of hospital spaces are aimed to reduce by creating atmospheres that are not recalling the traditional hospital atmosphere. For a new project of children's hospital in USA, children and families are interviewed about how do they feel and what hospital represents for them. The result of the research showed that hospital means "transformation" for children, and the new concept was designed with abstract transformation themes which distracts their attention from their process in the hospital.

2.4.1 Evidence Based Design



Architectural design in larger scales have to stand on proved studies. Standards for healthcare design, can be supported by other investigation based on statistics of outcomes of different hospitals. Evidence based design is a method using credible data based on detailed studies on hospitals.

Evidence based design (EBD) is based on studies linking the physical environments of hospitals to health outcomes of the patients. It is an approach used in healthcare improving the wellbeing of both patients and staff, healing process, stress and safety.

Research group conducted by Roger Ulrich measured the efficiency by evaluating duration of patient stay, amount of accidents occurring in hospital, time spent with orientation in the building, privacy, satisfaction of patients and visitor, and efficiency of staff.

The research has a very wide scale, concerning both medical and patients, investigating deeply on parts of spaces, facilities, equipment they are using, or the variables (sound, light) that affect their work or healing.

. Post Occupancy:

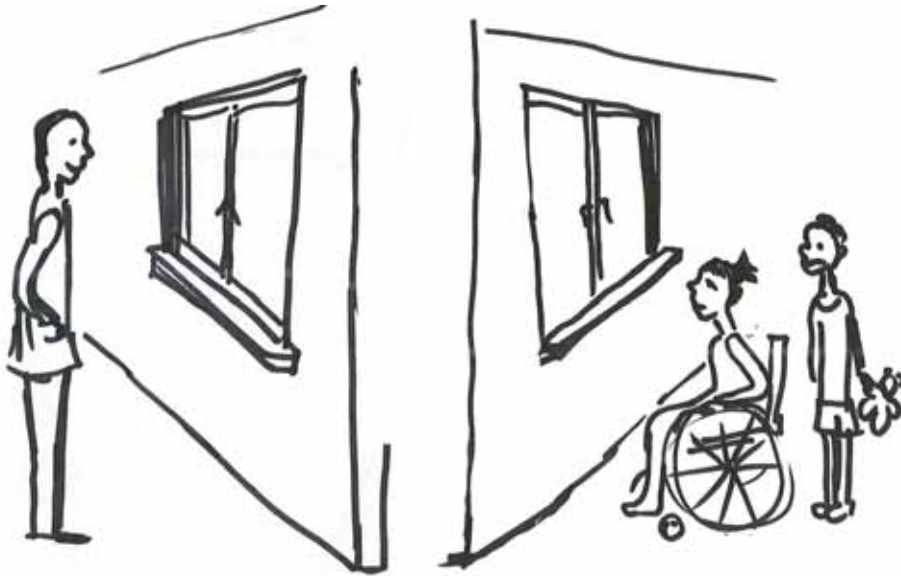
The post occupant research is based on interviews or reports after the building is used to serve its duty. Evidence based design usually studies the post occupancy tests, comparing the numbers and reports of previous condition and the improved one.

A good healthcare environment for children should enable to navigate for some activities alone, encourage children to use their abilities, and make them feel safe as home.

Healthcare environments for children



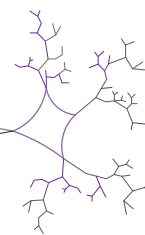
3. Healthcare environments for children



Physical differences

Children are smaller in size than adults. While furniture sizes are adapted for children, the architectural dimensions are also to be considered in design.

- shorter steps > longer distances > hesitation
(also affects wayfinding)
- high window sills > disable the visual contact



Buildings we are using in daily life are planned for the use of adults, such as orientation of functions, circulations, distances and dimensions.

Children are mostly expected to be guided by adults and also not expected to use all the functions. When we think of a child staying in a hospital, there are some facts that make them more sensitive than adults. For example a child who is detached from home environment, sometimes away from parents, not able to continue school, therefore away from friends and education, cannot play properly and going through a painful situation. A good healthcare environment for children should enable to navigate for some activities alone, encourage children to use their abilities, and make them feel safe as home.

Many design concepts intend to include more colors or cartoon images to adapt environments for children. Although some of these elements are important for distraction, children also require special planning for their circulation, needs for relaxation and privacy.



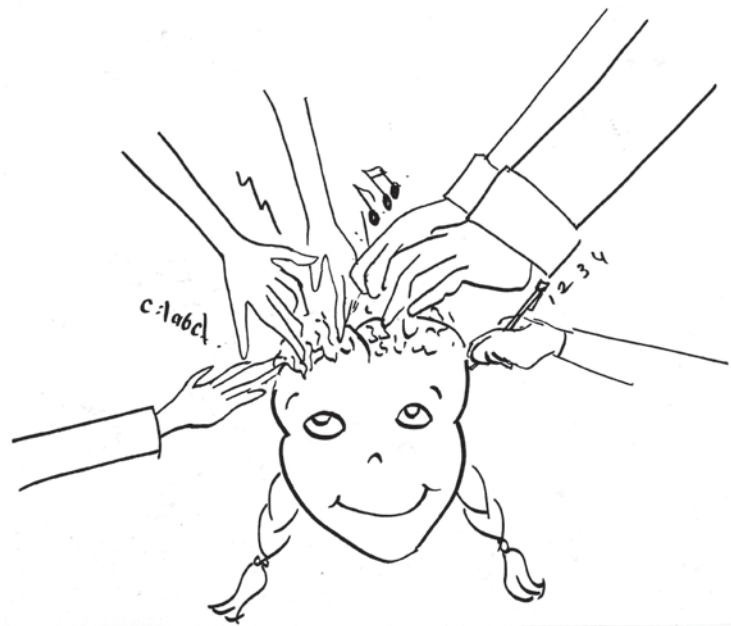
Evalina children's hospital

3.1 Designing for children

3.1.1 Planning, Circulation

Children differ from adults in perceiving environments. The difference comes from the limited experience they have, the scale of their bodies and memories.

Children intend to experience their surroundings to learn, through their senses. Since they are significantly smaller than adults, they take more time to reach to certain points. This also makes them more aware to environment, and more open to influences.



.Plasticity vs. Memory

When our brains continue remodeling by our environments, the amount of impact is determined by the plasticity of our brains. Children have a greater plasticity compared to adults, which makes them more open to stimuli. While plasticity gives the children a high ability to adapt themselves to new environment and use their capacities, there are also some functions that children are lacking due to their age; such as memory and experience.

When I asked about how environments affect children compared to adults, to Michael Nilsson, Professor of Neurology in Sahlgrenska, he replied that it is proportional with plasticity; “Take the plasticity of adults and multiply it with four or more”. Smallest changes in the environment can have a greater effect in children, and we can use it in a positive way in the design.

3.1.2 Children's Perception



While children navigate in the buildings, it is also important to make them remember the routes themselves. Spaces, corners, directions can be designed to attract their attention so they will recall the images easily.

Memory and connections

Memory of space is the link connecting us to the place. When we are connected, we know the directions and feel comfortable when we navigate. Children with limited collection of memories fail to connect places to each other. They have difficulties in finding their way or remembering the routes alone.

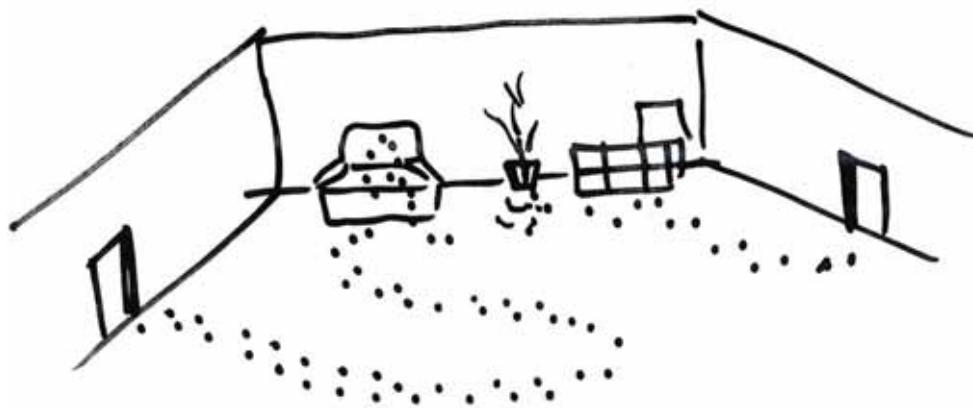
Therefore spaces designed for children should be easily read and understood by children. Children's physical participation with the architectural features and natural landscape elements extend to satisfaction and the experience stay in their memory¹.

Once children store the data, they tend to remember better, since they don't confuse it with other information.*

3.2 Children's healthcare



Adult circulation



Children and extended circulation

Enabling motor skills:

A hospital indoor environment limits children to practice different motoric and sensorial activities (they are object to treatments and mentally or physically they are limited). Allowing the child to move more has a positive impact on brain activity and motor skills.

3.2.1 Neurologic needs for children's healthcare





A children's healthcare, in addition to medical treatments are usually supported by environmental therapies, such as interacting with other children, socializing, or improving their skills thorough plays and enriched spaces. In order to have an efficient therapy, the spaces should enable concentration, relaxation and disable stress, Therefore environment should provide appropriate light, acoustics, volume, way finding, needs for privacy and relaxation while avoiding stress.



At a cognitive level, both acute and chronic stress are known to be associated with impaired problem solving ability and increased error rates in decision making.¹ Chronic activation of the stress response is also associated with suppressed immune responses resulting in health effects such as prolonged wound healing, a decreased antibody response to vaccination, and increased severity and frequency of viral infection (Sternberg, 2006).

3.2 Children's Healthcare

common mental disorders in children	Traumatic brain injuries (TBI)	Attention-deficit/hyperactivity disorder
Neurologic condition	caused by an external physical force, resulting in total or partial functional disability or psychosocial impairment , or both, that adversely affects a child's educational performance;	easily distracted , forgetful about daily activities, dislikes activities that require sitting still, tendency to daydream
Behaviors	such as cognition; language; memory ; attention; reasoning; abstract thinking; judgement; problem-solving ; sensory, perceptual, and motor abilities ; psychosocial behavior; physical functions; information processing; and speech.	Hyperactivity: does not stay seated as expected, difficulty playing quietly, in motion, restlessness
Treatment methods	Acute stage: ensuring proper oxygen supply, maintaining adequate cerebral blood flow, and controlling raised intracranial pressure., neuroimaging, surgery.. Chronic stage: Rehabilitation, Treatment of neuropsychiatric symptoms such as emotional distress and clinical depression may involve mental health professionals such as therapists, psychologists, and psychiatrists, while neuropsychologists can help to evaluate and manage cognitive deficits	Cognitive behavioral therapy (Psychotherapy to teach a person to think about his motivations before he acts.) Art therapy, music, or dancing helps to calm down and focus better , Biofeedback (focus by training him, to control his body's responses to stress,)
Environmental treatments	To maximize the effectiveness of rehabilitation therapies after stroke, it is critical to determine how the brain responds to different types of stimuli . Enriched Environments has profound effects that can be utilized to develop and improve cognitive abilities or to resist the negative consequences of different types of stressors.	changing the environment to reinforce (increase) desirable behaviors while punishing (diminishing) undesirable behaviors. Set up the environment to support the child's efforts (e.g., minimize distractions)
Architectural reflection	 .Visual enrichment (bright colors, shapes), memories (pictures), easy .wayfinding , social interaction spaces (efficient spaces for visitor meeting), use of art (good lighting) music (clear acoustics)	 .calm design .allowing small changes in the rooms .avoid distraction .opening to nature

<http://www.braininjury.com/children.html>

http://www.mentalhelp.net/poc/view_doc.php?type=doc&id=13866&cn=3

http://www.keepkidshealthy.com/welcome/conditions/anxiety_disorders.html

3.2.1 Neurologic needs for children's healthcare

Learning and communication disorder

may include **difficulty in following directions**, attending to a conversation, pronouncing words, perceiving what was said, expressing oneself, reading, spelling.
Difficulties with speech may include being unintelligible due to a motor problem or due to **poor learning**.

Speech Therapy to help children learn new vocabulary, organize their thoughts and beliefs. Behavior Therapy to increase children's use of **desirable communication behaviors**, use of maladaptive coping strategies, and to promote their development of useful **interpersonal skills**.

Environmental Modification (ex.giving extra time during school-based tasks to more adequately formulate responses).



.avoiding distractions..
.maximized lighting for concentration, good acoustics for clarity of speech .Promoting the focus and self courage (privatized spaces, low ceilings)

Anxiety disorders

panic disorder, obsessive compulsive d., **post traumatic stress d.**, social anxiety d., specific phobias, and generalized anxiety disorder

worry and fear are constant and overwhelming, and can be crippling.

Medication, anti depressants

Psychotherapy (a type of counseling), **Relaxation therapy**, guided imaginary

Avoidance or **minimization of stimulants**

Good sleep: adequate, restful sleep improves response to interventions to treat anxiety disorders.

Reduction of stressors. Identify and remove or reduce stressful tasks



.silent (avoiding environmental noises)
.dark room for sleepavoiding
.avoiding hesitation in wayfinding (less doors, less decision making)
calm colours-clear design

In presence of mental disorders, environment can become a part of the treatment itself.

Some of the behaviors in mental disorders can be consequences of other disorders, diseases or physical disorders.

The chart shows the common mental disorders seen on children, and clinical description and treatment methods. Both clinical and non clinical treatments have requirements for environment. (For example: a good sleep is important for efficiency of medication, while it can be used as a relaxation method)

Architectural conclusions refers to my own conclusions, considering the required environmental setting for the related treatments or the mental state.

3.3 New approaches in children's hospitals



Groot Klimmendaal Children's Rehabilitation

The rehabilitation center designed by Koen van Velen is located in Arhem, Holland. It is one of the major rehabilitation clinics in Holland and has a capacity of 120 beds.

Tucked between the trees, merging through the natural pattern of the woods, the impression of the building is more like a spa rather than a rehabilitation center according to the therapists. Some doctors are critical to evidence based design, yet they don't deny the positive feeling having an open view to the nature.



Although the building is highly appreciated in Holland, it is hard to find information in international sites, not even on the web site of the architect. The impression the building gives me is abundant daylight and natural scenes will be helpful for families to reduce stress. When we take from medical staff's view, the transparency between the spaces provides an easy supervision in my opinion.



However there are some post occupancy problems that shows us the dark side of the building, such as maintenance costs. Huge glass facades for the climate of Holland adds to heating costs. Another complaint comes for hygiene, as the corners and edges is hard to clean, which can be problematic for open wounds. Some other problems were expressed about the transfers within the building.

3.3.1 Groot Klimmendaal Children's Rehabilitation



The planning problems and technical problems (insulation, heating, shading) could have been solved initially or adapted with other solutions but the building itself still introduces a new approach that inspires the healthcare designers. I find the building challenging with its contemporary architecture, which is not very common to have a brave approach when it comes to a rehabilitation center.

From view from neuro-architecture, the building strongly emphasizes the relaxation of both patients and staff. Relaxation and decreased stress will increase the efficiency of treatments, that can eventually reduce the healing duration.

3.3 New approaches in children's hospitals



Holland Bloorview Kids Rehabilitation

New children's rehabilitation center in Toronto, designed by Montgomery Sisam Architects is a fairly complex project with amalgamation of pediatric rehabilitation and complex continuing care teaching hospital. The Project hosts clinical care and rehab therapy for both inpatients and outpatients, an integrated school, a creative arts programme, recreational programmes, assisting technologies and prosthetic labs, a research institute and a hotel for families.¹

First key driver for the design approach was to reconnect the hospital to urban fabric, discussing against the 60s approach of pulling hospitals from urban centers and internalized planning. The new design will emphasize that kids with disabilities are also a part of city, and bring variety. Connecting the new hospital to urban, another key element the architects emphasized was blending exterior and interior together, bringing the exterior to interior, as daylight or nature, extending the borders of therapy spaces to outside. Determining the facilities and planning, with help of workshops, views from client, hospital staff, patients and their families were taken into consideration, ensuring to satisfy all the users.



3.3.2 Holland Bloorview Kids Rehabilitation



Each of the three inpatient units have their own social space, including dining facilities. The common and social units in the large scale have flexible planning, with ability to open to the outdoor terraces. When the building links to outdoor with public spaces, the common therapies in the building also links into the building's internal public spaces. Facilities requiring double height such as swimming pool or exercise hall is seen from circulation halls in the other floors which brings a visual connection between the building, letting the whole facilities flowing through each other.

Another emphasize is about nature and natural visions. The connection to exteriors brings in the nature and natural light which creates more open and lighter spaces inside, and gives calm feeling. Wood was used as interior material which also strengthens the feeling of nature, isolating from the traditional hospital atmosphere.

The inpatient section was set as a focal point to the building, and all the facilities concerned with inpatients 24 hours placed in the same level with patient rooms. Single patient room is considered to be a better solution in EBD since it decreases injuries, and promotes individual patient comfort, when it comes to children's hospital staying over parents are also taken into consideration. For example the architects chose to use both single and double rooms, making the families feel safer that they are not alone.

