

## Abstract

This report presents the idea of making a Snoezelen inspired environment for a single person use to be placed in an institutional context. The intention is that it should have a relaxing influence on children with ADHD. The initial hypothesis stated that, "by using the Snoezelen theory, we can create a prototype that will help children with ADHD, within an institutional context, become more balanced and socially included in their everyday life." This project is using interviews with a Snoezelen Consultant, Social Educator and a learning support teacher to find out how children with special needs are using and reacting toward Snoezelen installations and similar sensory stimuli. We have used this knowledge to produce a prototype that we unfortunately not have been able to test within the time limit of this semester. The interviews, combined with our knowledge from the "review of literature" indicate though, that the concept of a Snoezelen inspired cave will have a positive effect on children with ADHD in an institutional context.

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Next we owe a lot of gratitude to the three experts we have interviewed;

Majbritt Lind, Social Educator and leader at “Kornvangen“, Esbjerg who took the time to give us a guided tour at their Snoezelen house. Her contribution led us in the right direction regarding the theory of arousal.

Gitter Andersson, Social Educator and Snoezelen Consultant at “Guldhornet“, Skanderborg, who prioritized to spend two hours with us during her already busy day. She gave us useful input on the Snoezelen theory and how we could benefit from this in our prototype.

Kari Brinch, former learning support teacher to children with ADHD, now a fairytale-guide at Fyrtojet in Odense. She gave us a guided tour of this fantastic house and she was a really big help in our understanding how children with ADHD react to storytelling.

In addition we would like to thank Eva Petersson, Tony Brooks and Helle Jørgensen for supervision and inputs during the semester.

## Introduction

BISI – Building Interfaces for Social Inclusion is a special cross-disciplinary semester that is possible to attend during the fourth semester in Medialogy. It aims at creating welfare technology for people with special needs. In accordance to the specified demands within the scope of BISI, the group will in this report research the following question:

- How can we help children with ADHD to relax and become more balanced in their everyday life?

Since the 1970s the idea of Snoezelen rooms / houses has been adapted into many countries. The use of these installations is to create well-being for people with special needs by using multisensory stimulation (Mertens 2008). Together with the theory of arousal and its effect on attention and emotions (Derryberry and Rothbart, 1988) in people with ADHD (Attention Deficit Hyperactivity Disorder), this report describes our aim towards creating of a prototype called the “Rest Nest”. The “Rest Nest” will be inspired by the Snoezelen theory and will combine multisensory stimuli along with the musical therapy approach MusiCure. MusiCure is especially designed to make people relax by providing “Musical allegories” (Lundquist 2008).

We hypothesize that:

- By using the Snoezelen theory, we can create a prototype to help children with ADHD, within an institutional context, become more balanced and socially included in their everyday life.

To reach this goal, the group will introduce the sensor classification theory by Mulder (1994) in order to sort the different requirements for a prototype. Additionally the planning phase of the prototype and the development through specialists from the institutions “Kornvangen”, “Guldhornet” and the “Tinderbox” will be included. As it has not been possible to plan the test of the prototype before the project hand-inn we will treat the interviews with these specialists and our experience of their institutions as our result. In the discussion section the group will discuss the experts’ suggestions and theory related to our initial prototype idea.

## Review of literature

This chapter presents the special semester Building Interfaces for Social Inclusion (BISI). The focus will be on the special aims, participators and demands we have worked with this semester. Afterwards the concept of Snoezelen houses/ rooms and the use of them worldwide are presented. The theory of arousal and its relation to ADHD will be established by introducing the Low-Arousal Theory in order to clarify the needs of our target group. We will then present some aspects of music therapy as it has shown to have a positive influence on the users in Snoezelen houses but also in general healing-and recovery processes on hospitals. Finally there will be a brief introduction to Sensor Classification by Mulder (1994). The Sensor Classification will be used as background theory for building the prototype in order to create a blueprint.

### BISI – Building Interfaces for Social Inclusion

“Tomorrow’s professionals are also BISI professionals”<sup>1</sup> is the heading on the site of the new multi-disciplinary international semester that the group attends. BISI focuses on creating welfare technology in a cross-disciplinary based semester; this includes students from Social Educators<sup>2</sup>, Medialogy<sup>3</sup>, IT- and Electrical Engineering<sup>4</sup> across different locations in Denmark. The students are divided into groups of approx. 5-7 students with representatives (ideally) from each education. The goal is that through the comprehensive cumulated knowledge new and innovative ideas will be generated. In the end of the semester each group should present a prototype of a product that aims towards enhancing the quality of life to children with disabilities.

The actual teaching is organized within each specific educational programme and at four BISI-camps (2-4 days each) spread throughout the semester where the students and lecturers from each education meet and attend different presentations, workshops and

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<sup>1</sup> <http://www.bisi.dk>

<sup>2</sup> <http://www.ucl.dk/>

<sup>3</sup> <http://www.esbjerg.aau.dk/>

<sup>4</sup> <http://www.eal.dk/eal/site.aspx?p=23>

social activities related to the projects. At each camp, representatives from several companies and one social institution “Platanhaven<sup>5</sup>” have given inspiration, input and feedback on the process. The companies are:

- “Birdhouse”, that sells disability equipment for children and young people.
- “Flexus”, a communication software company that focuses on people with cognitive disabilities.
- “Mikroværkstedet”, develops and sells educational software for children with special needs
- “Intertisement”, software company that the uses newest technology to optimize visualization solutions.

“Platanhaven” is a public social institution for children with both mental and physical disabilities in the age range from 0-7 years-of-age. A key value in the institution is that the everyday training should only be carried out through play. In the beginning of the semester “Platanhaven” presented 8 cases from their everyday life. The cases represented specific problems some of their children experienced every day i.e. holding a pencil, getting in and out of a swing etc. The cases were meant to be inspirational to the projects but it was not mandatory to help out the specific problems mentioned.

The project solution has to follow six BISI-criteria:

1. It is an interface that can offer those who are impaired/disabled as well as those affected by their disability (e.g. healthcare staff/therapists, family etc) new opportunities toward an improved situation that could give benefits - e.g. functionality (psychophysical, physical or cognitive), communication, social inclusion and contact, (micro)development.
2. It helps and assists the user in their everyday life, and/or enforces the user’s possibilities for aesthetic expression/impression, self-expression and/or communication.