Environmental setting, includes architectural solutions of healthcare spaces, and it gains a more delicate approach when we focus on the children as users.

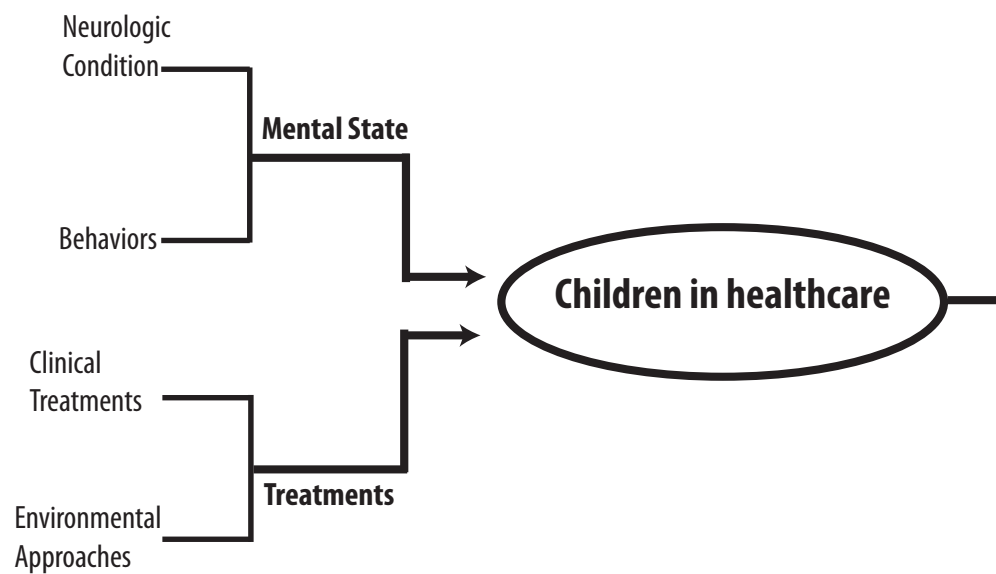
Design principles which going to be listed under this chapter, are essential in any healthcare design, yet it is more problematic for children as for their limited sight, lack of navigation and limited understanding due to their age.

Design Interventions for Children's healthcare

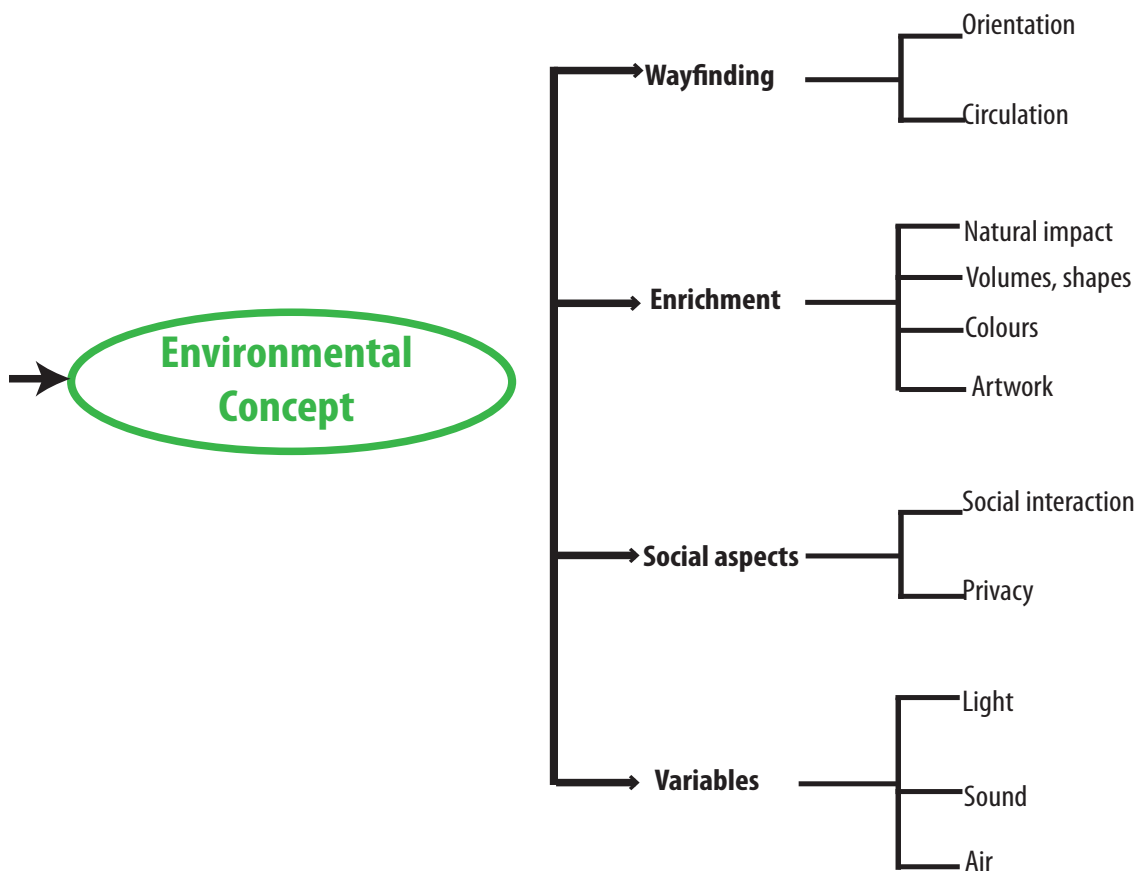
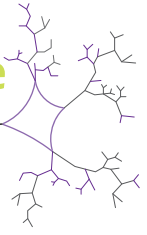


.Groot Klimmendaal, Children Rehabilitation, Koen Van Velse, Netherlands

4. Design interventions for children's healthcare



4.1 Determining parameters for architecture



There are numbers of design parameters related to healthcare environments. Classifying the parameters under different aspects of the spaces, gives a clearer perspective for architectural design. Adaptation of these parameters for children's hospital

.Children & Brain

Collecting information on children in healthcare environments. Searching on disorders can be treated with environments. Learning about mental disorders and therapy methods. How healthcare environments affect children

.Environmental approach

.The data involving architectural setting is related with the information gathered from children and healthcare. The design concept is handled with 5 aspects that involves/reveals/stimulates brain in different ways. Each aspect handles different parameters, to be studies individually.

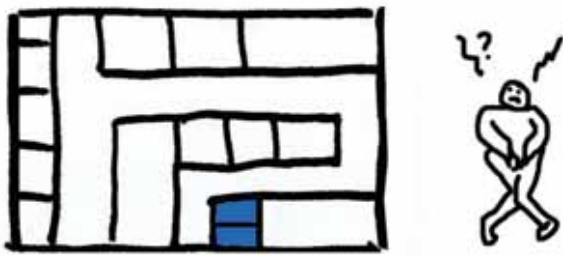
The parameters vary between different conditions of children, or unites for shared spaces, for the common qualities of a children's healthcare environment.

4.1 Determining parameters for architecture



A good environmental image gives its possessor an important sense of emotional security.¹ We normally do not get lost in the environments that we are used to, or if a new city has a well ordered design, it also serves a reference plan to our mental maps.

Feeling of being lost, hesitation, delay in navigation, causes stress. Patients are highly affected by stress as it affects their medication, state and so as the duration of their healing.² When we compare children with adults, children are more likely to lose their route, and be distracted, for their limited memory. Therefore the cognitive memory of the child should be reinforced by the surroundings while the child circulates within the building.



.Please don't hide toilets from children!

4.1.1.1 Clear planning and Simple Circulation

Clear planning should be a principle in every healthcare center, yet adult users are more capable to find their way, or form a mental map of a hospital as they have been to previously. Easy planning is also important for medical staff, since it avoids delays and injuries.



.easy access from common spaces

In a children's hospital, the circulation should be visible, from the corridor, so the child can feel confident that he/she can find her way alone. In a children's hospital, the authority might ask for limited circulation for patients, but the organization can set an easy planning within the limits, and encourage them to stay in desired spaces.

4.1.1 Wayfinding and Navigation

4.1.1.2 Landmarks

Hippocampus related with memory is very essential for way finding. How do we remember our ways in buildings, is either from memories from previous visits to similar buildings or by learning thorough the spatial planning by recalling the landmarks. A child might not remember where a certain room in the building is, but have higher possibility to remember, if he recalls the landmark. Hence landmarks don't help when they are used abundantly. Landmarks lose their function if they cannot be recalled separately, and gets confusing for children's orientation.

The landmarks can be perceived in a different way when, they are viewed from different angles, especially for a child recalling the certain view of the mark. A test was made to children, showing pictures of landmarks alone, and the answers were more accurate comparing to the pictures taken with their natural surroundings.³ For healthcare environments, the result can be concluded that the location of landmarks, shouldn't have other distractions that weakens the cognitive memory.

4.1.1.3 Color references, symbols

Using colors for certain floors and functions is a widely used method in hospitals. Using colors from different palettes, referencing an activity, or dominant color of the room (furniture, curtains...) helps the children to find their way to the target. The use of colors can be a part of the directions lines, signals or lights. Combining the colors with landmarks, can be suggested as they can also help rotation.



.Landmark and direction

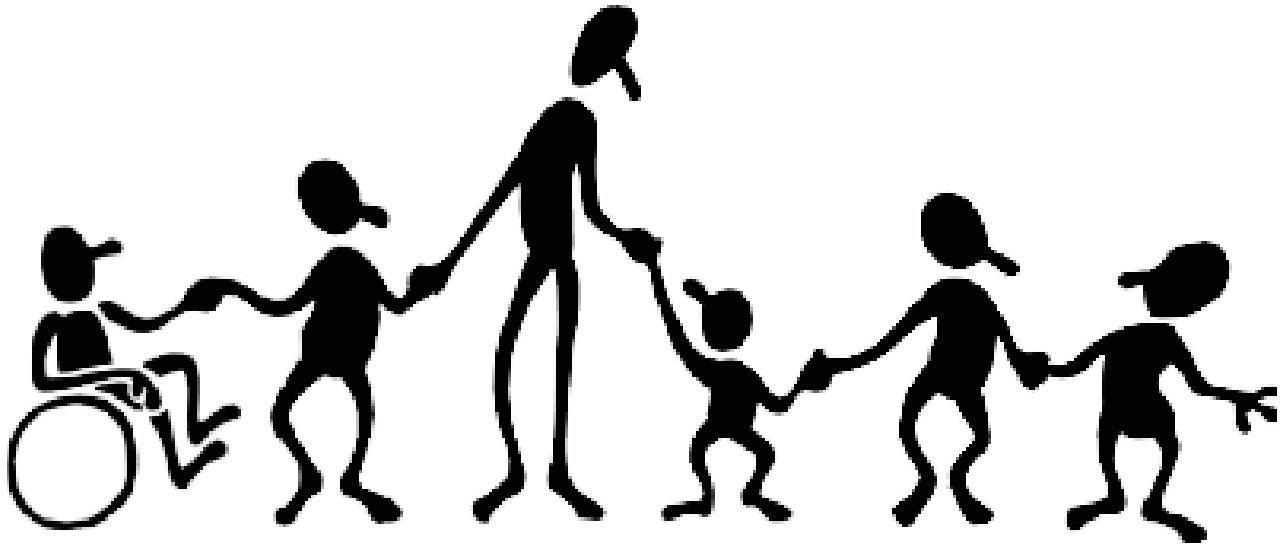


Confusion between landmarks



Color, landmark and direction

4.1 Determining parameters for architecture



Humans are social animals and social interaction is something we often have either with our families, friends or in public environments we share with others. During treatments the only interaction the patients have are with their families and medical staff.

New approaches in healthcare for children, encourage more and more interaction with other people, which also makes them feel more valuable as a part of a bigger group. While some therapies are involving group activities with other patients, some therapies involves member of their own families to maintain the closeness of their home environment.

4.1.2 Social Interaction



Setting for families and children, Bräcke children's rehabilitation

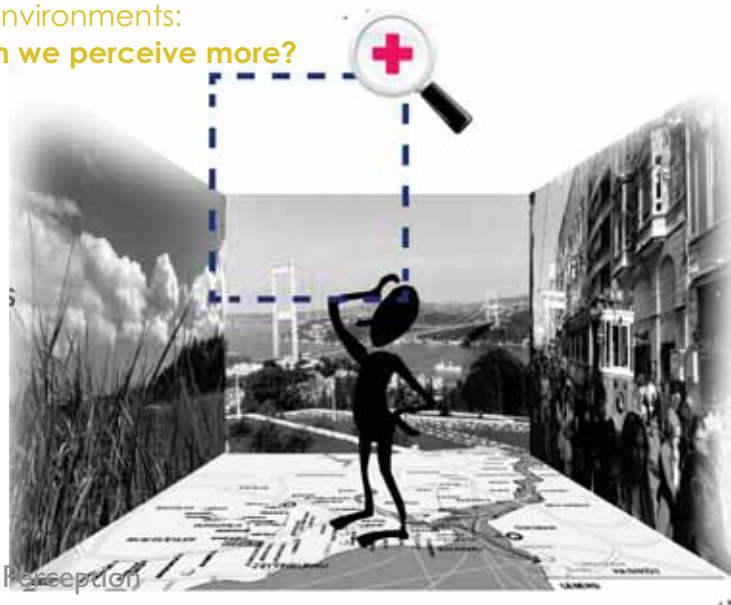
4.1.2.1 Socialization Vs. Privacy

Involving social interactions and encouraging the children for social interaction with other children or with their families distracts them from their pain and makes them a part of a bigger social group. However involving social connections cannot be an optimum solution for every occasions. A child spending time with his/her family has right to have privacy, without stressing that they can be disturbed, or interrupted. Giving semi-private spaces for family gatherings in hospitals can be an alternative approach. Children rehabilitation unit (of Drottning Silvia's children's hospital) in Bräcke creates semi-private sitting corners for families to spend time with their children.

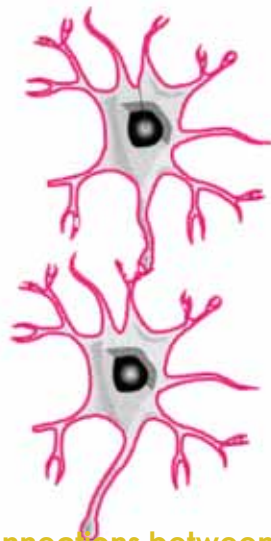
Other concern about privacy in healthcare, children in an unhealthy condition can be disable to achieve some activities as healthy children do. And learning, regaining or training this physical or mental activities can be difficult for a child, and do not want to be exposed while trying and failing during the treatments. The spaces related with training can be kept partly isolated to keep them comfortable and also to support their concentration.

4.1 Determining parameters for architecture

Effect of enriched environments:
What happens when we perceive more?



Our brains receive stimuli



New neurons & synapses (connections)

When our brains are stimulated new connections between neurons occur and also new neurons are produced in the hippocampus.

4.1.3 Enriching Environments



Definition from Wikipedia : *Environmental enrichment concerns how the brain is affected by the stimulation of its information processing provided by its surroundings (including the opportunity to interact socially). Brains in richer, more stimulating environments, have increased numbers of synapses, and the dendrite arbors upon which they reside are more complex.*

In earlier chapters it was mentioned about how our brain is responding enriched environments and how important this is for brain stimuli. In healthcare environments, when we consider about the disorders and condition of the patients, enriched environments can have a positive impact on patients having brain injuries.

The elements of spaces the children are using, can increase their perception, therefore can help the process of recovery. Not only for brain injuries, but an enriched environment also serves as an distraction from pain, attracting the attention away from the pain or helping the concentration on other activities. Architectural and conceptual elements of enriched environments are explained in this section.

4.1 Determining parameters for architecture

Östra Psychiatry, Göteborg

A relevant example involving nature can be given, Östra Psychiatry clinic that I personally visited in Göteborg, design by White architects. The design doesn't only face the surrounding green areas that can be viewed from patient rooms, but the nature is brought into the building by courtyards. The courtyards are designed to reach to the other floors, where patients from different floors have the possibility to reach to the garden from different levels. Embracing the green is also made possible to the waiting units merging into the courtyards with glazed frames.



4.1.3 Enriching Environments



4.1.3.1 Natural Impact

When it comes to stimuli, nature with varieties in color and geometries is a rich stimuli, that we are naturally encoded to be stimulated. In other words nature provides a source of neurological nourishment. Nature exhibits ecological complexity: interacting plants that in turn provide visual complexity, which is a source of neurological nourishment. (K.G. Medsen 2006) While artificial stimuli is not perceived in the same way by everyone, natural stimuli serves both for distraction and relaxation.

Effect of nature on reducing patient stay have been studied comparing the process of patients in different rooms according to their view to nature . Including that from prospective randomized controlled studies, it has shown that exposing patients to nature can produce substantial and clinically important alleviation of pain (Ulrich, 2008)¹. Therefore nature in healthcare environments is emphasized by evidence based design, gaining more importance in hospital design. Maximizing the opening to the nature will maximize the effect of treatments and speed up the healing process.

4.1 Determining parameters for architecture

4.1.3.2 Volumes, Room height



The more brain perceives, the more the brain is stimulated and developed. Colors, heights and different dimensions in the room serve for brain stimuli.

The volume of room has also other impacts on our brain which influence our behaviors. One of the most dominating element of volume is ceiling. Changes in ceiling height is a large field of study which concerns widely environments for research and productivity and places for consumption.

The ceiling impact debate has a background of architectural settings that we experience in our daily lives, as how the volumes change our behaviors, volume of our speech, or how broad we can think. Experiments on low and high ceilings, analyze both observations of behaviors and changes in the body states. High ceilings reveals freedom and thinking independently . However low ceilings signifies confinement therefore it collects the attention to certain point which increases focus.¹

The perception of height is not only limited with ceiling. Different installations in the heights, such as suspended ceilings, height of lighting armatures change the perception of the volume of the rooms. The different effects of heights can be used to strengthen ability of concentration or encourage creativity for the children. For example, children in healthcare exposed to medication and maybe dealing after a trauma might experience difficulties in learning and lack of concentration. Spaces designed with lower ceilings, for rooms involving learning, can help gathering attention. On the other hand when more creativity is desired, such as workshops to encourage the child to discover his/her abilities, higher volumes might support thinking broadly. ¹

4.1.3 Enriching Environments

4.1.3.3 Colors



Perceived color is based on the relative activity of ganglion cells whose receptive field centers receive input from red, green, and blue cones. It appears that the ganglion cells provide a stream of information to the brain that is involved in the spatial comparison of three opposing processes: light versus dark, red versus green, and blue versus yellow (Bear, Connors, & Paradiso, 2001).¹

Since perception of colors differ from age to age and between mental states, for enriched environments it will be a more common approach to determine the colors by their brightness colors instead of grouping them with their perceptions.

When colors are brighter they will behave as a stimuli since they are more recognizable. Brains remember the things easily that are more remarkable. If the colors are used in connection with the spaces, it can strengthen the position in the mental map, and stimulates the memory.

However same stimuli is not desired for every function. The brighter the colors , the more attention they attract, and if they are used in rooms where attention is expected, the attention will be collected in the wrong place. It will a better solution to involve neutral colors, with less contrast, and preferably light colors to perform with lighting.

4. Design interventions for children's healthcare

1. Bear, Connors, & Paradiso Neuroscience, Exploring the brain,

2. University of Rochester, Color Perception Is Not in the Eye of the Beholder: It's in the Brain

4.1 Determining parameters for architecture

4.1.4.1 Light



Light serves for various purposes: to make spaces to find the orientation, to reveal or conceal the spatial volume or features, or to draw attention to a task. Our perception and desire for light also varies among the purposes we will need the light for, for example while a light for dining can be sufficient, whereas the same light will be insufficient for studying.

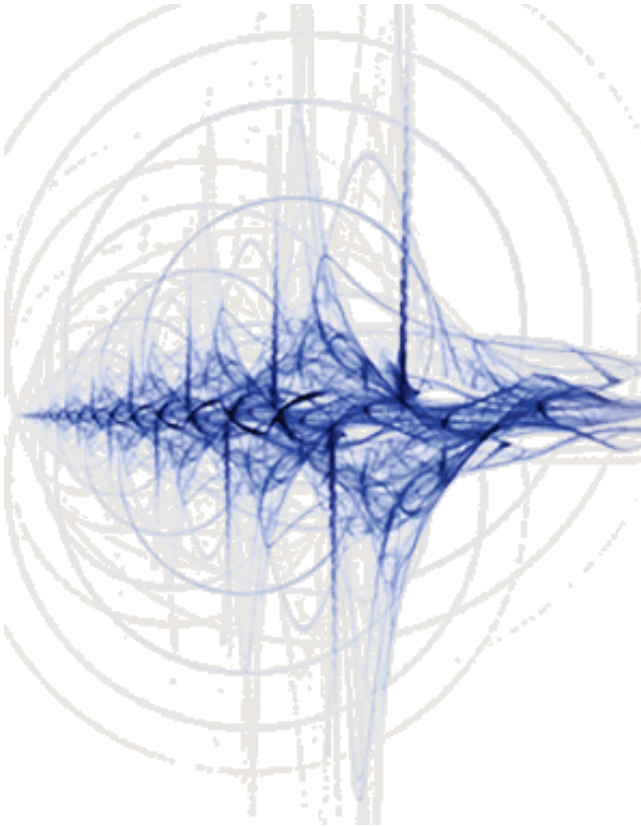
When performing a visual task, the light that reaches our eyes and is therefore laden with the raw information for our mind is usually reflected light—that is, light reflected off the details of the task (typed letters), the immediate background (paper), and the surround (desk top and room). In this context, light is defined as electromagnetic radiation that can be detected by the human eye.¹

Not all the spaces in the healthcare buildings require the same amount of light. Especially it is important that patients have dim light in their rooms, when they spend all their days in the rooms. Another thing it is important that the room can be blinded totally during the sleep, since a good sleep is desired for all patients, while it is more essential for patients going through a trauma.

Daylight is a solution for lighting general spaces, when it is possible. As mentioned earlier involving nature as much as possible will bring more daylight if it is opening directly to outside. However for activities involving attention, for example therapy rooms with workshops or teaching activities in children hospitals, direct day lighting will also bring the problem of glare. Unless the glare is prevented, it will distract the attention from task, make it hard to read and see which will later discourage children's will to learn. These type of rooms can be designed with low transmitting glasses, or shadings, or another solution is to use artificial lighting for task lights to gather the attention.

4.1.4 Variables: Light & Sound

4.1.4.2 Sound



Sound is another variable handled in the architectural setting and it shows similarity with light when it comes to purposes. Level of sound also varies for different purposes, while sometimes it is sufficient to be perceived only as a sound or a melody, sometimes it needs to be carefully understood so the levels and clarity gain importance.

As mentioned earlier, children are more likely to be distracted and it is hard to get them concentrated. In rooms for conciliations, teaching, or training where children are listening and talking, the room should provide a clear understanding. While sounds can cause distractions should be prevented or insulated from the room, another important value is the clarity of speech. To increase the acoustic quality of the room, a simple solution can be using absorbers in the ceilings, to prevent echoes.

When it comes to patient rooms, when the light in the room is dimmed and even be blinded for a good sleep, it is hard to prevent the expected sounds since there are many machines or functions running all through the night. Lowering the transmission of sound to the room can be provided by having absorbers in the corridors, (e.x dampers in the floors) or door with sound absorbers.

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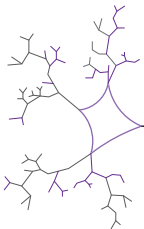
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please continue with
part II



.Enriching healthcare environments for children

.Cagil Kayan .Master Thesis .Examiner: Peter Fröst .Chalmers .VT2011

Neuro-architecture

Enriching healthcare environments for children

part II.
design



PART II. (Design)

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Design Applications with Neuroscience & Architecture

This part of the thesis is about how neuroscience can be applied on architecture for children's healthcare.

The research part of the thesis work becomes more visualized how spaces can be arranged considering children in healthcare.

White Architects are working new extension building for Drottning Silvia's Hospital for Children and Adolescents. For application part of my thesis, I studied on how the new play therapy department can be designed using my research on neuro-architecture. The department is planned to be located on the ground floor, and my project is on designing the space assigned for the play therapy department.

The program for the unit was taken from the hospital and design process was developed with researches, interviews with medical staff and with tutorials from both White architects and my examiner Peter Fröst.

5.1 Drottning Silvia's Children Hospital

5.1.1.1 Background

Children's Hospital in Göteborg has a history for almost 150 years. First children's hospital was opened in Östra hamngatan with donation of Carnegie couple in 1859.

Later in 1909 the hospital was moved to the new building in Annedal. The hospital was specialized in heart surgeries. In 1973 the hospital extended as children's clinic and hospital and moved to new location in Östra Hospital where it became a regional hospital of all children and youth care.

In 1997, the hospital became part of Sahlgrenska University Hospital. The hospital was named after the queen, Drottning Silvia in 1999 and still serving as a regional hospital in Göteborg.

The hospital still grows, and now they need a new building, to gather all the facilities together in extended spaces which will be also located in Östra.



The hospital is serving as a regional hospital in West Gotland region with its 1850 medical staff and 250 beds capacity. Everyday around 550 children and adolescents visit hospital, out of which 150 children stay more than 10 days in the hospital. Östra hospital zone provides residences for children's families visiting from outside of Göteborg. Not only from Västra Götaland but the hospital has many patients from all around Sweden as the hospital is established for experience in heart surgery.

The specialization fields of the hospital are:

- .Medicine
- .Oncology
- .Cardiology, including cardiac surgical care
- .Neurology, neuropsychiatry and habilitation
- .Neonatology
- .Surgery
- .Acute ingestion, acute short-term service and receptions
- .Child and adolescent psychiatry
- .Radiology and Clinical Physiology
- .Surgery, Anesthesia and ICU



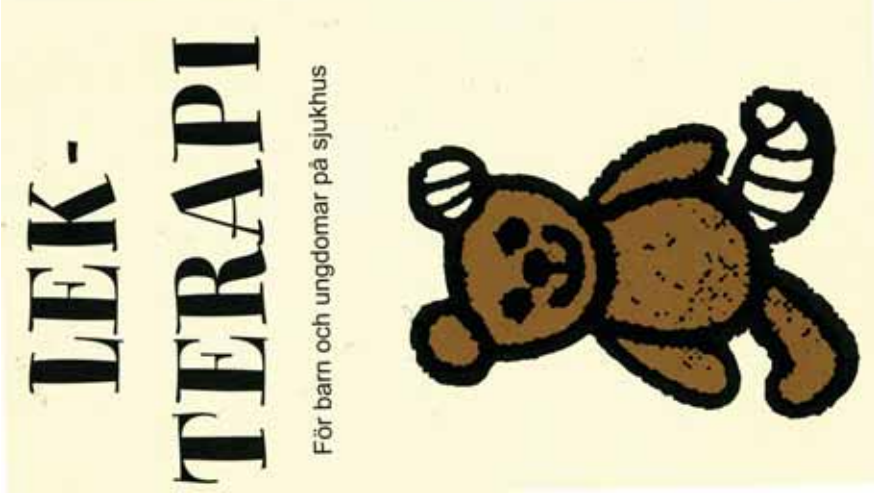
For long lasting, and chronic disorders, the hospital has a separate children rehabilitation unit in Bräcke, Hisingen. Drottning Silvia's Children's hospital in Östra has its own therapy department for staying and visiting patients. The therapy units in the hospital in serve to retrieve and practice the abilities of the children both physically and mentally. The therapies are gathered in three groups:

Occupational therapy:

Promotes health, by teaching purposeful occupations. The therapies in the hospital often aim to enable the patients to maintain their daily activities.

Physiotherapy:

Helps the patients who have physical impairments to restore their functional abilities. The unit has a gym and an exercise pool where the children train with the therapists one to one.



Play therapy

Serves for all children staying or visiting the hospital. The purpose is to help children express their experiences in a natural and self guided way through plays, and other activities that they can't join due to their condition.

The unit serves for a wide age range, promoting children's integration and socialization. Children can both attend activities guided by therapists, or spend time with their parents, or play games with their siblings.

My personal observation of this section is as a hiding zone from reality, distracting the stress of hospital environment. It allows a wide variety of activities and encourages children to mingle and experience.

Play therapy is defined by Swedish law, as all the children and adolescents staying in hospitals must have the same opportunity to play as the healthy children, therefore it is their legal right to receive the play therapy.

The goals of Play Therapy described by Child Care Program

"Promote normal, healthy growth and development by providing therapeutic play and creative arts opportunities.

Enable children and adolescents to work through the stressful experience of hospital environment, resolving anxiety and regaining strength. In cooperation with medical staff, provide support to parents and siblings." 3

The play therapy unit is serving to children from different age groups (small children - teenagers). The hospital wants to have flexible shared-spaces between units and a plan that allows the sections work

5.2 Design Approaches for the Play-therapy Department

5.2.1 Objectives for the new department

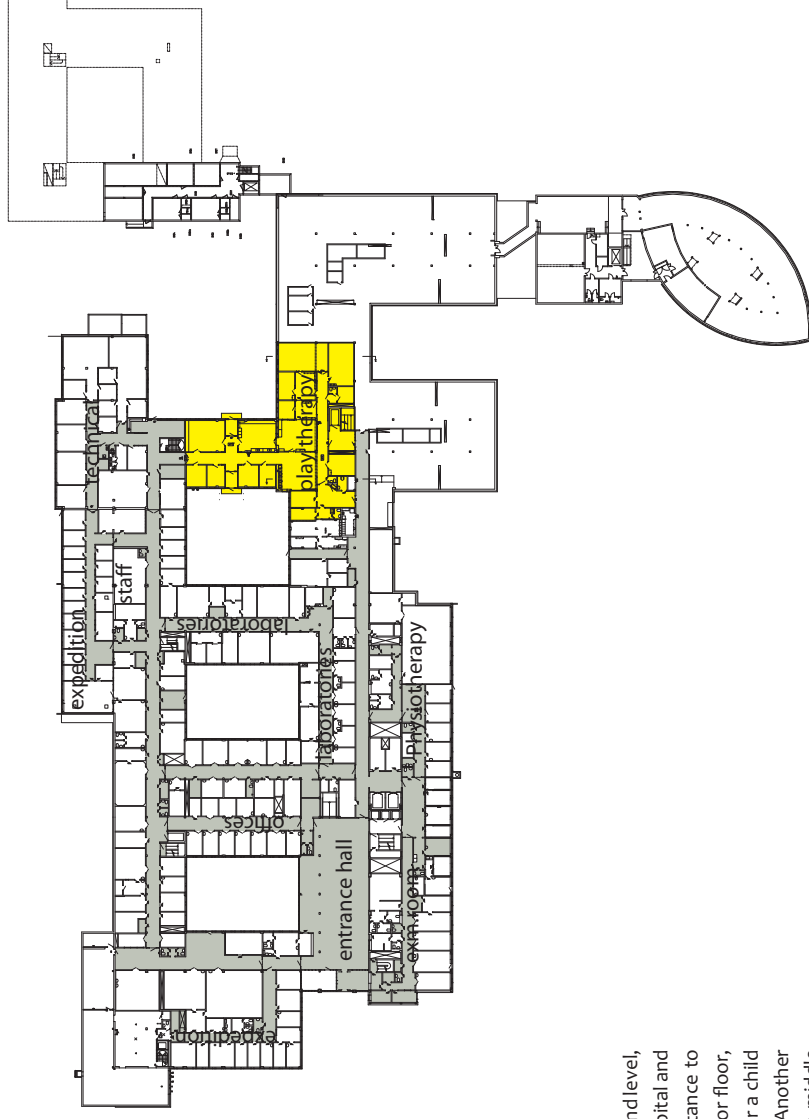


The new hospital plans to have the common facilities for children on the ground floor (entrance level), to be visible to the outside, for daily visitors, and gather the patients on a common floor.

The facilities for children includes group therapy rooms (play therapy), gathering squares, physiotherapy spaces (including gym and pool), rooms for teenagers, daily care for small children, therapy rooms for children open to infection, library and classrooms.

The objective for the new building is to make children spend as much time as possible together in common spaces instead of staying in their rooms. Gathering all the facilities close to each other; enhances the interaction of between different age groups and visual connection of spaces attracts attention of children involved in different activities.

Especially since the play therapy unit is as a key generator to interact children with social activities, the new approach is establish more connectivity to the outside with gardens.



1. Floor plan 1/1000

Access:

The play-therapy unit in the hospital is on the ground level, where you pass the main entrance hall in the hospital and follow the long corridor to find the unit. The distance to the unit is solved with guiding lines on the corridor floor, and glazed door to the unit, however it is hard for a child to find his way directly to there without help. Another disadvantage of the location is, since it is in the middle and not facing the front façade, it is not possible to run independent from the main hospital.



5.2 Design Approaches for Play-therapy Department

5.2.2 Existing Building

5.2.2.1 Analysis of spaces



Small children's room [småbarnsrum]

Function: For children aging between 2-5, guided with therapists. It is visible from the square, so the parents can watch their children.

Condition: The room is only accessible from the play therapy unit and it is desired to have a free entrance for the new building. Parents are lacking private space when they accompany their children for whole day.



Medical play [sjukhuslek]

Function: The therapists help children to learn hospital within a game to make them feel comfortable about hospital.

Condition: It is now accessed through sewing room, but needs to be in a quiet zone, since it serves for a sensitive activity and they shouldn't be distracted to have full attention.



Workshop [snickeri]

Function: Room full of creative features, plaster, wood, paint for children's disposal.

Condition: The room has both eye contact to the corridor and to outside. It is facing to a quiet courtyard, which is good for them to be concentrated on their activities.

Sewing room [syrum]

Function: Relatively small room with sewing machines.

Condition: It has access both from corridor and medical play room, however it is proposed to be a part of teenagers' section.

Multi purpose room [Allrum]

Function: The room where the children can perform a theater, watch a visiting act, play games in the white screen, or play pinball. It is a flexible room, maybe lacking some closed storage unit as some decorations are hidden behind the curtains.