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<sup>5</sup> <http://odense.dk/web2/platanhaven.aspx>

3. It may be playful and interactive and thereby increment quality of life and offer progression (or decrease regression).
4. It is an interface, which expands the ability of interaction towards broadening the world of the end user in many different ways.
5. There must be a focus on social inclusion
6. It must have an innovative touch  
([www.bisi.dk](http://www.bisi.dk))

These six criteria and how we have met these, will be further discussed in the “discussion” section

### Snoezelen Room

A Snoezelen room is a sensory room developed for relaxation; it typically combines lightning effects, colour, sound/music, various interactive instruments and different structured surfaces and fabrics to give the user an exiting experience in the house (Mertens, 2008, p.9).

“Snoezelen is the production of well-being through controlled multisensory stimuli in a specially designed environment” (Mertens, 2008, p.11)

The word *Snoezelen* is a combination of the Dutch words “snuffelen” and “doezelen”, they mean to sniff and to doze (Andersen et. al., 1994, p.10). The term snoezel and the use of Snoezelen rooms originated in the Netherlands in the 1970s (Mertens, 2008, p.9). The idea behind the Snoezelen room is to provide a controlled sensory experience for the user.

Andersen et. al. (1994) describes the usability of a



Picture 1 Light installation, “Kornvangen” Esbjerg

Snoezelen room as enhancing the sensory perception of a disabled human being without exposing it to the various stimuli of real life. Regarding the user group, Andersen et. al. (1994) mention people with disabilities, especially children in this case, have gaps in their sensory apparatus, hence everyday experiences may seem so intense and overwhelming that they are shutting their sensory inputs off and thereby isolating themselves from the real world. The Snoezelen room hereby acts as a safe and inspiring environment, which animates the user to explore the surroundings whilst being empowered to have a degree of control, thus stimulating the development of the used senses. The aspect of a safe environment has been a key point from the start of the project. Our prototype should provide an environment where the user can explore his/hers imagination by stimulating his/hers senses primarily through audio and video. For further explanation on our prototype, see the “prototyping” section.

Through the last decades a pedagogical discussion has emerged. People with disabilities should not only have the same civil-and human rights as others but there should at the same time be an emphasis on also improving their quality of life. This could be done by i.e. giving them more choices in their every-day life and the possibility to enjoy life in general. The Snoezelen rooms are developed in parallel to this discussion (Andersen et. al., 1994, p.16). This quality of life approach is also emphasized by Mertens (2008); she underlines the important role of the carer/teacher to be well informed and understanding of the user’s needs and wishes. Gitte Andersen and Majbritt Lind in the Snoezelen houses in Esbjerg and Skanderborg describe that the process with the users is more important than keeping a fixed plan for the day. The intention of having a user-controlled experience is one of the approaches the group is aiming for in the project. By giving the user the ability of choosing the length of his/her stay in the prototype they only stay for that individual time they themselves feel stimulated.

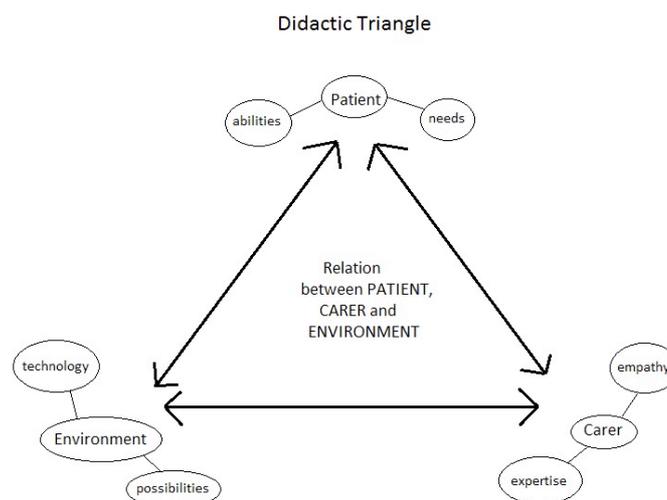
Today, the usage of Snoezelen room’s and its therapy form is accepted around the world and many different countries such as Denmark, Germany, Japan, USA, Great Britain, Australia and many more have their own Snoezelen houses (Mertens, 2008, p.10). In addition, there is also an international Snoezelen network.

## Using Snoezelen

The primary usage of a Snoezelen room works as a guided experience between the carer and the user towards a goal. This goal can be defined as wellbeing or relaxation in general but can also be narrowed down to specified sensational experiences, such as feeling, smelling or seeing. The choice of how the rooms are used is decided both by the carer and the user by a direct/indirect communication. The “Rest Nest’s” focus on giving the user a relaxing and immersive experience through an audio based stimuli, which is supported by pictures/animations and limited tactile stimuli such as having the children laying on a plastic-ball madras. For further elaboration on our prototype, please see the section “prototyping”

Mertens (2008) underlines that it is important that the carer has a basic understanding of neurology since the Snoezelen experience is based in neurological stimuli and the desired effect depends on the guidance through the different stimuli. Mertens explains that the Snoezelen shows its effects through a Didactic Triangle “... the effect, the desired result or the successful intervention develops in a harmonic relationship between the designed *environment*, the *patient* and the *carer*.” (Mertens, 2008, p.13).

As a pedagogical and therapy based experience according to Mertens (2008), the carer must have the ability to acquire knowledge about the Snoezelen through literature. Their emphatically skills on the other hand are vital towards a successful treatment. “The carer is



distinguished through his or her emotional warmth and sympathy.” (Mertens, 2008, p.21). The group is in line with

Figure 1 Didactical triangle, figure made by Med-4 H208

Mertens (2008) that the carer should be aware of the special needs children with ADHD have and should further give the child a safe and comfortable feeling. Since the “Rest Nest” is designed to be placed in special needs institutions and possibly at private homes it should fit both the carer and the user, so that the carer can comfort the user in it if necessary. We have had that in mind in the design process.