Condition: The room is lacking visual contact to the active sections in the therapy department. Since it hosts broad variety of activities, it can have more opening to main halls and welcoming for children, so children can choose with their own will to join the activities.



5.2 Design Approaches for Play-therapy Department

5.2.2 Existing Building

5.2.2.1 Analysis of spaces



Senses room

Function: A special room without daylight, lit by special light systems, changing color and brightness. Only used with a therapist, and booked for certain hours.

Condition: Senses therapy is a very concentrated and sensitive therapy. When they leave the room, they should stay calm to preserve the effect of the treatment. However when they come across to sound and crowd in the main square, they get anxious, which reduces the effect of treatment.

Library

Function: Very open and flexible room, where children loan books or plays for the multipurpose room.

Condition: The disadvantage is it is disconnected common units, more connecting to the teenager's unit, which keeps it hidden from children when they circulate by themselves.

Classroom

Function: For children to keep up with the lessons with guidance of a teacher in communication with home school. Usually 3 children at the same time, maximum 5 children at the same time.

Condition: It is quite far away from library, hard for children to discover without being guided by their teachers.



Music studio

Function: A studio to experience music, in a fully equipped room.

Condition: Has a double entrance but the door is usually kept open, to let the sound be heard, to attract children's attention.

Teenagers' room

Condition: A stylish room, referring to teenagers and young patients up to age 25. They can gather, play a game or watch a movie with their friends from outside in this room.

Condition: Fluent connection between pool room and the living room provide a private facility for the teenagers.

Pool room

Function: Accessed from teenagers' unit, pool room which also hosts music library.

Condition: Teenager's unit serves as a social unit, without the sense of a hospital, giving the teenagers possibility to keep on their usual activities.



5.2.2.2 Comments and critiques



Interview with play-therapist Sofia Månsson

What should be kept?

.Interconnection of the rooms

The children can see or hear the activities in the other room, and the planning allows them to move freely between rooms.

Sofia Månsson: The library is not the traditional library form where you are not allowed to talk. Here we don't want silence, we want them to move, to talk, to hear to experience other activities.

.Visual contact

The rooms are mostly visible from the corridors, which encourages children to join.

S.M: Visual contact is also important for children coming with their parents. They feel secure seeing their family. We also encourage them to join activities with their siblings to make them feel they are a part of units, they have an identity.

.Square

S.M: The square is where we gather, and where parents sometimes wait all day long for their children so it is important to offer them some privacy.

Functions to be added or changed:

.While the rooms open up to the main square, it gives more interaction, but certain functions such as senses therapy, require a quiet entrance.

S.M: It is a very quiet and sensitive activity, and since it is opened to the square in the current condition, the children get distracted and afraid when they come across to a crowded space.

.Play-therapy refers to different ages varying between 0-25, and there are certain rooms serving to only one age group. Functions related with them can be grouped in different sections.

.Floor plan enhances fluency and openness between functions but it is lacking clearness, which brings confusion in orientation.

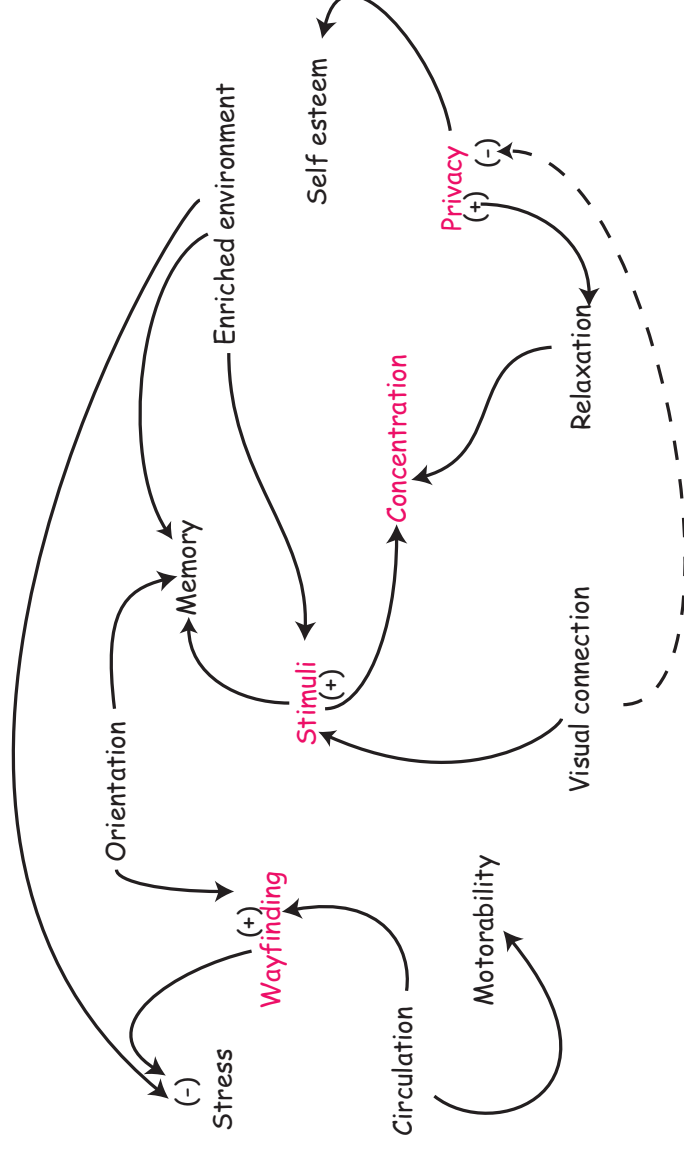
.Room for children open to infections: They cannot use the play therapy when the other children do, because of infection risk. They can only come after 4 o'clock, when the other children have already left, and the activities have ended. For example if a theater visits, it is at day time, and they miss it.

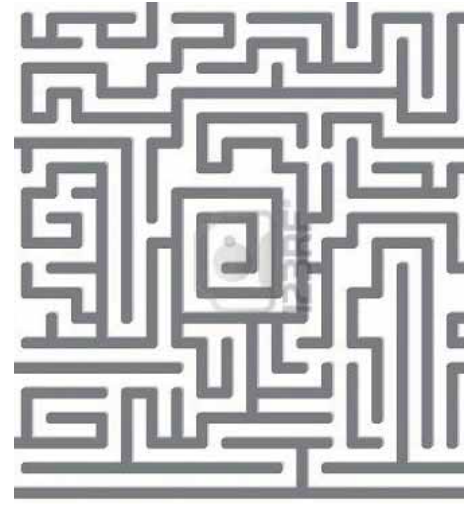
What is important in Play Therapy?

Therapy units refer to a wide variety of children from different age groups, or with various illnesses and injuries. In a wider perspective, what unites them is that they are not healthy, and the play therapy unit aims to encourage them to enjoy their time, as if they were healthy.

Children in play therapy join the activities as a part of their hospital stay, or as a free visit when they come for a regular day visit. In addition to activities guided by therapists, parents and siblings are also involved in the process, allowing children to spend more time with their families, gives them individual value.

Differing from their daily routine, here they have the freedom to choose the activities they want to join and learn new skills. In other words, they are encouraged to explore, learn, discover, socialize while they are distracted from their pain.





Stress- Way finding

As the therapy unit encourages the children to decide the activities they want, it is important to enable them to achieve things on their own. Joining the activities in the unit, children should be capable to find their own route, navigate to discover, without stress and hesitating of “Will I be able to find it? What if I get lost?” The design intervention can start with “way-finding” to enable the child to find his/her own route in the building. When children are unhealthy, they have difficulties in remembering. Therefore the planning should refer to their memories, easy to understand, and remarkable so they can recall and make connections.



Stimuli - Enriched Environment

All activities in play therapies are to stimulate the brain in different ways: one refers to thinking, one refers to the senses or one refers to motor ability. The architectural setting can also be designed to stimulate the children's brains, giving links to different activities, with a visual impulse and curiosity. Nature, as a very effective stimuli, can be involved in the planning concept with visual and/or physical connections.



Concentration - Distraction

Play therapy is not only focused on having a fun time, the actual aim is to help them retrieve their abilities, or to teach them new skills either with lessons or workshops. Some children due to their age, or due to injuries have difficulties to concentrate. Spaces for learning can be designed to have minimized distractions, such as pastel colors, calm images, or a view to a quiet part. Lower ceilings and smaller divisions proved to help concentration, which can be supported with efficient lighting, and acoustic solutions for speech clarity.



Anxiety – Privacy

Children do not feel stressed to find their direction when they navigate in a building with clear orientation. Privacy also has a similar effect as way-finding. With sense of privacy, a child feels more secure, and even confident. A child trying to learn or exercise would feel anxious and uncomfortable when he/she feels others watching, which can also cause discouragement and distraction. The level of stress is very important in a healing process, and since children are continuously developing, it might have more powerful effects.



The habilitation center is outside center, away from density, closer to nature. The neighbourhood hosts other rehabilitation centers as well.

The building is constructed in 1980s, to serve as a habilitation center from the beginning, says Kate Himmelmann, children's neurologist. The size of the building is allowing generous spaces for all the functions within the building. It has a capacity to host 10 children for overnight stays, and usually 5 (or maximum up to 10) children for day visits.



The planning allows abundant light into the common spaces and corridors, and enriched with views to nature.

On the ground floor, there is an extremely wide play room, which allows children to move freely whether on foot or on wheelchair, and they can even ride a bicycle. The size and fluency of the room encourages the children to develop their motor-abilities and allows doctors to monitor their process. The therapy rooms are accessed from the main play hall.



Although access to the therapy rooms is not clear without the tables on the doors, the symbol language and descriptive images makes them clear for all children. It is an important approach, giving courage to children to promote their abilities.



Visual contact vs. Privacy:

When it comes to visual contact, the habilitation unit differs from the play therapy unit in Östra. Here, the therapies are scheduled individually for every patient, so joining to the therapies spontaneously is not very likely. Visual contact is replaced with privacy concern here, since children might feel anxious or stressed when they feel that they are watched.



Privacy for all:

Patients' room are one floor up, separate from therapists allowing them to have it like their private home. Parents can have free time with their children here, they can also use their own kitchen on this floor. Personalization and privacy support their comfort of stay.



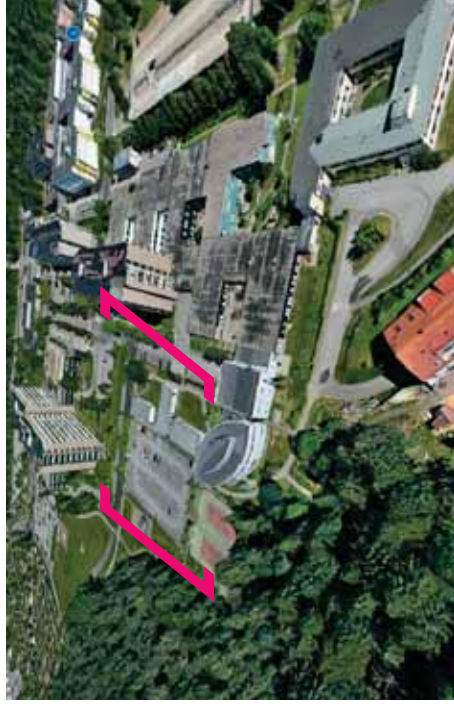


Sweden > Västra Götaland
Göteborg

5.3 Design Process

5.3.1 Site

5.3.1.1 Current Situation & Future plan



Existing condition of the site

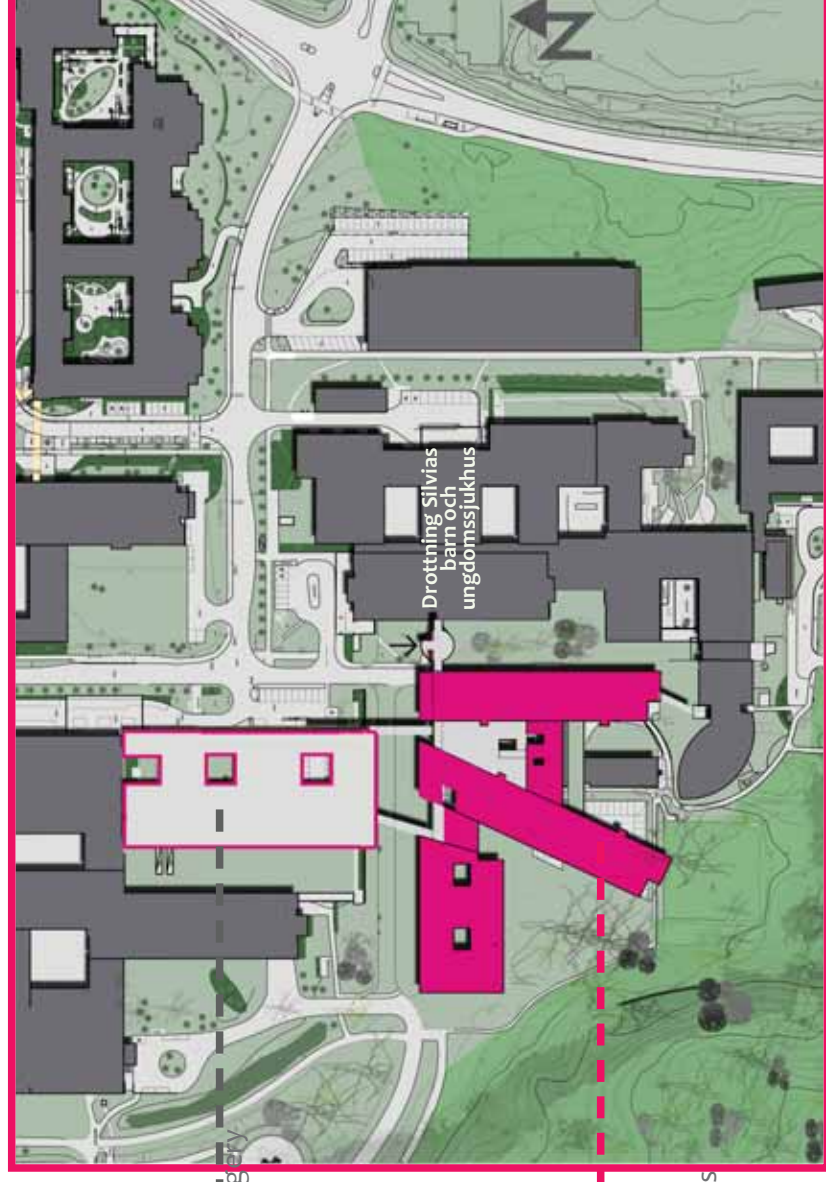
The site

The site is located in Östra Sjukhuset hospital zone, with an extended area of healthcare buildings, surrounded by green areas.

The site for the children's hospital has green zones in the south. The extension building will be located on the site behind the existing hospital, where they have car parking area now.

The new approach tends to include more green on the site with inner courtyard and outer yards, and by letting the building open up it self to the surroundings.