Picture 2 Technical Room, “Kornvangen” Esbjerg

Another aspect of the Snoezelen rooms is the technical side. The carer must not only be an emphatic and theoretical trained person but also be able to use the technical side of the equipment, Mertens (2008) points out. This is also

mentioned by Majbritt Lind from “Kornvangen”; many parents who rent the Snoezelen house have problems with operating the technical gear. The problem of technical expertise was taken into consideration and the group has agreed that “Rest Nest” should be as easy to use as possible. This could be reached by implementing sensors to start the “Rest Nest” automatically when the user enters the device or a user interface, similar to the one in “Guldhorner”, where the user or carer chooses between preset themes and only the music have to be added.

## Arousal

In everyday life, arousal plays a central role to human beings. The degree, to which a person feels thrilled or bored, to name two extremes, reflects directly on their arousal. To give an example; some people may get aroused by jumping out of an airplane in a parachute and not so much sitting in a classroom listening to math. Parachuting is, in their view, considered an intense experience hence adrenalin is pumped through the body. Some people might even be aroused just by imagining such a thing. Math on the

other hand is a different and not-life threatening experience of knowledge which demands a certain amount of understanding of theoretical principles. It might be difficult to understand and hence lower the feeling of thrill. This example could just as well have given opposite reactions in another human being and that is why the theory of arousal is complex. These examples give an idea of how arousal can be experienced. Arousal is the force, which makes us pay attention or feel different emotions depending on our likes and dislikes for certain activities. Derryberry and Rothbart (1988) explain that arousal is in direct correlation with emotion and attention. The attention we feel is partly determined by the arousal we feel for a certain thing, the “Rest Nest’s” aim is to generate arousal through the different stimuli, described further in the section “Snoezelen Room”, thereby relax the user and give a better basis for the everyday social life.

Derryberry and Rothbart (1988) point out three arousal types in and their impact different personalities: extraversion, introversion and neuroticism.

“Compared with extraverts, introverts are said to possess greater tonic activity in their ascending reticular activating system (ARAS) and to therefore possess more reactive cortical pathways. As a result of their greater reactivity, introverts attain an optimal level of arousal (Hebb, 1955) at relatively low levels of stimulation and thus enjoy and approach milder forms of stimulation. Compared with stable individuals, neurotics are said to possess more reactive autonomic nervous systems, to demonstrate heightened sympathetic arousal, and to thus show stronger and more variable emotional reactions.” (Derryberry and Rothbart, 1988, p.958)

The theory of arousal and emotions has been discussed intensively within temperament and personality research. “Although theorists such as Eysenck (1967, 1981) view emotion as resulting from arousal, others emphasize emotion as a cause of arousal. For example, Gray (1971, 1981,1982)...” (Derryberry and Rothbart, 1988, p.958). We used this argument not to discuss whether arousal is evoked one way or the other, but to give a basic understanding of what arousal is and how it correlates with other factors in everyday life. Arousal is the leading psychological state, which determines if a person is

getting engaged. Using sensory stimulation to engage the arousal of the user and thereby stimulating the imagination and relaxation in the purpose by using arousal.

Through the different aspects presented by (Derryberry and Rothbart,1988 ) it is possible to identify three archetypes with different arousal patterns:

- 1) Introvert: Attain an optimal level of arousal with a low level of stimulation, sensitive to signals of punishment and non-reward. Characterized by anxiety behaviour
- 2) Extraverts: Opposite of introverts, need a high level of stimulation to maintain optimal arousal, more sensitive to signals of reward and non-punishment. Characterized by impulsive behavior. (p. 958)
- 3) Neurotics: Strong correlation between emotional stimuli and arousal level

The attention - arousal correlation is especially interesting due to the close symptoms defining ADHD positives. According to Johnson and Proctor (2004, p.41) excessive impulsivity, impairments in focusing attention and hyperactivity are main characteristics of ADHD. The lack of attention is caused by low arousal, so in order to arouse them, people with ADHD start to be physical active. In activities where a high degree of focus and attention is needed, this physical activity is counterproductive.

## ADHD

ADHD is a diagnosis with three core elements, attention problems, hyperactivity and impulsive behaviour (Damm and Thomsen, 2006, p.11). Each of these core elements has distinct criteria:

Attention Symptoms; the person:

- Misses details in schoolwork or other activities
- Has problems in staying focused on a assignment
- Appears not to be listening
- Has problems in organizing work or activities
- Avoids tasks, which needs long-term concentration
- Looses or forgets things necessary for activities
- Is easily distracted by the surroundings

- Is forgetful

Symptoms of hyperactivity, the person:

- Has fidget behaviour
- Has problems to work or play quietly
- Appears to always be active
- Talks often excessive

Symptoms of impulsivity; the person:

- Often answers questions before the questions are finished
- Often has problems to wait on once turn
- Interrupts or intervenes in conversations

These criteria are part of the ADHD diagnosis stated in Damm and Thomsen (2006, p.11-12) and is raised through observations, questionnaires and interviews with the patient and their family.

ADHD is primarily diagnosed in the childhood and a child will have to meet a number of the mentioned criteria, further it is important to notice that ADHD only is diagnosed if any other disorders are more plausible.

The ADHD diagnose helps to understand the special needs of the target group. When understanding these needs, the group is able to decide, which kind of sensory stimulation to include in the prototype.

## Low-Arousal Theory

According to Johnson and Proctor (2004), the Low Arousal Theory is one way to explain ADHD's impact on everyday life. "This theory maintains that people with ADHD have abnormally low arousal levels, which means that they seek external stimulation in order to keep themselves as aroused as possible."

([www.brighthub.com/mental-health/adhd-add/articles/110202.aspx](http://www.brighthub.com/mental-health/adhd-add/articles/110202.aspx), retrieved

28.03.2011). Further they state, that impulsive behaviour is correlated with low arousal. Inattentiveness caused by a lack of stimulation through the environment is leading to impulsive behaviour in order to increase the stimulation.

## MusiCure - Music Therapy

The term and therapy method MusiCure was developed by the research group "Musica Humana" and composed by Niels Eje. MusiCure is a scientific approach to music as a supportive therapy in different psychological conditions such as anxiety, restlessness or sleep problems (Lundquist, 2008, p.6). MusiCure is especially developed to relax people and make them feel better by stimulating them mentally. According to Niels Eje, cited in Lundquist (2008) the music should remind the user of "music allegories" rather than known genres. The music therapist Torben Egelund Sørensen supports the scientific background of MusiCure by explaining that sound reaches the middle brain through the ear and there activates different feelings. MusiCure is music with nature sounds with a floating rhythm and few contrasts. By listening to relaxing music, the brain sends the sleep regulating hormone melatonin into the body to reduce the stress level. This can be measured by the decrease of the stress hormone kortisol. Easy implementation of MusiCure and music in everyday life situations, is one point of the success, another point are the results gathered by working with music therapy in general. According to Lundquist (2008), patients can often avoid using medication or decrease the medication needed for different treatments to stimulate their wellbeing.

MusiCure does not only work for ill people but can also stimulate the wellbeing of healthy people by relaxing them and enhancing their mood.

The approach of MusiCure is of interest for us, because it is used in a high degree to relax people in different conditions, both after an operation in a wakeup room but also within movement therapy. MusiCure is used by Snoezelen houses to create the characteristic relaxing moods within different theme-rooms. There is a variety of MusiCure CD's available and for the "Rest Nest" has been chosen a fairytale CD to activate the users imagination and evoke relaxation.

### Sensor Classification

According to Axel Mulder (1994) the use of sensors can be classified into three categories; inside-in, inside-out and outside-in. These classifications can be used as a guide for the sensors used within a certain project, and thereby create an easy-to-access listing of sensors.

- "Inside-in systems are defined as those which employ sensor(s) and source(s) that are both on the body..." (Mulder, 1994, p.4). These sensors have usually a small form factor (SFF), SFF means the device is smaller than the devices usual used, and therefore are better for tracking/measuring smaller body parts. Inside-in systems could cover a sensor glove, both the sensors on the glove and the glove is located on the body.
- "Inside-out systems employ sensor(s) on the body that sense artificial external source(s)...or natural external source(s)..." (Mulder, 1994, p.5). Systems like this could include head mounted tracing devices using external sources as references.
- "Outside-in systems employ an external sensor that senses artificial source(s) or marker(s) on the body, e.g. an electro-optical system that tracks reflective markers, or natural source(s) on the body..." (Mulder, 1994, p.6).

Mulder describes the usage of human movement tracking systems and the different technology involved such as; the sensors and/or markers (body), sensors and/or markers

(external), computer interface-electronics, computers, the human and the representing data.

Although Mulder focus his work in tracking systems, we put an emphasis on his use of sensor classification as a useful scientific method in order to validate and reconstruct pre-existing experiments. Mulder's sensor classification is also interesting in the context of which sensors we can use for our prototype. With a list of sensors and their classification, the choice of what kind of sensors to use can be optimized.

### Summary

The "Review of Literature" has presented the reader for the BISI semester and its purpose to create an interface for social inclusion and the demands to reach this goal. The concept of Snoezelen rooms, a multisensory room for relaxation, and the guided use by carers is introduced. The theory of arousal and its relation to different personalities is outlined together with definition of ADHD and the Low-Arousal Theory, which correlates to ADHD. The Music Therapy section introduces the reader to the MusiCure therapy and the scientific validation of music as a therapy tool for supportive treatments alongside medications. The last section gives an overview of sensor Classification and its use to recreate pre-existing experimental conditions.

## Method

The method chapter will give the reader an overview of the prototyping, from the planning phase to the idea development. In the end of the chapter there will be an estimation on the possible hardware and software implementation for the prototype.

## Prototyping

The Prototyping was divided into two parts, high fidelity prototyping and low fidelity prototyping (Sharp, Rogers and Preece, 2007, p.531-536). During the BISI camp, the group explored different approaches to build a device, which should include the different features from both Snoezelen and the sound/narrative aspect of the project.

The idea for the high fidelity prototype was to create an apple formed shell out of plastic or lightweight metal, which would act as a foundation to mount the different technical devices. The idea of forming the prototype as an apple was to pick a form that would be recognizable and hence not scary to the children.

The animations and pictures within the prototype could either be presented on a mounted screen on the inside of the shell or a projection upon a white background. The audio part, mentioned in section MusiCure – Music Therapy, would be delivered through



Picture 3 Graphical User Interface "Guldhornet" Skanderborg

speakers. Both audio and video will be activated through a force pressure sensor when the child goes inside the prototype and be operated from the outside via a Graphical User Interface. This could be a tablet and by implementing symbols and colours as guide easy use will be guaranteed. The initial idea for the prototype was to address one

user, but the size, according to the experts, should fit for both a child and adult in order to introduce the child to the device.

The low fidelity prototype differs from the high-fidelity by consisting of a white inner tent so that a projector can project the video on the surface, the audio is be presented via speakers from the outside of the tent. In front of the tent, a large piece of cardboard shaped like an apple is placed to give the

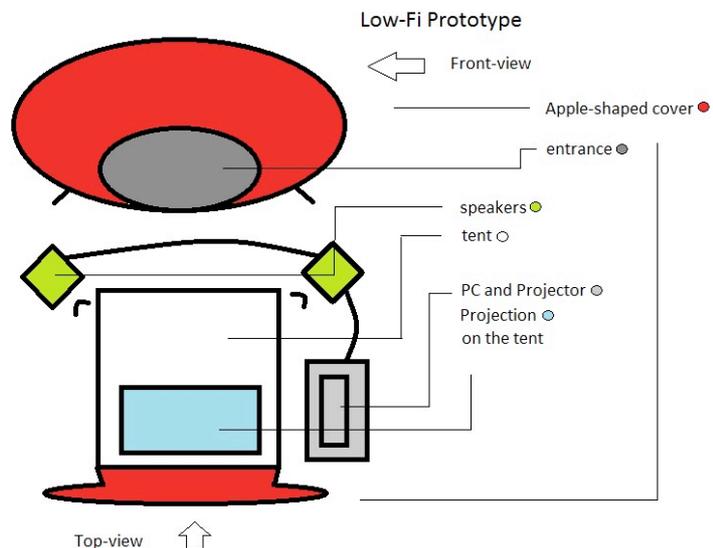


Figure 2, Low Fidelity prototype, figure made by Med-4 H208

same visual representation as the high fidelity prototype. Inside the tent is a mattress, which simulates the bean bag. The system is not activated by a force pressure sensor but instead one group member starts the device.