Future Building for Adult Surgery
(Building size is not certain yet)

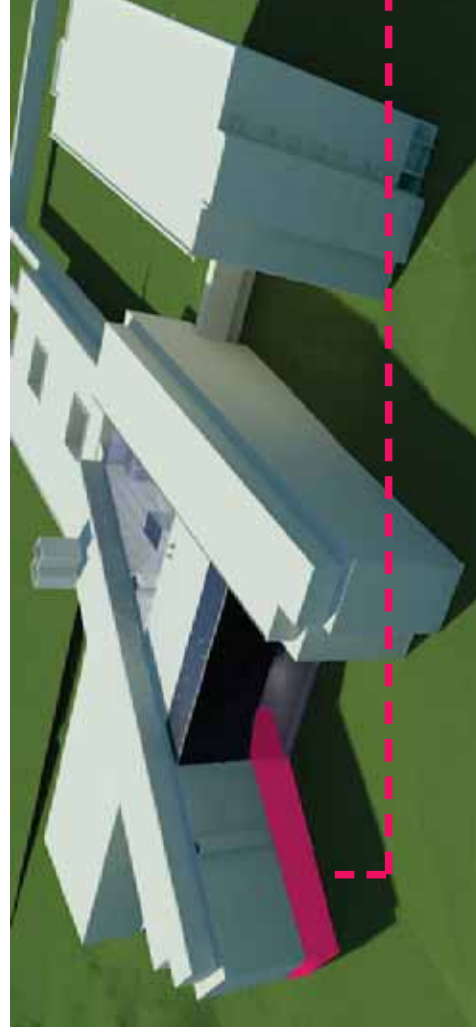
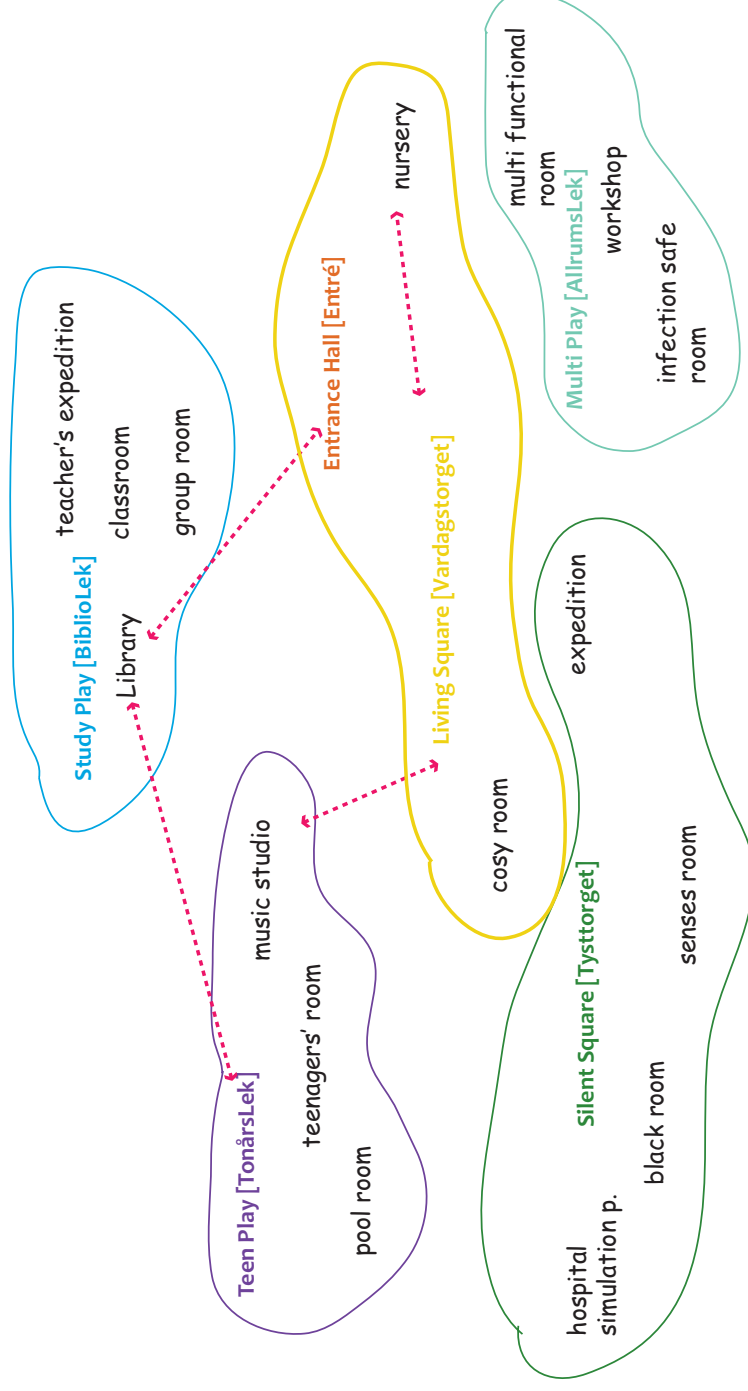


Extension Building of Hospital for Children and Adolescents
proposed by White Architects

Play Therapy (on the ground floor)
my proposal related with my research

Future developments and proposed hospital

Plan 1/2000



Distribution of the facilities

Play therapy unit has many facilities and refers to all children who are treated in the hospital, which means they have a large variety of age group and health condition.

Although all children are welcome to participate in any activity, the facilities are grouped according to related activities or target group.

Here is the simplified program from hospital:

Square [Torget]: For gathering, fika, lunch, accessible for gurney, visual contact to nursery and library

Nursery [Småbarnsrum]: plays with legos, dollhouse, sand tables, visual contact for waiting parents

Multi-functional room [Allrum]: Table games, theater, table tennis, movie screening, dance room height is important

Workshop [snickeri]: ceramics, woods, painting, plaster

Infections safe room [infektionskänsligas rum]: separate entrance

Senses room [Sinnenas rum]:

Black room [svarta rummet] rest and massage, no daylight

Hospital simulation r. [sjukhuslek]: playing with medical toys, imitating hospital environment

Teenagers's room [tonårsrum]: computer, video games, music, gathering with friends

Library [biblioteket]: for loaning books, movies, music, computer games, visibility from circulation hall, a separate entrance

Ground level:

Play therapy department

Distribution of zones and open spaces



	common: entrance, daily square, nursery, therapists' expedition, cosy room, services
	creative: multi purpose room, atelier
	silent: senses room, black room, silent square

	teenagers: pool and leisure room, sewing room
	study: library, classroom, group study, teacher's expedition

0. Level
Plan 1/500

5.3 Design Process

5.3.3 Planning

5.3.3.1 Wayfinding > Entrance

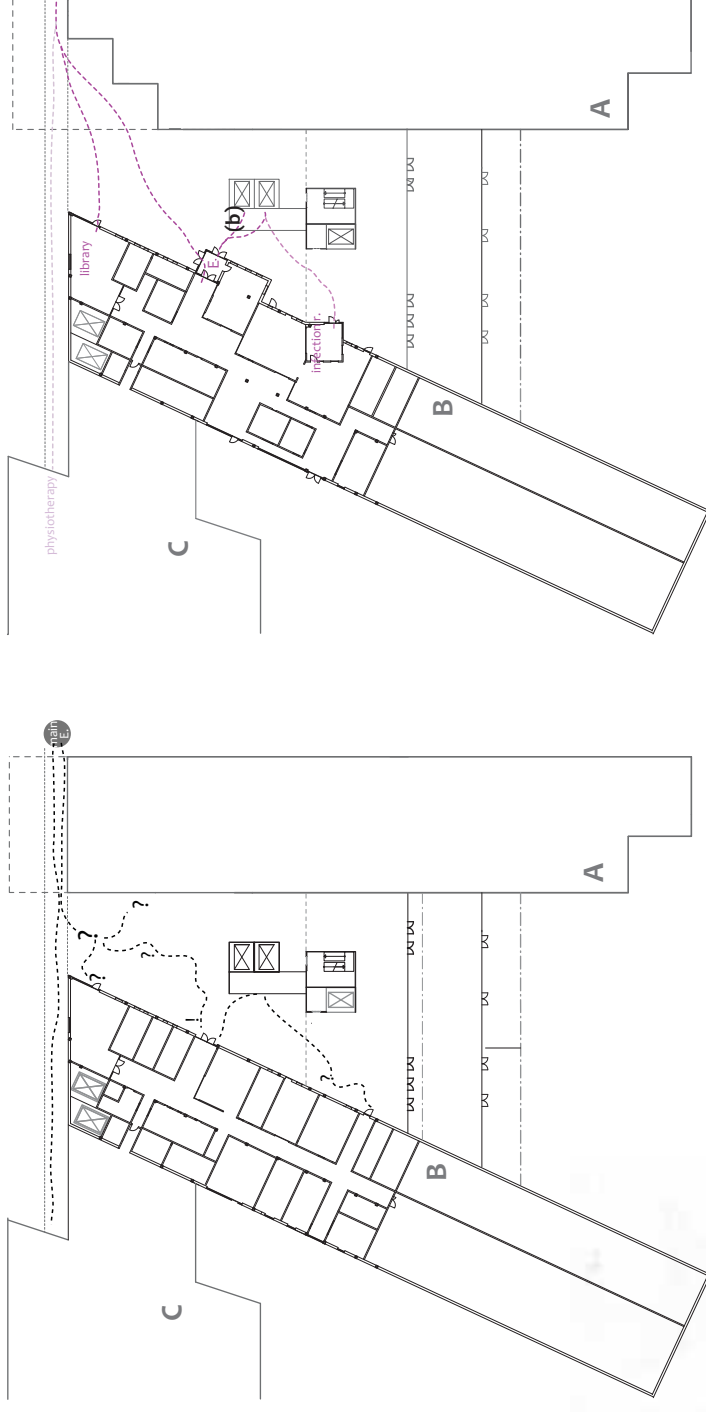
The therapy departments are located on the ground floor of the new extension building. They both serve for in-patients and out-patients.

Access to the Play Therapy:

Entrance for the play therapy is on the ground level opening to the courtyard, which is covered with a glass roof providing a weather proof inner garden. Patients arrive to the therapy departments either from outside or the main hospital.

• **Visitors from outside:** They pass through the passage from the main hospital.

• **Visitors from hospital:** They reach the department with elevators to the inner yard.



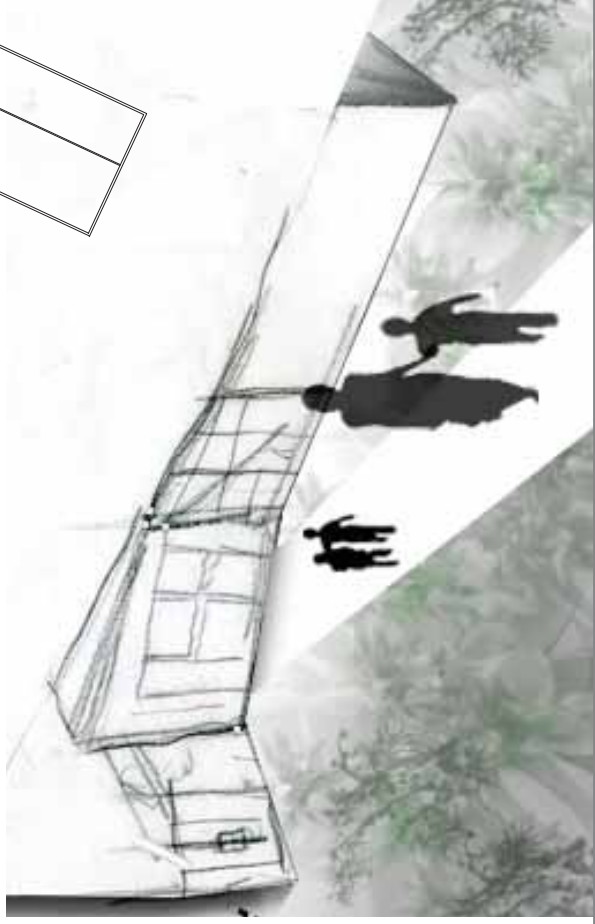
Directing to entrance:

When the patients from outside arrive, after they arrive to the main building, they pass the main entrance for the extension and pass the first building (A) to arrive to the therapy departments.

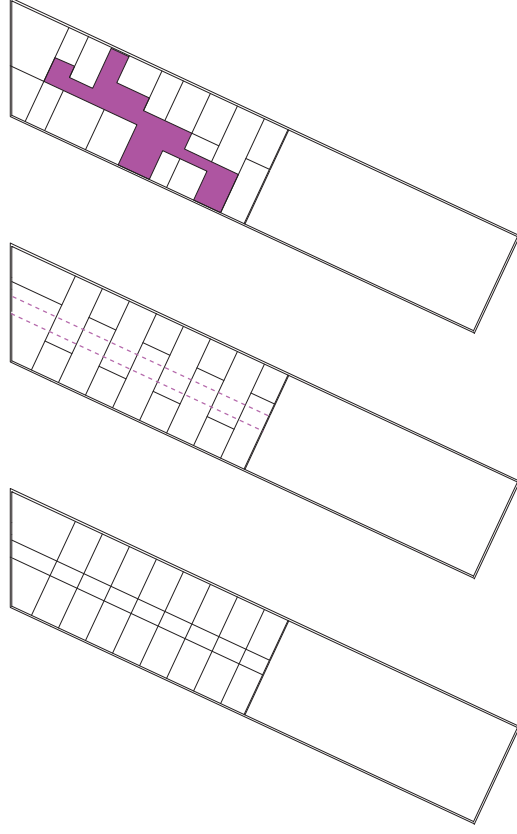
A straight passage leads the pedestrians with a straight direction, which blocks the choice to go to other directions. For physiotherapy and occupational therapy it is the right way to go straight, but for the play therapy the entrance is from the center of the courtyard, therefore they have to find the entrance with their own observation.

Disturbing the parallel walls of the passage into an open path will give a wider view to the inner yard. Orientation of the inner yard can be supported with paths and colors. To make the entrances visible from different angles, the entrance is pulled out which also brings in more light from glazed walls.

There is an additional entrance for the children with infections. Their entrance is also pulled out letting a straight entrance when they arrive with elevators from other floors.



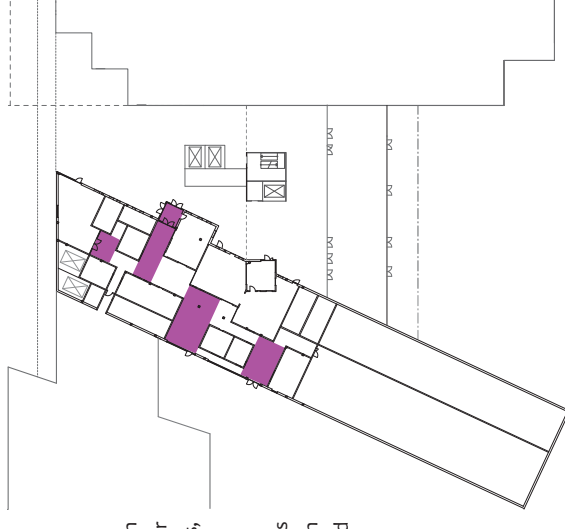
5.3.3.1 Wayfinding > Orientation



Corridor Vs Squares

Children have weaker sense of orientation compared to adults. Although straight corridors might be functional for circulation in a hospital, for a department where children are expected to circulate by themselves, the plan needs to be more easily perceived.

The straight corridors are broken into squares and shorter corridors connecting them, to increase the variety of the spaces, and make an easier orientation. Every square host a different group of activities, and each has a different concept which gives an individual identity.



Memory and Place

Another aim of the “square planning” is to enhance memory, making the places easily recognized and memorable for the children. It is especially important for children to feel encouraged to find an activity they want to join, without hesitating about the direction and without asking help.

The concept of each square and its related activities is supported by a color palette, a geometric pattern (window frame or shape of furniture) and a land mark.

Here I suggested the concept as sky, with sun, moon and star as landmarks for the squares, and using related textiles and decorative elements (toys, lights, glows..).

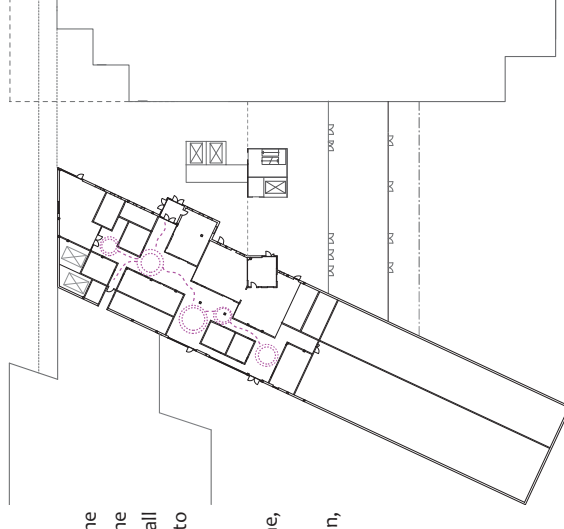
Landmarks

Landmarks are visible from the other parts of the floor and have an easily recognizable sign for the square. It can be easier for the children to recall the squares using the landmarks they see, or to remember the directions by the objects there.

Entrance and teenagers part: Star (welcome, encourage)

Living square and multi play: Sun (inspiration, creativity)

Silent square: Moon (calm, relaxed)

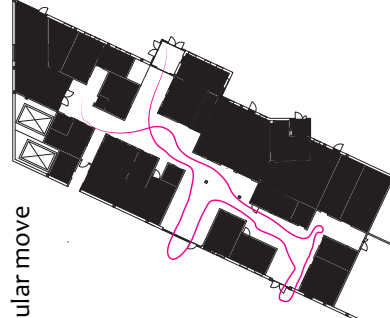


Motor skills

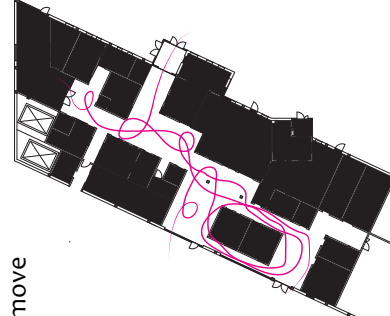
The health condition of the children in play therapy are varied. Paul Uvebrant, neurologist in children's hospital, emphasizes the importance of using motor skills in a physical activity to improve cognitive abilities.

In Drottning Silvia's Children rehabilitation, the building allows very large spaces for children to perform their abilities for walking, running and even riding a bicycle. They are having possibility to move freely in spaces that they can't have in their homes or hospital floors. Considering this approach, I planned the floor to give round circulations. Children can follow either a regular path to reach their activities, or they can choose to alternate their movement, or just play. This planning also allows more daylight to the common spaces.

Regular move



Free move



Floor color

Circulation in the halls can be supported by color options. Either promoting nature and access to the gardens, or gathering the children in main (living) square. The color lines lead to the conceptual squares/sections, for example blue leads to study zone, purple leads to teenagers zone.

**It is an early proposal to support circulation. In order to make a proper wayfinding graphics, it requires an extended research based on signs, diagrams, and a well worked method of applying the color paths.*

play therapy department

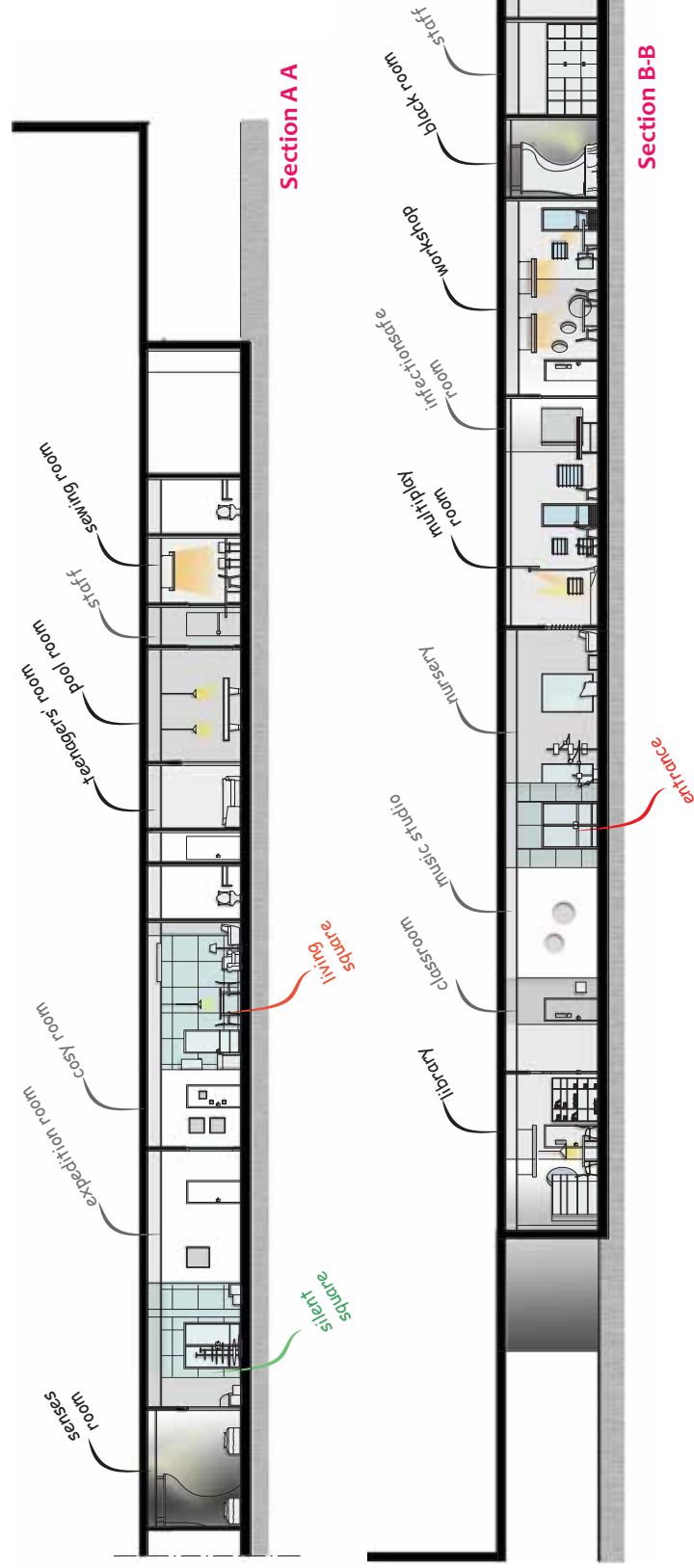
[Lekterapi]

Plan 1/200

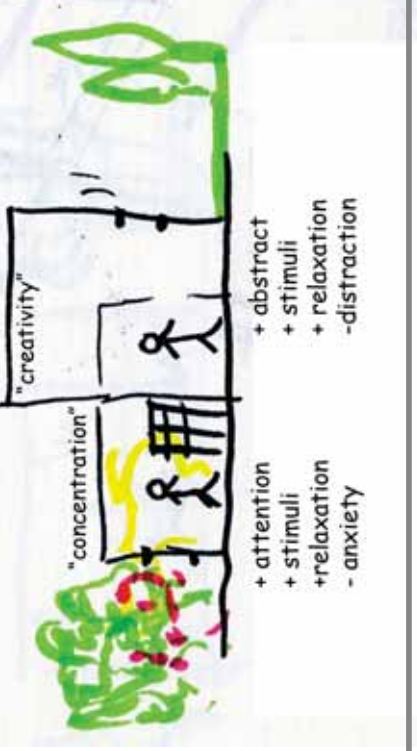


Library	55 m2		Study Play [BiblioLek]	.Access from both inside and outside, enabling flexible working hours
Teachers' expedition	14 m2			.Classroom and group room can unite with adjustable seperation
Classroom	16 m2			
Group room	11 m2			
Sewing room	14 m2		Teen Play [TonårsLek]	.Teenager section has more privacy by having an internal entrance hall for facilities
Billard room	20 m2			.Visual and physical connection between facilities
Teenagers' room	12 m2			.Music studio is open to use for all the children, and connects to entrance hall with a window, attracting attention with sound
Music studio	18 m2			
Nursery	40 m2		Living Square [Vardagstorget]	.Opens to the garden with abundant daylight
Living square	57 m2			.Corner seating for nursery forms its own square giving privacy for parents while still connected to the main square
Cosy room	16 m2			
Multi purpose room	65 m2		Multi Play [AllrumsLek]	.Multipurpose room and workshop unites with adjustable walls, socially connecting children participating in different activities
Infection room	22 m2			.Room for children open to infections have visual and auditorial connections, allowing all children have equal participation
Workshop	50 m2			
Senses room	22 m2		Silent Square [Tysttorget]	.Since silent zone includes therapies of relaxation, it is placed apart from main squares
Black room	12 m2			.Access to the garden , giving a natural sight to the square
Medical Play	20 m2			
Services			Services	.includes expedition room, storages, staff rooms and toilets

5.3.3.2 Enrichment > Volumes



Volumes



Activities in the play therapy refer to different abilities and therefore require different environments. The way how children perceive the environments affects how they behave, consequently it affects the tasks they are performing. In the solution, volumes are adapted to the type of the activities that the rooms are hosting, by considering the height of the ceiling, flooring, windows, lighting and connections.

. Activities involving creativity, abstract thinking: For example multi play (which hosts different activities : theater, table tennis, video games...) has an open visual contact to outside, and have higher ceilings.

. Activities requiring concentration: Study section has lower ceilings and have a closed entrance (not square) Workshop and sewing room is related with creativity but also requires focus on the task they are working with. Suspended ceiling is lowered on the working tables helping them to concentrate, also with lower task lights.

5.3.3.2 Enrichment > Socialization



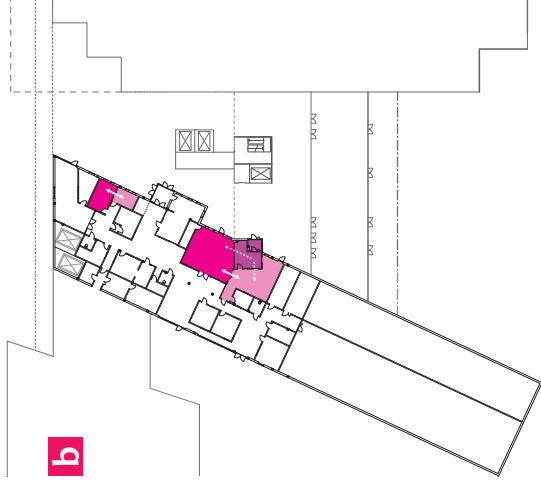
a

Visual Contact

Play therapy offers freedom and flexibility to children. When they have strict schedules during their treatments, here they can decide what they want to do, and therapists encourage them to participate in the activities. In the existing building, it is quite fluent, and while children move from one to another they see or hear other activities, and they join to try them.

In this proposal different rooms open up to the squares by windows, providing a visual connection, where children can see different activities and choose if they want join.

Figure (a) shows which spaces are visually connected to each other



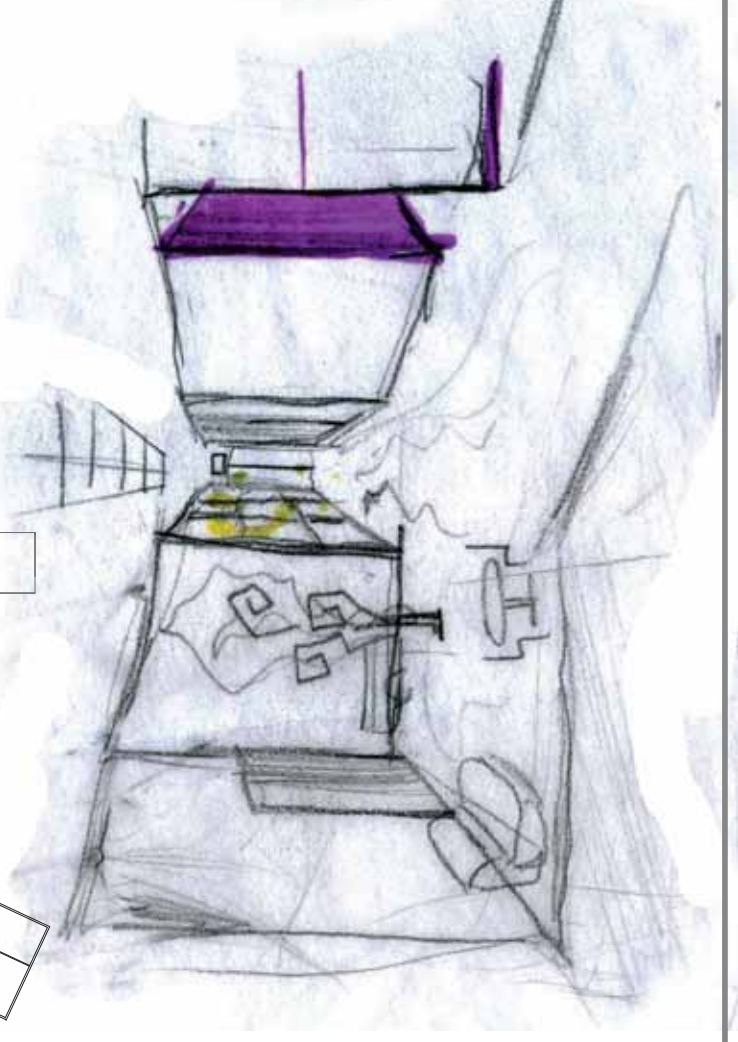
b

Collaboration

Allowing flexible openings between different rooms, increases interaction between children participating in different activities.

The adjacent rooms allowing flexibility can be also used for large activities, allowing a wider vision for supervisors when children are sharing one volume.

The infection safe room is placed in the middle of workshop and theater, letting them see (window) and hear (speakers) or join (microphones) the activities even though they are unable to participate physically.



Privacy

While allowing visual connection, the amount of connection is limited for the children participating in activities which require attention. For example while the activity in the workshop can be seen from the corridor, children in the workshop do not see the square directly so their attention is not distracted.

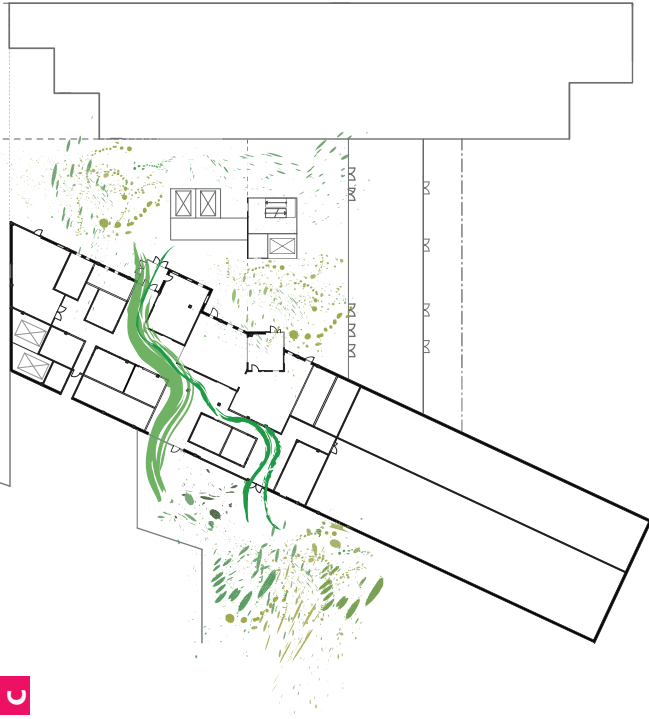
Privacy for families:

Most of the time children, especially younger ones, are accompanied by their parents in play therapy. Parents leaving their children to the nursery spend their whole day in the hospital, sitting and watching their children while they are in therapy. Knowing the presence of their families gives an emotional security to the children, the therapists say. When parents are staying for a longer time, they do not enjoy being in the middle of rush. In the existing building parents spend time in the main square. The new proposal allows them to have their own semi-privacy while the are watching their children, in an extension of the living square.

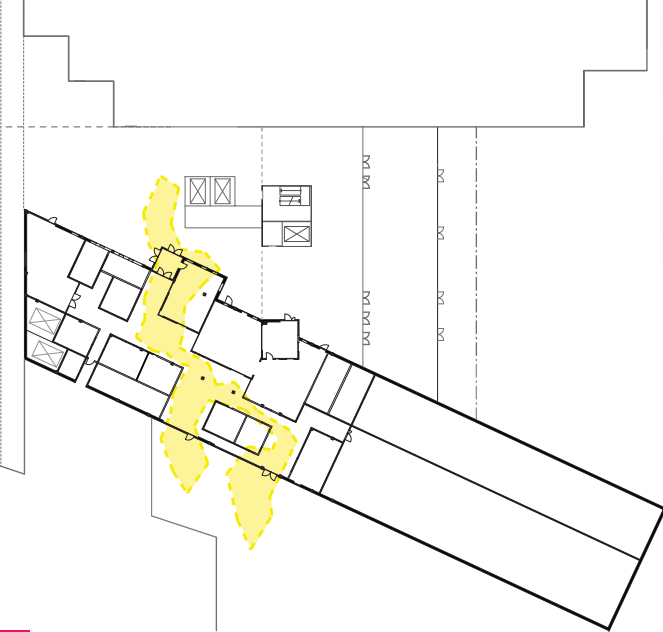


positioning inf room

c



d



Daylight

In the existing building the play therapy unit has a very poor opportunity for daylight. Studies on patients having severe depression showed that patients staying in sunnier rooms have less duration of stay.² Higher daylight exposure reduces depression and stress, which may also reduce pain, also reduces stress and increase work satisfaction² (Roger Ulrich, 2010)³. Although children are using the unit for a limited time it is important to let daylight in, especially in waiting and common areas.

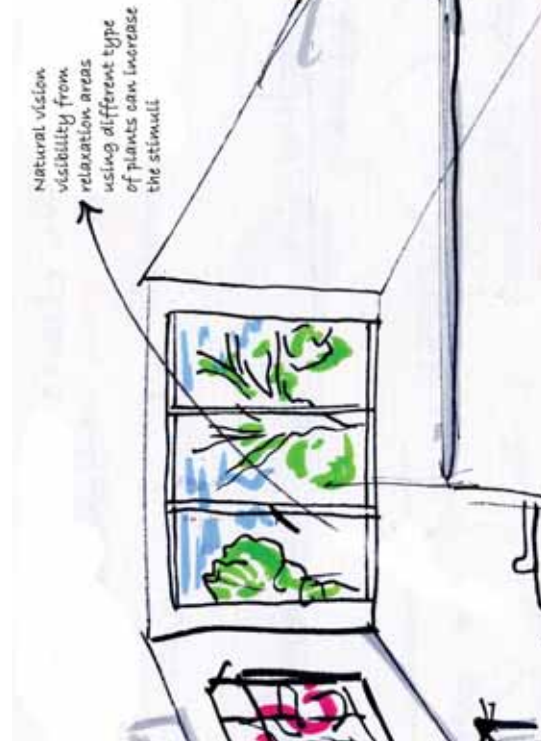
Opening to east and west allows an efficient daylight. Allowing openings between the rooms let the more light in to the squares. [d]

Natural access

“...nature whatever the explanation be genetic, cultural or a combination of the two, has a tremendously powerful impact on us human beings”¹