## Planning Phase

The planning phase for the prototype started in the beginning of the semester during the BISI camp. The groups have been introduced to the different cases by the participating institutions.

## Idea Development

Through the planning phase at the BISI camp, the group founded the initial idea; the “Rest Nest”. Being inspired by “Plantanhaven”, where one of the children had difficulties calming down after playing with the other children (both indoor and outdoor), and getting rest in the rest phase (they had a quiet time in between the play phases).

The “Rest Nest” should be a place where the child could relax in an engaging way, using Snoezelen as the main idea for stimulating the senses and hereby evoke the

comfort and safety of a “real” nest to make the user relax. The group discussed that the therapeutic features of the Snoezelen could be used to enhance the relaxation quality of the user. This should be done without decreasing the core meaning of the case presented by “Plantanhaven.

After a short discussion on what technology should be included to reach the goals, the group started to plan the physical properties of the device. We followed the proposal of the Social Educators students, Trine Bramm and Lina Amankavičiūtė, to form the shape of the device like an apple, so the children could relate to the device in a playful and positive way.

We used a lifecycle model (Sharp, Rogers & Preece, 2007, p.448) to re-design and re-evaluate the prototype according to the information we gathered. The lifecycle model has been used continuously to adapt to the new information acquired. Two pieces of information had a major impact upon the project. In the interview with Majbritt Lind from the Snoezelen house “Kornvangen” in Esbjerg, the group gathered their first firsthand impressions on what a Snoezelen house is like. During the interview, Majbritt Lind emphasized the importance of arousal and how arousal is related to ADHD. This gave the group one key-aspect in understanding the user’s needs, so the initial idea got a strong theoretical foundation.

Through the interview with Gitte Anderson from “Guldhornet” in Skanderborg information with impact on the design phase was obtained. The idea to develop a device, suitable to only host one user, was criticized by her with the argument that people with ADHD usually have problems to fit into social structures. Being alone in the cave could make them feel lonely and isolated. To avoid this, Gitte Anderson recommended designing the device to support 2-3 users with complementary personalities, see chapter Arousal. By giving persons with complementary personalities a shared experience, according to Gitte Anderson, the users are gaining a more distinct and social stimulating experience.

## Software and Hardware Implementation

The implementation of software and hardware for the low fidelity prototype is limited to the basics in order to quickly create a working prototype.

Hardware specifications:

- PC
- Speaker (Standard stereo sound)
- White inner tent
- Projector
- Mattress

Software specification:

- Software capable of playing both audio and video (Windows Media Player, Winamp)
- Music (MusiCure)
- Animation (Windows Media Player animation)

Late in the project it was brought to the group's attention that it could have been possible to make a functioning low fidelity prototype including force pressure sensor and different interactive features to enhance the user experience. The audio/visual software tool Max/MSP is providing the capability of programming an interactive setup including live feedback from sensors and interactivity between the software and the prototype. This will ideally be implemented in a later prototype.

## Summary

This chapter described how the group came up with the initial idea during the BISI camp and how the idea has developed through different phases. In the "Idea Development" section the reader gets introduced to two elements (the arousal theory and building a device for 2-3 persons) that have had an impact on the development of

the prototype. The last section showed an estimation what hard- and software could be used for the Low fidelity prototype.

## Results

As we have not been able to actually test our prototype within the time-limit of this semester, we will treat our visits in the three institutions as results. The Results chapter introduces the reader to the three institutions “Kornvangen” (Esbjerg), “Fyrtøjet – „Tinderbox“” (Odense) and “Guldhornet” (Skanderborg). It gives a description on how the institutions have arranged their Snoezelen facilities and how they are used on a daily basis. The descriptions are detailed as we through these visits gained a lot of knowledge and inspiration towards building our prototype. Every room we describe have in some way had an impact on how we have chosen to design the prototype.

During the interviews, the group had no optimal recording device to record the interviews and hence there will not be a transcript of the interview in the appendix.

### Kornvangen

The visit in the “Snoezelen” house”Kornvangen” in Esbjerg guided by the head of the institution and Social Educator Majbritt Lind. The house was built in 1995 and it has continuously been renovated and improved. It has 6 rooms in total; the Hallway, the Yellow Room, the White Room, the Spa Room, a technician room and a changing room/ toilet. Each room (except toilet and Spa room) will be described according to its decor, the activities expected to be taking place inside it and then discussed in relation to the “Snoezelen” concept in general.

#### *The Hallway*

The hallway is the first thing the children encounter when they enter „Kornvangen“. The hallway is the pass way to all the other rooms in the house so the installations and features of this room are partially interactive and changeable in order to make the experience of entering the house more personal and comforting to the children. The features of the room are:

- A twinkling “starry night” ceiling
- 4 flat screen televisions showing an environment chosen by the child or its caretakers (e.g. “Under water” and “Desert landscape” etc”)
- An interactive floor projection that reacts on the children’s’ movements (e.g. “Fish pond” and “Cloudy sky”)
- A fiber light installation which colors support the chosen mood of the room

According to Majbritt Lind it is important for the children to feel safe when they enter the house hence it is really important that you can change the surroundings. She further explains that it is always of great importance that the Social Educator knows the children that he/she accompanies in the house. There are a lot of features that can be scary or even dangerous to some children i.e. light installation when children have epilepsy. She encourages that when the testing phase of the project prototype takes place we should only do this with the help of Social Educators who are familiar with the children.

### *The Yellow Room*

The Yellow Room is especially appealing to very active children and hearing and/or seeing impaired children as the features offer very extroverted sensory inputs. The features of the room are:

- A resonance bench/bed where the children feel the music that is playing
- A “Tuba”, a musical ”instrument” with proximity sensors that reacts to the user’s presence
- An interactive sound/light board on the floor with force pressure sensors that responds when being stepped on
- A wallmounted sound bar with big colorful buttons
- A bean bag chair with “arms” that can be wrapped around the user
- Speakers (animal sounds)

Majbritt Lind tells that in this room the resonance bench is really popular. It has many functions since it is both used as stage where the children can plug in a microphone to hear and feel themselves singing, but further it is really helpful for hearing impaired

children. She explains that children with Cochlear implants uses the bench when training in getting comfortable with their implant. As described this room has many features and Majbritt Lind explains that the room in general is interesting for children who need strong sensory inputs and that this would probably not be suitable for our project. She recommends that if the child has already used a lot of energy, as in our case, it would preferably only be introduced to few stimuli in order to relax.

### *The White Room*

The White Room is appealing to children who are comfortable with a more introvert sensory experience. The room is special in its décor and its colors. Its features are:

- White pillows and mattresses arranged around the wall of the room. This gives the room a more intimate feeling even though the room is quite big.
- 4 tubes approx. 30 cm in diameter and 2 meters high with bobbling water and changing lights
- Light installations, that can change between 4 different colors
- Fibre lights
- Projector (projects either “Musicure” videos to the wall)
- Speakers (“Musicure”)



Picture 4 White Room, “Kornvangen” Esbjerg

know to get full the experience.

Majbritt Lind tells that they often use this room to storytelling. She points out that one has to be aware that not all children are able to go in to the fantasy world that story listening is. Again it is important for some children to be accompanied by someone they



### ***The Technical Room***

The Technical Room is not actually a part of the “Snoezelen” rooms, it is only worth mentioning because Majbritt Lind explained that they experience that the technicalities of the house are too difficult to operate to many of the childrens’ parents and as the purpose of the house is, that it is to be visited without a consultant, this issue is a really big problem to both parents and Social Educators. She requested that the system should be more automatized and have a easier user interface.

### ***Fyrtøjet – et kulturhus for børn (The Tinderbox)***

Situated in the centre of Odense, only a few houses from the birth place of Hans Christian Andersen the “Tinderbox“ is a cultural facility for children. The idea in the house is to present his fairytales through storytelling, theatre and drama. In their 200 m<sup>2</sup> theatre they do this without the actual spoken narrative. The children have to make up their own story supported by the music and the wings in the theatre. In the “Tinderbox” we met with Kari Brinch one of the “fairytales-guides” (Danish transl: eventyrpilot<sup>6</sup>). Kari Brinch has a background as an elementary school teacher and as a learning support teacher for children with ADHD. Her job in the house is to help the children shape the stories in their minds. The facilities are not specifically designed to children with ADHD but the house is often visited by classes for children with special needs (such as ADHD).

The house has several activity rooms but only the few of relevance will be described here. The two main rooms are the “storytelling room” and the “theatre room”.

### ***The Storytelling Room***

The room is designed by inspiration of the ancient Roman amphitheatres so that everyone can see and hear the storyteller in the middle of the room. This is the first

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<sup>6</sup> [www.fyrtoejet.com](http://www.fyrtoejet.com)

room the children are introduced to; from here the scene is set and the children can with



the help of the “fairytale-guide” begin to make up their own stories. The back wall of the theatre is actually the gate way into the theatre room next door, so that doing the storytelling the children can get small glimpses of the world they are about to enter. Kari Brinch explains that the story they are told beforehand is

helping the children to bring focus in their play. This gives them a common ground to interact from. The line between the two rooms is clearly drawn by a portal of coloured glass. According to Kari Brinch it is important that the theatre room is a defined area as it creates a safe environment for the children to get comfortable in their play.

### *The Theatre Room*

The theatre room is the largest room in the building and all the activities in the house evolve around it. The two-storey room is approx. 200 m<sup>2</sup> and it is filled from top to bottom with scenes supporting the fairytale “The Little Mermaid”. The floor is decorated with corals, sand, wave illustrations and rocks to represent the floor of the



ocean. The ceiling is covered in fishing nets and flapping pieces and strings of plastic in golden and blue shades to represent the waves and clearly illustrate that the participant is really situated under water level. In one side

Picture 6 Theatre Room, “Tinderbox” Odense

of the room a sunken pirates' ship is squeezed in between the sandbars and in another the mermaids' king's conch palace rises. The lightning creates a maritime feeling in blue and green lights dip the scenery in a blurry and shifting mood.

The theatre room is mostly used during the regular opening hours by the visitors. Free and imaginative play, where families can get in to different roles and explore the scenery and fairytale together is the primary use of the room. The scenery is also used

by school classes who have fairytale lectures. These lectures follow a more linear structure, where the children are presented to the fairytale by the guide (in the story telling room) after the story, the children get costumes and experience together with the guide the scenery



Picture 7 Glass Portal dividing Theatre- and Storytelling Room, "Tinderbox" Odense

while re-enacting the story in their own way.

This is really a room where imagination can run free.

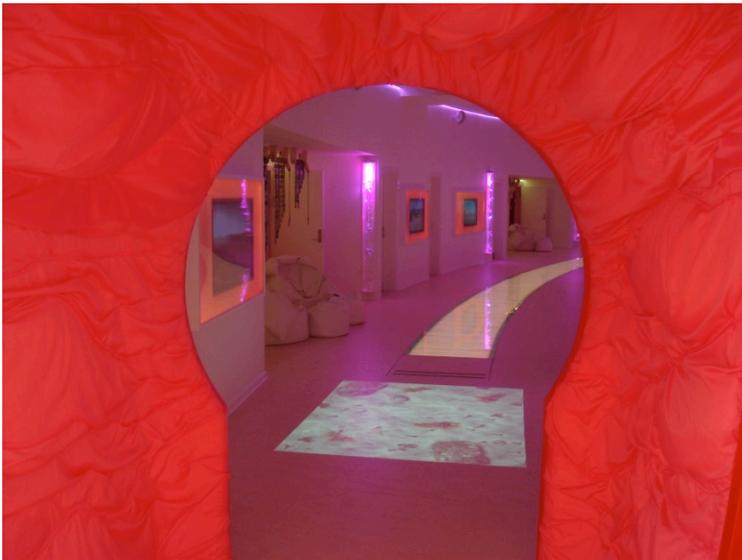
The visit at "Fyrtøjet" differs from our visits in the Snoezelen houses as it is, in its very nature, a completely different facility. The key values here are playfulness and imagination and hence it is of interest to us. In our prototype we are really inspired by especially the soundtrack made by composer Erling Hjarnø. It has not been possible though to get a copy of the soundtrack on CD. When interviewing Kari Brinch about her everyday experiences with the children in the house she also came with a lot of inputs to our prototype in general. This input will be mentioned in the discussion section.