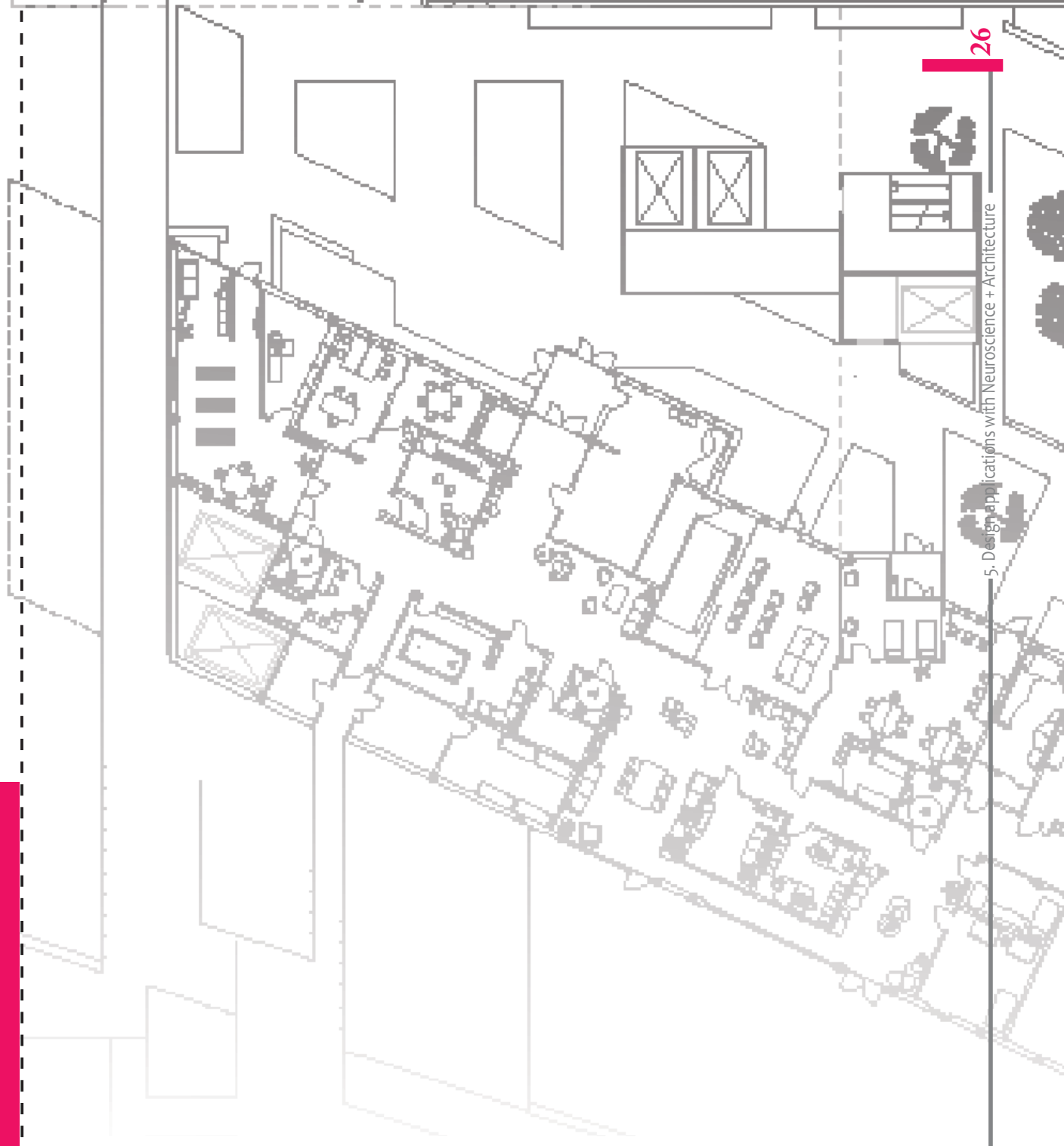
The design proposal for the new building enables children to play in green areas throughout the year, under a glazed roof in the inner yard. For the play therapy the plan is arranged to direct the children to the garden, and allowing some activities to open up to the inner yard (workshop and multi-play room) [c]. A view and an access to the nature will help to reduce the stress of patients and relatives who spend most of their time in hospital wards.

Especially in the silent square by the relaxation therapies (senses room, dark room) nature can help to increase the efficiency of the treatments, with a calm view after the therapies.



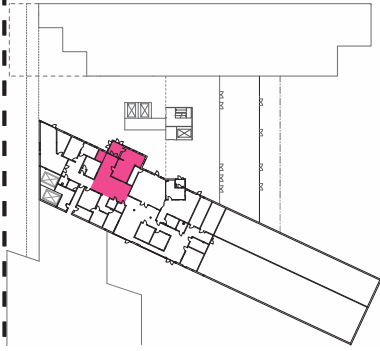
¹ Human behavior, cognition and affect in natural environment Knoph Richard C
² Architecture as Medicine, Stefan Lundin
³ Evidence based design as a Process, Forum vårdbyggnad 2010, Roger Ulrich

5.4 Zoom into plans



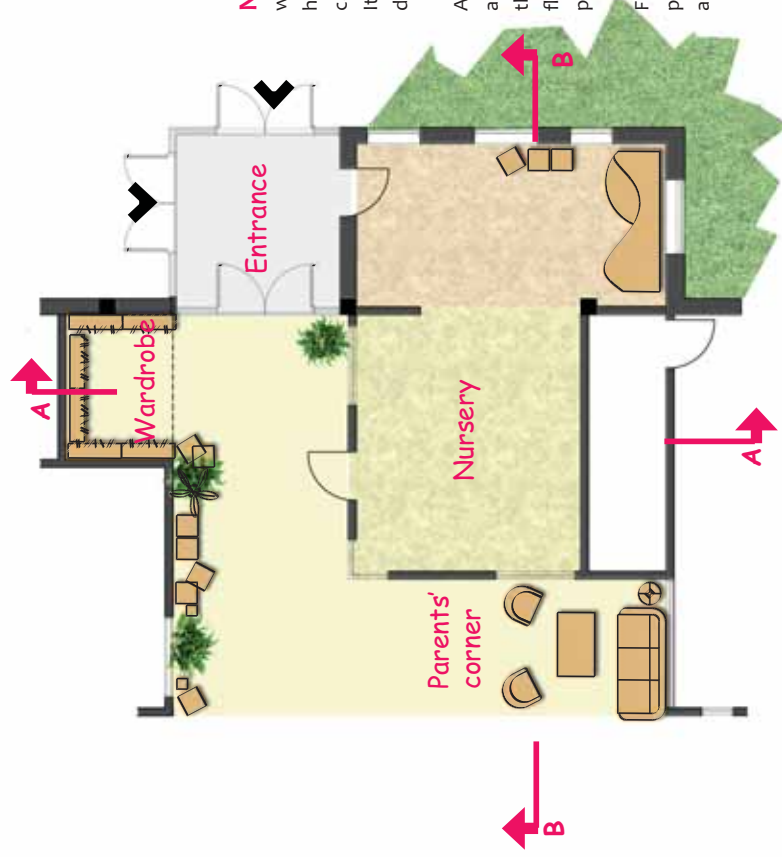
5.4 Zoom into plans

5.4.1 Entrance



Entrance from the courtyard is visible with the glazed entrance. Although an air lock is not needed for the inner yard, it can still help for leaving the mud or the shoes. The entrance hall doesn't directly see the main square but the square planning gives a wide vision to the inside.

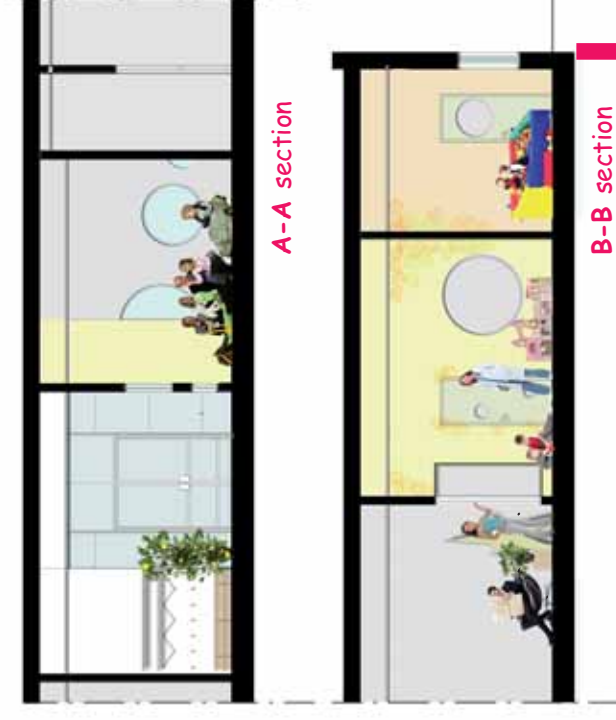
Nursery is visible from the entrance hall. After the entrance hall and the semi-private corner for parents who leave their children to the nursery.



Nursery is for children under 5 years old, where they play with various toys, legos, doll houses, or small acts with their teachers. Parents can participate in the plays with their children. It can be entered from the therapy unit or directly from outside.

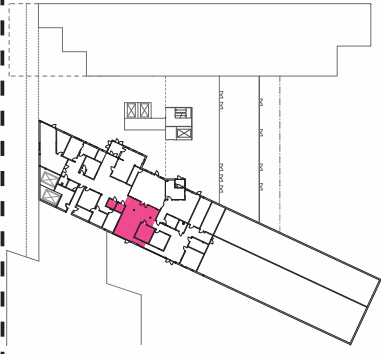
Although the nursery is one space, the half wall and color differences is suggested to make the room perceived as two spaces, allowing flexibility to arrange different activities in two parts.

For example: While some children play with free plays in ball pool, others can play with a creative activity, such as legos.



5.4 Zoom into plans

5.4.2 Living square



Living square [Vardagstorget]

It is the heart of play therapy department, where children, therapists, and families gather and meet informally, for lunch, coffee breaks, piano, or just to spend time sitting or playing.

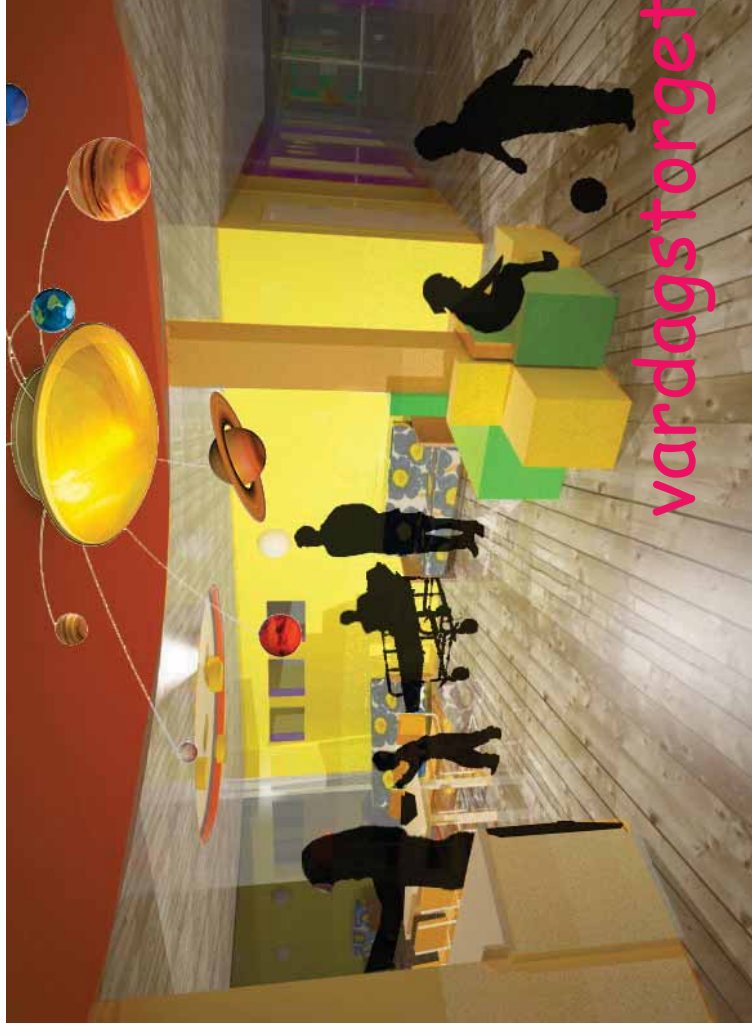
The square is visible from the whole floor, which makes it to be found easily, and being open from all sides gives possibility to the therapists to see the other squares.

The square opens to the outer garden, and fills the space with daylight. For summers it is possible to block the sun with shadings.



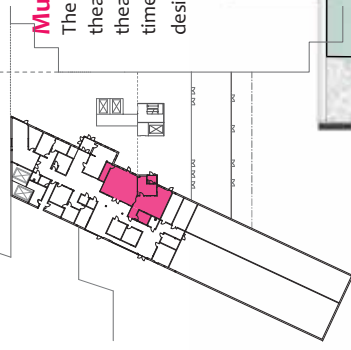
Cosy room [mysrum]

For the children between 8-12.
A room where they can spend time with the children from their age group, playing a video game, wii, watchi tv, or just to sit together.



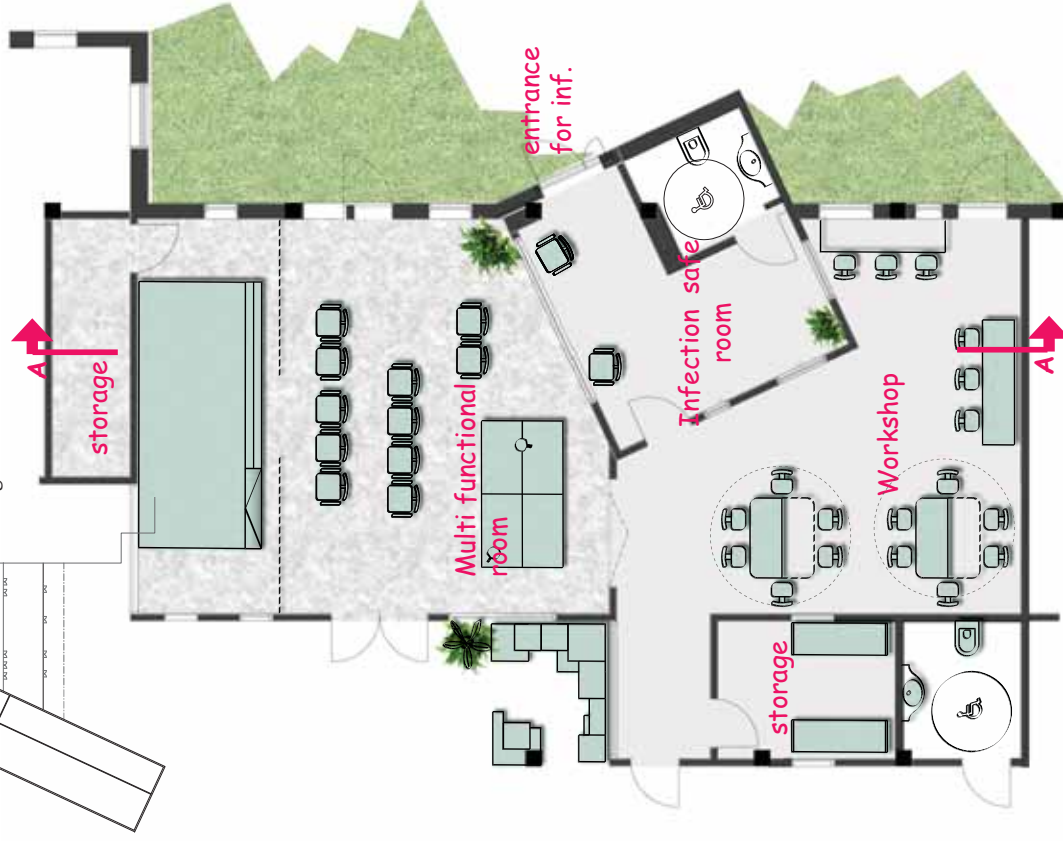
5.4 Zoom into plans

5.4.3 Multi-Play



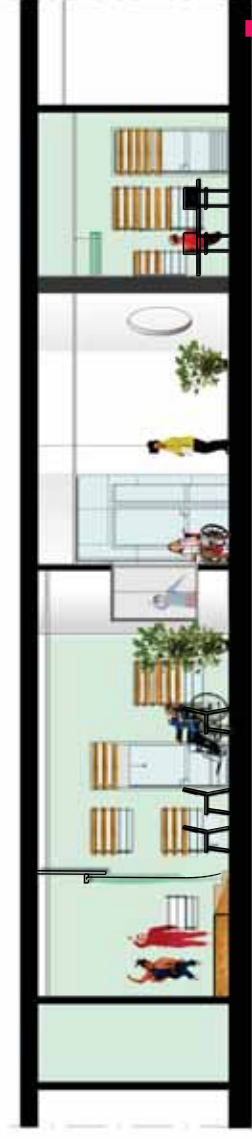
Multi Purpose room + Workshop = Multi Play [AlrumsLek]

The rooms are open for children from every age. The multi functional room hosts theaters or other group activities requiring larger space, such as table tennis. For theater and screening functions the room is preferred without daylight. Since most of time the room will be used freely, the daylight is still necessary, so the windows can be designed with blinders.

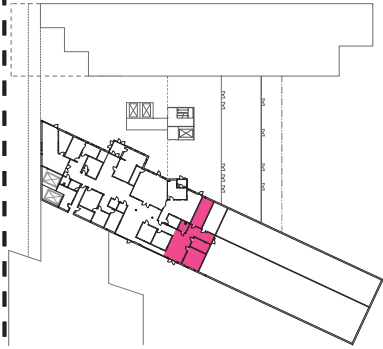


Infection safe room:

To enable all children to participate in the activities, in addition to accessibility, section for children open for infections is considered to have connectivity. Placing the room in the middle of two actively used rooms children can be part of the games, see, hear and even talk to other children with installed audio settings. So they can see the workshop, watch the theater, or sing together, without being isolated.