## Guldhornet

The Snoezelen house “Guldhornet” is located in Sølund, Skanderborg. Sølund is one of the biggest institutions in Denmark for people with physical and mental disabilities. The house was finished in late 2009 and with 850 m<sup>2</sup> and 10 rooms it is the largest of its kind in the country. Gitte Andersson, a certified Snoezelen Consultant and leader of the house, introduces us to the different rooms and how they each can be relevant to different user groups. Some of the installations in the house is very similar to the ones in “Kornvangen” so they will not be emphasized further in this part.

### *The Hallway*

One enters the actual Snoezelen facilities through a portal visually representing a woman’s womb. Gitte Andersson explains that it is important for the users to have a



clear line between the worlds, because easily identifiable pattern recognitions help comfort them. The hallway is approx 30-35 long with several Snoezelen rooms on each side.(we were presented to 6 rooms but there were more).

The setting in the hallway is similar to the one in “Kornvangen”, along the walls flat-screens televisions provide the right mood settling through the preselected videos. On the floor, interactive projections give the user a chance to play and interact with his/her surroundings. The videos, floor projections, music and lighting is easily changed to the user’s preferred setting through a graphical user interface next to the entrance. It is also possible to connect the users own Ipod to the system so that they can hear their own music. Gitte Andersson explains that this function is really helpful when introducing the house to the users for the first

couple of times. If they can hear the music that they were just listening to at home a couple of minutes ago, this makes the experience feel safer.

### *The Music Room*

The music room in „Guldhornet“ is very similar to the one in „Kornvangen“. The only thing differing is a special speaker with a microphone plugged to it. The interface of the speaker is a colour palette that reacts to and lightens up according to the users voices. According to Gitte Andersson this instrument is especially entertaining for the users in the house who have no spoken language and therefore communicates through sounds. With this instrument everyone who participates in the game have the same language and it thereby enhances a feeling of equality between the users.

### *The Ballroom*

The only thing in the room is a large rubber “pool” filled with transparent plastic balls sized of approx 10 cm in diameter. From the bottom of the pool coloured lights changes the colour of the balls to the preferred one of the user. Gitte Andersson explains that in earlier editions of the pool the balls were in different colours themselves (similar to those in children’s’ play lands) but from the Snoezelen Consultants’ experience it proved to be frustrating for some of the users. The transparent balls can be coloured by light in every colour desirable but also just stay neutral and hence calming for those users who gets easily distracted. This is also applicant with the lighting in the room itself. The pool is big enough to fit 4 -5 people and Gitte Andersson elaborates that this room is especially beneficial for users who need tactile stimuli in company with others.

### *The White Room*

From the first appearance the white room itself does actually only contain waterbed mattress and in one corner the white wall stretches out in what appears to be a small built-in hut. Near the floor a small entrance allows the users to enter the hide-out into a dark environment where ultra-violet lighting activates a whole little universe above one’s head.

The room changes its appearance when projections and a soundtrack are turned on. What before seemed to be a white-roofed hut can now be an active volcano with lava flowing down the sides or an icy glacier in a snowing landscape. The whole room gets

absorbed by the chosen environment and the user can lie in the bed and feel they are along on the travel. Gitte Andersson tells that this room is especially for users who like to feel immersed and absorbed by their surroundings. It is a room that is open to the close relation between the carer and the user as the user will most often prefer to have the carer lying next to them in the bed.



## Discussion

In this section we will discuss the difficulties and different curiosities the group have come across during the project phase. In relation to the research question: “How can we help children with ADHD to relax and become more balanced in everyday life?” we compare the approach from the three experts with the knowledge and theories we obtained through the “review of literature”.

Since the first interview at “Kornvangen” the group chose to use arousal as the primary theory in understanding the complexity of ADHD and the theory of Snoezelen. The group is in line with Derryberry and Rothbart (1988) that arousal is in correlation with attention and emotions although different researchers such as Eysenck or Gary have different theories, see also section Arousal. This is supported by our results as Majbritt Lind from “Kornvangen” explains that they use the arousal levels of the children to choose certain activities with them and through the guided experience regulate the stimuli. The theory about ADHD indicates that attention is a major factor within this disorder, where Johnson and Proctor (2004) state that the lack of attention within ADHD is caused by low arousal.

This also correlates with the Low-Arousal Theory where ADHD is described as a result of low arousal and most of the symptoms are caused by this low arousal. This theory

correlates with the arousal theories where a lack of arousal leads to many of the symptoms of ADHD. The theory of arousal takes a central role in the “Rest Nest”, it is important to stimulate the user to such a degree that one gets immersed into the experience the “Rest Nest” provides. Majbritt Lind states that some disabled children have the need for strong sensory stimuli but especially children with ADHD are not recommended to have too many strong stimuli if they should feel relaxed. This supports our intention of providing limited sensory stimulations in the “Rest Nest.” Gitte Andersson states that, no matter if a child is under-stimulated or over-stimulated, in a Snoezelen room he/she can be satisfied and find balance. A Snoezelen room is created to suit different target groups though, where the “Rest Nest” instead is targeted to suit one group of users. If the institution wishes to it should be easy to change the target group with only a few modifications in the prototype.

The idea to use music stimulation and thereby evoke relaxation and wellbeing is both supported and criticized by the interviewed experts. Music therapy and especially MusiCure is used within Snoezelen rooms, both at “Kornvangen” and “Guldhornet” in combination with theme based animations or pictures. The “Tinderbox” on the other hand is using composed sounds and music to support and create a mood guided by a told story. The group’s initial idea for the “Rest Nest” has been to create sound based narratives to stimulate the user in combination with animations and pictures. Although the setup reminds of the setup used within the Snoezelen theory, there has been critique on it. Kari Brinch from the “Tinderbox” questioned if the goal was to get the child to relax or to create a fantasy experience, reaching both would in her opinion be contradictory.

The model of the “Tinderbox” was to create a fantasy experience with active participation of the children. In comparison the Snoezelen theory recommends that the user is going through different stages together with the guide/carer, depending on what needs the user has. The “Rest Nest” on the other side is only providing a certain aspect of stimulation, notably the aspect of relaxation without a guide. Gitte Andersson states here that a child with ADHD could not stay in such an environment without having used a lot of energy beforehand and that is why in Snoezelen houses have activity rooms. On

this note, the “Rest Nest” is designed to be used as part of a daily routine within the institution “Plantanhaven”, where the social educators can guide the child to go to the “RestNest” when they are worn out from their activities with the other children.

Kari Brinch states that in the “Tinderbox” children with ADHD can follow the story but they will have difficulties to stay focused without a guide if there is too much stimulation. This is why we hope that limited stimulation in the “Rest Nest” will help the child to get immersed and relaxed. In addition Kari Brinch recommends a closed environment as being good in creating a physical frame to the children. This enhances the feeling of comfort throughout the experience.

Gitte Andersson brings another point to our attention and that is the social needs of the children. She underlines that in the age (around 8 years), no games and play are fun alone, and especially a child with ADHD is normally quite lonely, so that separating a child with ADHD from the rest of the group in the institution could enhance the feeling of isolation. It is therefore of importance that the “Rest Nest” is able to fit 2 children that perhaps could complement each other if the guide considers it beneficial for the children.

This project was inspired by the case presented by “Platanhaven”. They needed a solution to help an 8-year old boy calming down doing his day in the institution. The needs of boys within his age group and diagnosis and the needs of the institution have hence been the main criteria for the process. As this is a special semester we have also had the six BISI criteria as a basic guideline and they are met by the project as followed:

- *It is an interface that can offer those who are impaired/disabled as well as those affected by their disability (e.g. healthcare staff/therapists, family etc) new opportunities toward an improved situation that could give benefits - e.g. functionality (psychophysical, physical or cognitive), communication, social inclusion and contact, (micro)development.*

As the “Rest Nest” is inspired by the Snoezelen theory, it is supposed to generate wellbeing through stimulation. This stimulation will be implemented in the prototype, the big red apple shaped cave. The device will give the user the

ability to immerse him/herself into a relaxing state and hence be more balanced in daily life.

- *It helps and assists the user in their everyday life, and/or enforces the user's possibilities for aesthetic expression/impression, self expression and/or communication.*

The "Rest Nest" project will create a prototype with the target to create a controlled environment that is designed to stimulate an ADHD child's imagination and can improve the child's ability to communicate with his/her surroundings.

- *It may be playful and interactive and thereby increment quality of life and offer progression (or decrease regression).*

As the "Rest Nest" is a cave/hide-out, the playfulness lies within the child's imagination and the interaction is a part of the sensory stimulation provided by the Snoezelen inspired stimulations.

- *It is an interface which expands the ability of interaction towards broadening the world of the end user in many different ways.*

The main focus with the "Rest Nest" project is to stimulate imagination through sound based stories or "musical allegories", see section MusiCure – Music Therapy. By engaging the imagination, the group aim for an increased ability to respond and react towards external stimulations in real life by the user.

- *There must be a focus on social inclusion*

The method of the "Rest Nest" itself is not social interaction, although there is an interaction between the child and his or hers imagination. This interaction is the main idea for social inclusion, by stimulating the child's needs for relaxation and wellbeing in an active day, the group aim to improve the child's ability to interact socially and more balanced with his/her peers after the experience in the

„Rest Nest“.

- *It must have an innovative touch*

The innovative touch of the “Rest Nest” is the primary idea to integrate a Snoezelen inspired relaxation cave into an active daily environment. This cave should include a unique soundtrack that is able to let the children explore their imagination and give them a break from their everyday life. The advantages of the cave compared to a regular Snoezelen house/ room is that the size of the cave will make it accessible to more institutions but perhaps also in private homes. Another advantage is that the time the children spend in the cave does not have to be guided by a Social Educator after the first couple of introduction try-outs. This aspect is beneficial in the institution where resources have been cut off the last couple of years. On the other hand the cave will be big enough to fit both a child and a adult if the child would like to share his/her experience with his/her parents or a trusted adult.

## Conclusion

In this process “Plantanhaven” has asked for a solution to help a child with ADHD relax and thereby enhance his/her social quality of life. Our research suggests that a device such as the “Rest Nest” can be applied into an institutional context.

The “Rest Nest’s” ability to relax and stimulate children with ADHD seems to work in theory. As we have still not been able to test the actual prototype, this will the closest we can come to a conclusion. By using parts of the Snoezelen theory and applying that to a caved environment in a institution where the theory of arousal is taking into consideration doing the day, the stimulation of imagination by sounds should lead to relaxation and thereby a more fulfilled and balanced life for the child. Our choice of combining MusiCure with animations and pictures is effective within the Snoezelen environment and we hope it to work similar within the “Rest Nest”. If so, this supports the hypothesis:

- That by using Snoezelen theory, we can create a prototype to help children with ADHD in an institutional context to become more balanced and social included in everyday life.

The use of sensor classification is relevant in the context that it gives a clear structure on what sensors to use. It thereby supports the building process of the prototype and gives the opportunity to recreate the setup.

There are different shortcomings which can have a potential impact on the results. The first point is the fact that there is no physical prototype yet to evaluate and support the theory with data and the group has not been able to arrange a testing period before hand-in. Another point is the discussion about the social factor. The “Rest Nest” was in the first place build for single-person use. There has been a discussion though if it would increase the relaxation and social inclusion, if the design would fit for more than a single user.

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