5.4 Zoom into plans



5.4.4 Silent Play

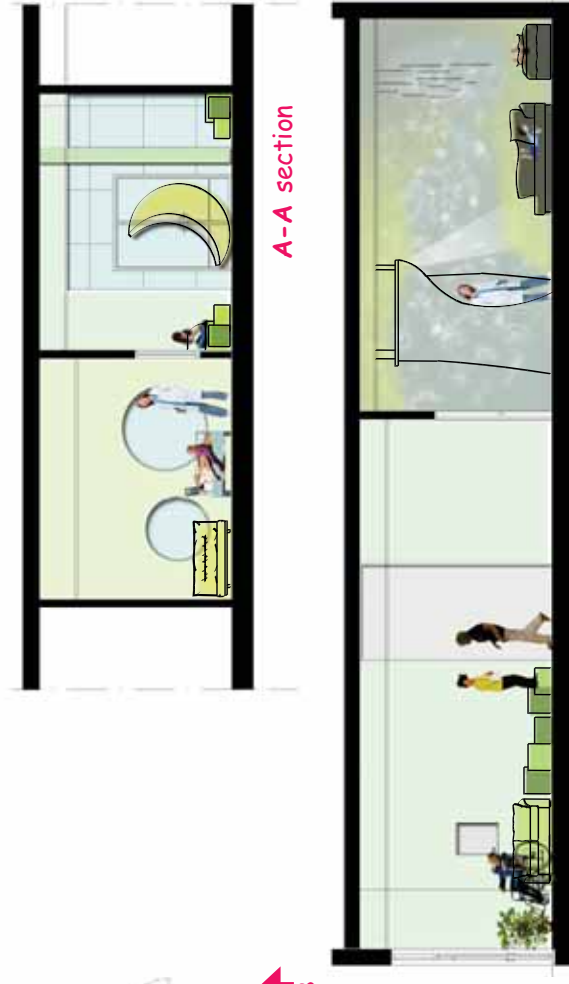
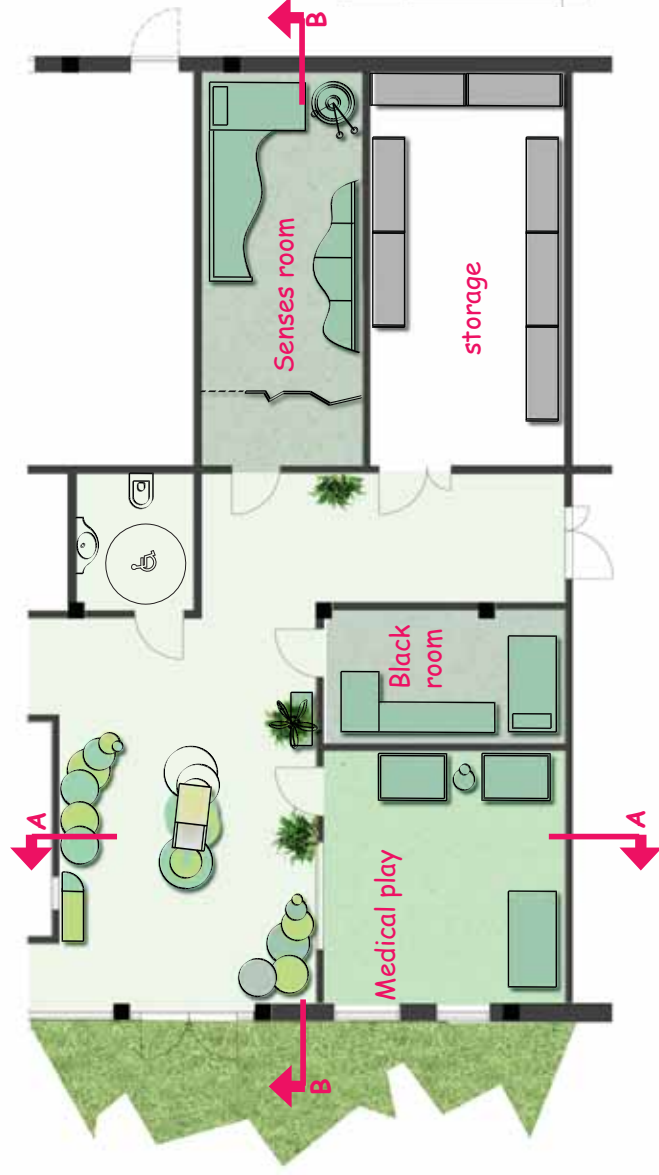
Silent Square [Tysttorget]

There are relaxation therapies, (senses room and black room) in play therapy where the children are accompanied by therapists, helping them sleep or relax. The rooms are decorated with light plays, bubble lights, projections so it is essential that the rooms are without daylight. It is a very sensual session, and after they leave the room, they are relaxed and calm so to preserve the effect of the therapy it is important to keep them calm and away from stress.

Medical Play

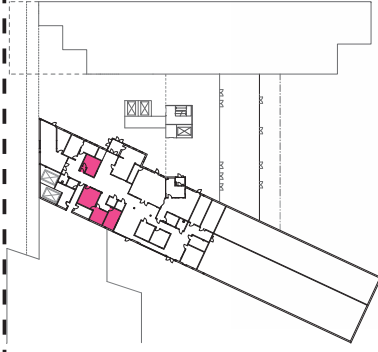
Therapists show them the functions of hospital with a play and children experience being a doctor by playing as doctors with medical toys.

To achieve a quieter zone, I chose to set a silent square away from the living square, and opening to the outer yard while taking the benefit of nature's calming view.



5.4 Zoom into plans

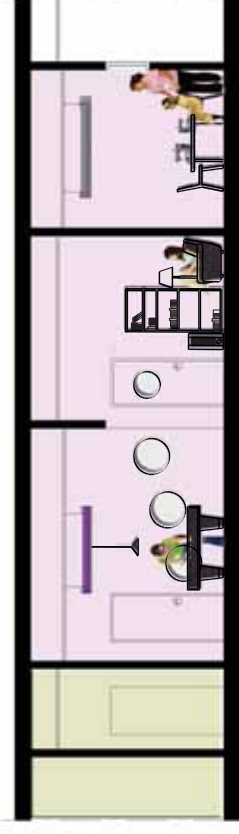
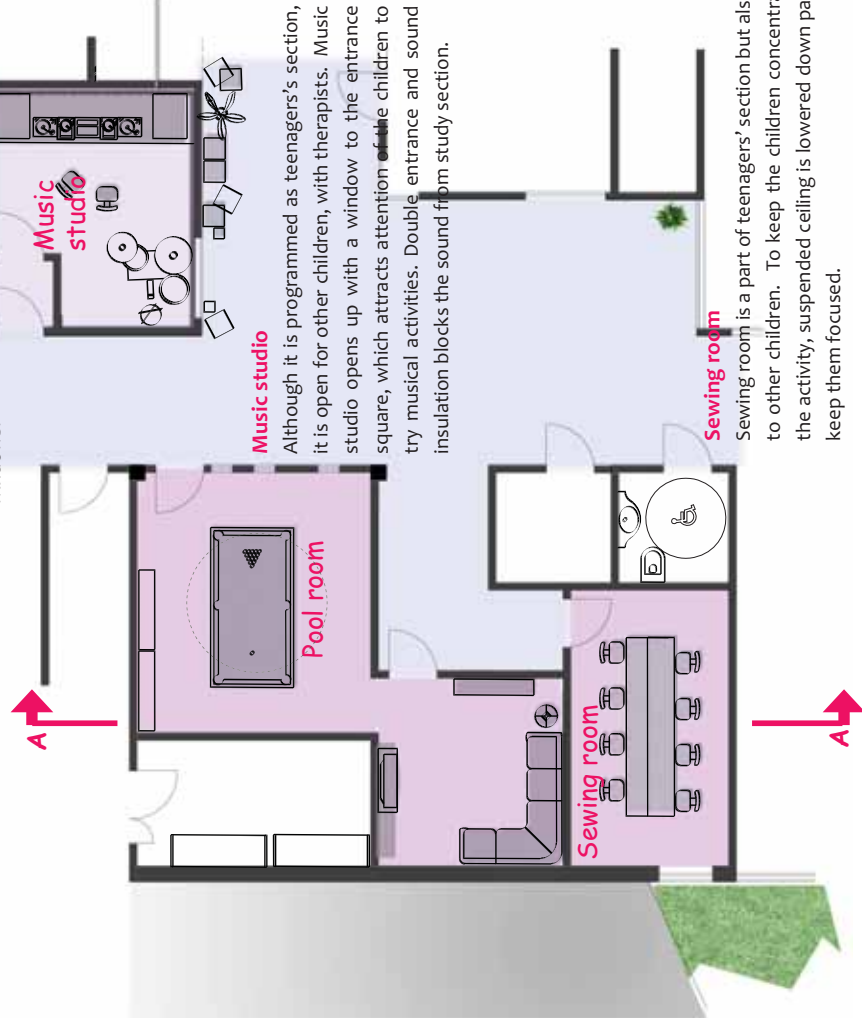
5.4.5 Teen Play



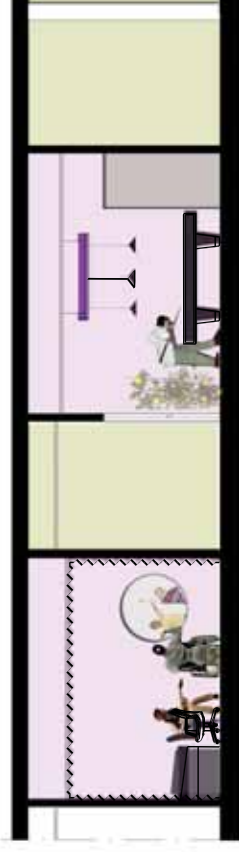
Teen Play [tonårsLek]

Teenagers from 12-25 have a separate section in play therapy. Since they are unable to go out meet outside with their friends, they can call their friends, spend time with them in this section. The room can be considered as a one unit with the living space and the billiard room but can be used separately with different group of friends.

The teenagers might ask for more privacy and since this section is only for teenagers, they have a limited visual contact with the corridor, and letting light in with higher windows.



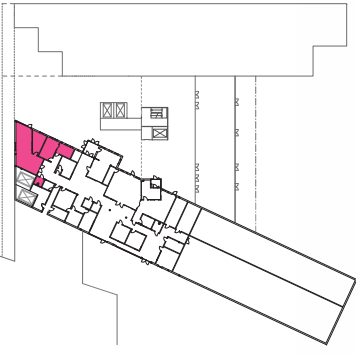
A-A section



B-B section

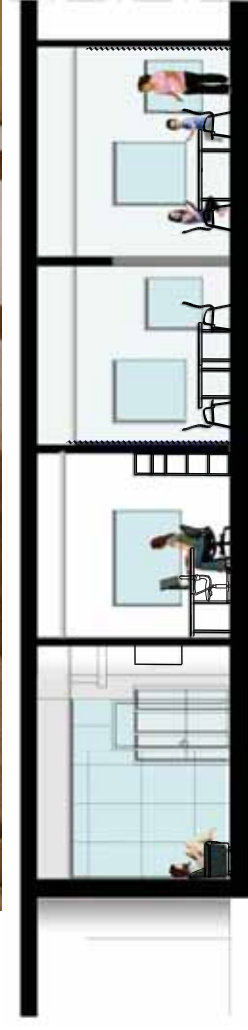
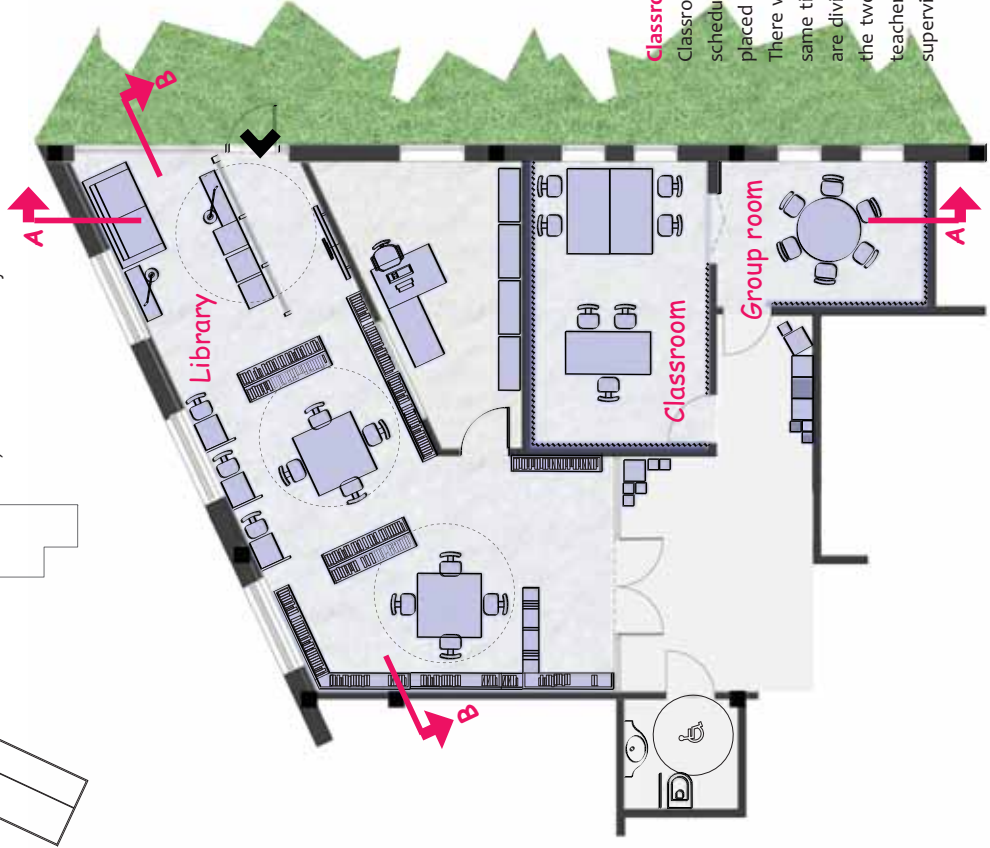
5.4 Zoom into plans

5.4.5 Learn Play



Learn Play [BiblioLek]

Learn Play consists of library, classroom, group study room and teacher's expedition. In the existing building library is accessed only from therapy unit which limits children to borrow books outside working hours. A separate entrance also visible from outside can increase the number of users and interests, even allow children to take books and read them in the inner courtyard. The library is divided into smaller sections with shelves to have smaller study units, for children to study more focused.



A-A section



B-B section

Classroom
Classroom and group room are have scheduled hours for studies and they are placed apart from the main walking hall. There will be around 3-5 students at the same time in the classroom. Two rooms are divided by large sliding doors letting the two rooms combine. For example a teacher teaching in classroom can also supervise the group study.

5.5 Conclusions



The aim of studies on neuro-architecture is how to develop architecture for better environments for the users. In my thesis zooming into children and healthcare environments I found the opportunity to think for children, seeing the spaces from their perspective and how to create better environments to help their healing process.

The application project is an example of how the information can be applied. I can also say that it is still a rough design since every sub topic of application is a wide topic requiring deep studies to give accurate answers. However it still helps to awaken new perspective to think from child perspective, considering influences on their brain and how to improve spaces to empower their development.

FAQ.

*** Frequently asked questions section is the sum and conclusion of the questions I received after my presentations and with my personal additions about what I got from my thesis, research and new design skills.**

How we benefit from neuroscience?

Learning neuroscience and how the brain is connected to environments opens another perspective to architecture.

Can neuro-architecture be a key generator for starting a design?

No. In brief, neuro-architecture is not an architectural concept. We can not start a design, saying we are going to build a "neuro-architectonic building", same as we don't start the design as "acoustic building". **Neuro-architecture is a tool**, such as any science or methods that supports and develops architecture. It is about brain, how we are affected by our surroundings and how we can change/motivate the effect in a positive way.

How do we apply the principles to healthcare?

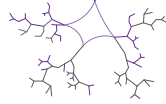
Play therapy is a part of healthcare unit. The sub topics, way finding, enrichment, privacy are closely related to the overall design of hospitals. In my design part, when I was connecting research part to architectural design, I searched through principals of healthcare and filtered them to one single department and deepened a new research on the related department. To adapt the principals to the other departments, the same topics of neuro-architecture are going to be applied but an additional research within use of other departments is needed.

How would the design look like if you didn't know about neuro-architecture?

Probably I would consider it as another part of hospital, search on existing hospitals, make some observations on the existing unit and add my architectural design approaches (which were not deeply focused on user brain before). In other words, it would satisfy the architects, but wouldn't evaluate the wellbeing of the patients by architectural design.

Will you use your research on other fields? Or can you use?

Yes! Because any building affects the brain and the parameters are relevant to everyday life. For example, we need wayfinding, in a hospital, in school, airport. We should avoid stress in schools, offices, and houses. We need concentration, relaxation, orientation... So if it is possible to do better, why not to use the information? ■



.Enriching healthcare environments for children

.Cagil Kayan .Master Thesis .Examiner: Peter Fröst .Chalmers Architecture .VT2011

thank you!

you can also check www.neuroticarkitekten.blogspot.com
to see the progress and see relevant topics about neuro-architecture.